발명의 설명

발명의 명칭: 헤테로아릴 유도체 화합물 및 이의 용도

기술분야

[1] 본 발명은 헤테로아릴 유도체 화합물 및 이의 의약적 용도에 관한 것이다. 구체적으로, 본 발명은 PKMYT1 및/또는 CCNE1 억제 활성을 갖는 헤테로아릴 유도체 화합물에 관한 것이다.

배경기술

[2] 단백질 키나아제는 분자 스위치로 작용하여 신호전달 경로에 관여하는데, 세포 내에서 키나아제에 의한 표적 단백질의 활성과 비활성 상태 사이의 전환이 원활하게 조절되어야 한다. 만약, 이 전환 과정이 비정상적으로 조절될 경우 세포 내 신호 전달을 과도하게 활성화하거나 비활성화시켜 통제불능의 세포 분열 및 증식을 유도하게 된다. 특히, 단백질 키나아제 유전자의 변이, 증폭 및/또는 과발현에 의한 비정상적인 활성화는 다양한 종양의 발생 및 진행을 유발하거나 염증성 질환, 퇴행성 뇌질환, 자가면역 질환 등 다양한 질병의 발병에 결정적인 역할을 하게 된다.

[3] 특히, PKMYT1 (MYT1; membrane-associated tyrosine and threonine specific cdc2 inhibitory kinase)은 WEE1 키나아제 패밀리에 속하며, WEE1과 함께 세포 주기 내 G2 체크포인트에서 유사분열기 (mitotic)로 진입하는 관문의 주요 조절 인자로 작용한다. 암 세포에서 DNA 손상이 발생되면, PKMYT1이 G2 체크포인트에서 손상된 DNA를 복구 (DDR; DNA Damage Repair)하는 역할을 한다 (Molecules, 2017, 22(12), 2045). 따라서, PKMYT1의 저해를 통해 암 세포의 G2/M 체크포인트 기능을 억제하고 유사분열 특이적 세포사멸 (mitotic catastrophe)을 유도함으로써 암 세포의 활성을 억제할 수 있다 (Journal of Hematology & Oncology, 2020, 13, 126).

[4] 많은 고형암 환자들에게 있어서 화학 요법이 반응하지 않는 경우가 있는데, 이는 암 세포의 세포주기 조절과 DDR에 기인한 것이다. 또한, PKMYT1은 비소세포폐암 (NSCLC), 대장암 (CRC), 위암 (gastric cancer), 간세포암 (hepatocellular carcinoma), 교모세포종 (glioblastoma), 유방암 (breast cancer) 등과 같은 고형암에서 과발현되어 있으며 (Cell Proliferation, 2020, 53, e12741), NSCLC 환자에서 과발현되어 있을 경우 암의 진행 및 전이를 촉진시켜 예후가 좋지 않다는 것이 알려졌다 (Eur Rev Med Pharmacol Sci., 2019, 23(10), 4210-4219).

[5] 합성치사 (Synthetic Lethality)란 1개의 유전자 이상으로는 세포사멸을 일으키지 않지만 2개 이상의 유전자가 변이, 억제, 또는 과발현되면 그 복합적 결과로 세포사멸이 유도되는 현상이다. 합성치사는 DNA 복구, 세포 주기조절 및 대사작용의 변화를 포함하여 세포의 다양한 결함들을 표적으로 할 수 있기 때문에 암세

포만 특이적으로 사멸되도록 하는 항암 신약을 개발하기 위한 기술로 주목받고 있다.

[6] 세포주기 조절 인자인 CCNE1의 과발현은 DNA 복제 과정에서 DNA 손상을 유도한다. 이때 세포는 손상된 DNA를 교정하기 위해 G2기에 정지되어 DNA 수복과정을 거치게 된다. G2 관문 조절 인자인 PKMYT1은 CCNE1 과잉 활성화 (hyper activation), 증폭 (amplification), 또는 과발현 (overexpression)에 의해 발현 및 활성이 증가된다. PKMYT1을 단독으로 저해하는 경우 세포사멸을 유도하지 않지만, CCNE1이 과잉 활성화, 증폭, 또는 과발현되어 DNA 손상이 증가된 암세포에서 PKMYT1을 저해할 경우 합성치사를 유도하여 세포사멸을 꾀할 수 있다.

[7] 상기와 같이 PKMYT1은 CCNE1 의존적인 활성을 보이는데, 이는 CCNE1 유전자의 과잉 활성화, 증폭, 또는 과발현으로 인한 CCNE1 내재적 의존적 (intrinsic dependent) 활성과 화학 요법 등에 따라 외부적으로 유도된 과잉 활성화, 증폭, 과발현이 발생되는 CCNE1 유도적 의존적 (induced dependent) 활성으로 구분될 수 있다.

[8] 따라서, PKMYT1 관련 질환 및 CCNE1 과잉 활성화, 증폭, 및 과발현으로 발생되는 질환의 치료에 유용하게 활용될 수 있는 신규 화합물에 대한 요구가 증대되고 있다.

발명의 내용

기술적 과제

[9] 본 발명의 목적은 신규한 구조의 헤테로아릴 유도체, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염을 제공하는 것이다.

[10] 본 발명의 다른 목적은 상기 헤테로아릴 유도체 화합물의 제조방법을 제공하는 것이다.

[11] 본 발명의 다른 목적은 상기 헤테로아릴 유도체 화합물의 의약용도를 제공하는 것으로서, 구체적으로 상기 헤테로아릴 유도체 화합물을 유효성분으로 포함하는 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방용 약학적 조성물, 상기 화합물을 이용한 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방 용도, 또는 상기 화합물을 투여하는 단계를 포함하는 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방 방법을 제공하는 것이다.

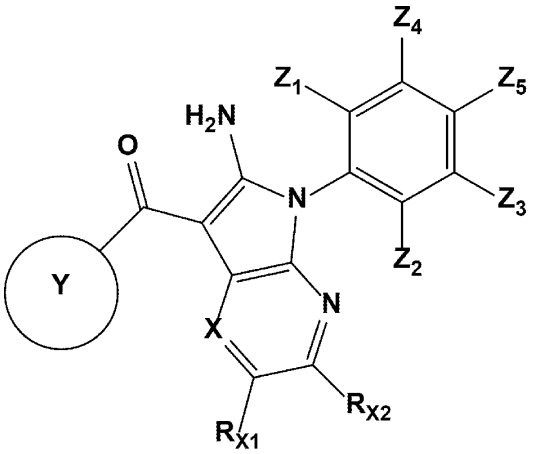
과제 해결 수단

[12] 상기 목적을 달성하기 위하여, 본 발명자들이 연구 노력한 결과, 아래에서 언급하는 화학식 1로 표시되는 헤테로아릴 유도체 화합물들이 PKMYT1 및/또는 CCNE1이 과잉 활성화, 증폭, 또는 과발현되어 있는 세포의 증식을 저해하는 것을 확인함으로써 본 발명을 완성하였다.

[13] 헤테로아릴 유도체 화합물

[14] 본 발명은 하기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염을 제공한다:

[15] [화학식 1]

[16] 

[17] 상기 화학식 1에서,

[18] X는 CH 또는 N이고;

[19] R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -C_{2-6}알케닐, -C_{2-6}알키닐, -C_{1-6}아미노알킬, -C_{1-6}하이드록시알킬, -C_{1-6}할로알킬, -CN, -NH(C_{1-6}알킬), -N(C_{1-6}알킬)(C_{1-6}알킬), -O-(C_{1-6}알킬), -(3-6원 사이클로알킬), -(4-6원 헤테로사이클로알킬), -페닐, 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 사이클로알킬), -(4-6원 헤테로사이클로알킬), -페닐, 또는 -(5-6원 헤테로아릴)의 고리 내 하나 이상의 H는 -C_{1-6}알킬로 치환될 수 있음; 또는 R_{X1} 및 R_{X2}가 서로 결합하여 12-13원 방향족 융합 고리를 형성하는 것이고;

[20] 고리 Y는 -(5-10원 헤테로아릴)이고, 여기서 상기 -(5-10원 헤테로아릴) 고리는 고리 내 하나 이상의 N, O, 또는 S 원자를 포함할 수 있고, 상기 -(5-10원 헤테로아릴) 고리의 고리 내 하나 이상의 H는 -C_{1-6}알킬, -C_{1-6}아미노알킬, -C_{1-6}하이드록시알킬, -C_{1-6}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -S(=O)$_2$-C_{1-6}알킬, 또는 -P(=O)-(C_{1-6}알킬)(C_{1-6}알킬)로 치환될 수 있음;

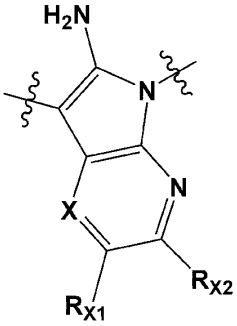
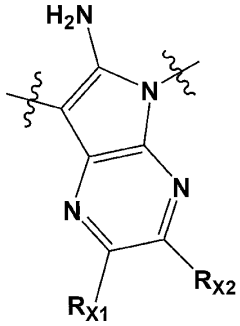
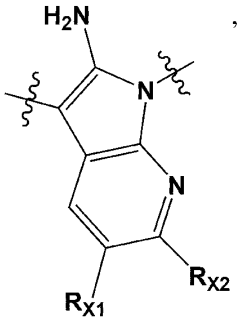
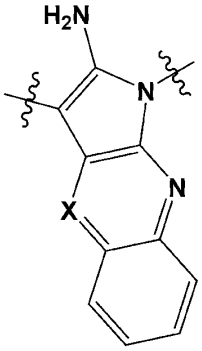
[21] m은 0, 1, 2, 3, 또는 4이고;

[22] R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-6}알킬, -C_{1-6}알킬-O-C_{1-6}알킬, -O-C_{1-6}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

[23] R_b 및 R_c는 각각 독립적으로 -C_{1-6}알킬, -C_{1-6}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-6}알킬, -S(=O)$_2$-C_{1-6}알킬, -S(=O)$_2$-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 헤테로사이클로알킬), 또는 -(CH_2)n-(5-6원 헤테로아릴)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 헤테로사이클로알킬), 또는 -(CH_2)n-(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-6}알킬, -O-C_{1-6}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

[24] n은 0, 1, 2, 3, 또는 4이고;

[25] Z_1 내지 Z_5는 각각 독립적으로 -H, -C_{1-6}알킬, -OH, 또는 -할로이다.

[26] 본 발명의 구체예에 따르면,  는 ,  , 또는  이고;

[27] R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -(3-6원 사이클로알킬), 또는 -(4-6원 헤테로사이클로알킬)이고, 여기서 상기 -(3-6원 사이클로알킬) 또는 -(4-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬로 치환될 수 있다.

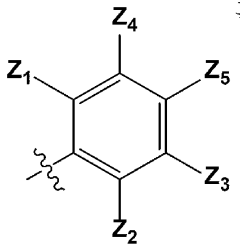
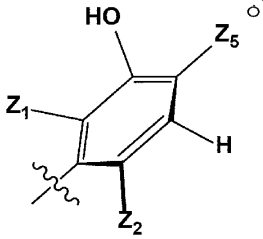
[28] 본 발명의 구체예에 따르면,

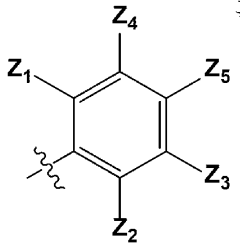
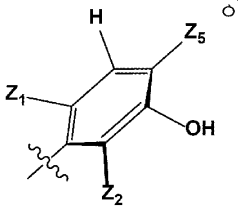
[29] 고리 Y는 -(8-9원 헤테로아릴)이고;

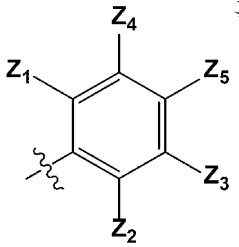
[30] Z_1 및 Z_2는 각각 독립적으로 -C_{1-6}알킬이고, 바람직하게는 -C_{1-3}알킬이고, 더 바람직하게는 메틸이고;

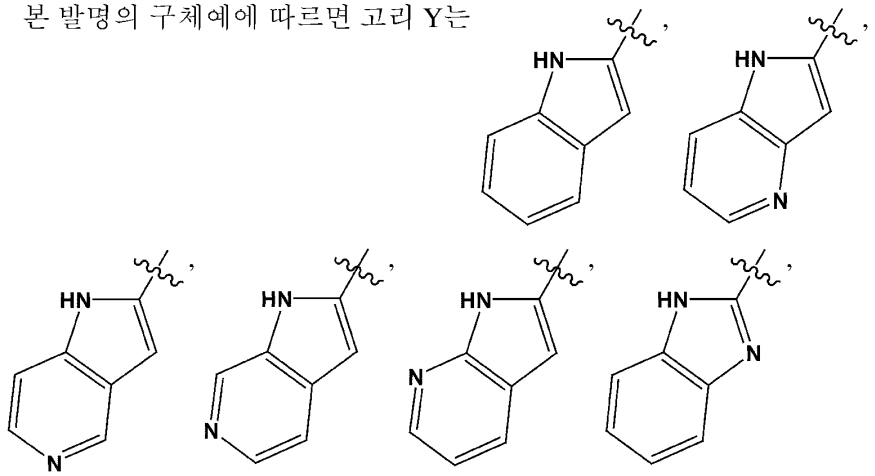
[31] Z_3 및 Z_4는 중 어느 하나는 -OH이고, 나머지 하나는 -H이고;

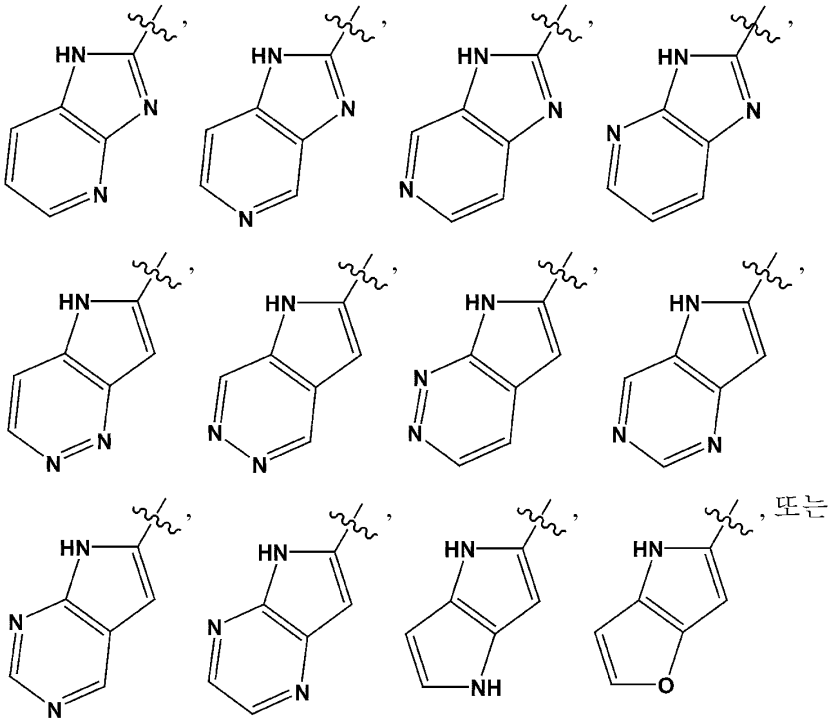
[32] Z_5는 -H 또는 -할로이다.

[33] 본 발명의 구체예에 따르면,  는  이고, Z_1, Z_2, 및 Z_5는 위에서 정의된 바와 같고, 본 명세서에서 S form인 화합물일 수 있다.

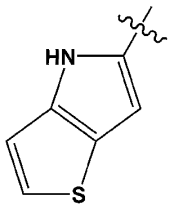
[34] 본 발명의 다른 구체예에 따르면,  는  이고, Z_1, Z_2, 및 Z_5는 위에서 정의된 바와 같고, 본 명세서에서 R form인 화합물일 수 있다.

[35] 또한, 본 발명의 구체예에 따르면,  는 라세미 혼합물(Racemic mixture)일 수 있다.

[36] 본 발명의 구체예에 따르면 고리 Y는 



, 또는



이고, 여기서 상기 고리 Y의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}아미노알킬, -C_{1-3}하이드록시알킬, -C_{1-3}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -S(=O)$_2$-C_{1-3}알킬, 또는 -P(=O)-(C_{1-3}알킬)(C_{1-3}알킬)로 치환될 수 있음;

[37] m은 0 또는 1이고;

[38] R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}알킬-O-C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

[39] R_b 및 R_c는 각각 독립적으로 -C_{1-3}알킬, -C_{1-3}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-3}알킬, -S(=O)$_2$-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -

C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

[40] n은 0, 1 또는 2이다.

[41] 본 발명의 구체예에 따르면, 상기 화학식 1로 표시되는 화합물이 하기에 기재된 표 1에 나열된 화합물로 이루어진 군으로부터 선택된 것일 수 있다.

[42] 본 발명에 있어서, "알킬"은, 다른 기재가 없는 한, 직쇄 또는 분지쇄의 비고리형, 고리형 또는 이들이 결합된 포화 탄화수소를 의미할 수 있다. 예를 들어, "C_{1-6}알킬"은 탄소 원자를 1 내지 6 개 포함하는 알킬을 의미할 수 있다. 비고리형 알킬은, 일 예로서, 메틸, 에틸, *n*-프로필, 아이소프로필, *n*-부틸, 2급(*sec*)-부틸, 아이소부틸, 3급(*tert*)-부틸, 아이소펜틸, 및 2-메틸펜틸 등을 포함할 수 있으나, 이에 제한되지 않는다. 본 명세서에서 상기 "알킬"에서 수소 원자 하나를 제거한 잔기를 "알킬렌"으로 지칭한다. 고리형 알킬은 본 명세서에서 "사이클로알킬"과 교환적으로 사용될 수 있으며, 일 예로서, 사이클로프로필, 사이클로부틸, 사이클로펜틸, 사이클로헥실, 사이클로헵틸, 또는 사이클로옥틸 등을 포함할 수 있으나, 이에 제한되지 않는다.

[43] 본 발명에 있어서, "알케닐" 및 "알키닐"은 직쇄 또는 분지쇄의 비고리형, 고리형 또는 이들이 결합된 불포화 탄화수소를 의미할 수 있다. 예를 들어, "C_{2-6}알케닐"은 하나 이상의 이중결합을 갖는 탄소 원자 2 내지 6 개의 불포화 탄화수소를 의미할 수 있고, "C_{2-6}알키닐"은 하나 이상의 삼중결합을 갖는 탄소 원자 2 내지 6 개의 불포화 탄화수소를 의미할 수 있다.

[44] 본 발명에 있어서, "알콕시"는 알킬 에터기로 -(R′-O-R″)을 의미할 수 있으며, 여기서 R′은 단일 결합 및 C_{1-6}알킬로 이루어진 군 중에서 선택될 수 있고, R″은 C_{1-6}알킬일 수 있다. 여기서, 알킬은 상기에서 정의된 바와 같다. 예를 들어, "C_{1-6}의 알콕시"는 C_{1-6}의 알킬을 함유하는 알콕시, 즉, -(O-C_{1-6}알킬) 또는 -(C_{1-6}알킬-O-C_{1-6}알킬)을 의미할 수 있으며, 알콕시의 일 예로서, 메톡시(methoxy), 에톡시(ethoxy), *n*-프로폭시(*n*-propoxy), 아이소프로폭시(isopropoxy), *n*-부톡시(*n*-butoxy), 아이소부톡시(isobutoxy), *sec*-부톡시(*sec*-butoxy), 또는 *tert*-부톡시(*tert*-butoxy) 등을 포함할 수 있으나, 이에 제한되는 것은 아니다.

[45] 본 발명에 있어서, "할로"는 F, Cl, Br, 또는 I일 수 있다.

[46] 본 발명에 있어서, "할로알킬"은 본원에 정의된 바와 같은 하나 이상의 할로로 치환된 탄소 원자를 갖는 직쇄 또는 분지쇄 알킬(탄화수소)을 의미할 수 있다. 상기 할로알킬의 예로는 하나 이상의 할로겐, 예를 들어 F, Cl, Br, 또는 I로 독립적으로 치환된 메틸, 에틸, *n*-프로필, 아이소프로필, *n*-부틸, *sec*-부틸, 아이소부틸, 또는 *tert*-부틸을 포함하나, 이에 한정되는 것은 아니다.

[47] 본 발명에 있어서, "하이드록시알킬"은 하이드록시(OH)로 치환된 탄소 원자를 갖는 직쇄 또는 분지쇄 알킬(탄화수소)을 의미할 수 있다. 상기 하이드록시알킬

의 예로는 -OH로 독립적으로 치환된 메틸, 에틸, *n*-프로필, 아이소프로필, *n*-부틸, *sec*-부틸, 아이소부틸, 또는 *tert*-부틸을 포함하나, 이에 한정되는 것은 아니다.

[48] 본 발명에 있어서, "알킬아미노" 또는 "아미노알킬"은 -(NR′R″)을 의미할 수 있으며, 여기서 R′및 R″은 각각 독립적으로 수소, C_{1-6}알킬, 및 N 보호기(예를 들어, Boc)로 이루어진 군 중에서 선택될 수 있고, 상기 선택된 R′및 R″은 각각 독립적으로 치환되거나 비치환될 수 있다. 또한, "C_{0-6}알킬아미노"는 알킬을 함유하지 않는 아미노(-NH_2) 또는 C_{1-6} 알킬을 함유하는 아미노, 즉, -NH(C_{1-6}알킬) 또는 -N(C_{1-6}알킬)$_2$을 의미할 수 있으며, 다이메틸아미노, 다이에틸아미노, 메틸에틸아미노, 메틸프로필아미노, 또는 에틸프로필아미노를 포함할 수 있으나, 이에 제한되는 것은 아니다.

[49] 본 발명에 있어서, "사이아노알킬"은 사이아노(CN)로 치환된 탄소 원자를 갖는 직쇄 또는 분지쇄 알킬(탄화수소)을 의미할 수 있다.

[50] 본 발명에 있어서, "알킬설폰일"은 -(R′-S(=O)$_2$-R″)을 의미할 수 있으며, 여기서 R′은 단일 결합 및 C_{1-6}알킬로 이루어진 군 중에서 선택될 수 있고, R″은 하이드록시 및 C_{1-6}알킬로 이루어진 군 중에서 선택될 수 있다. 상기 선택된 R′및 R″은 각각 독립적으로 치환되거나 비치환될 수 있다. 또한, "C_{0-6}알킬설폰일"은 알킬을 함유하지 않는 설폰산기(-S(=O)$_2$OH) 또는 C_{1-6}알킬을 함유하는 설폰일기, 즉, -S(=O)$_2$-(C_{1-6}알킬) 또는 -(C_{1-6}알킬)-S(=O)$_2$-(C_{1-6}알킬)을 의미할 수 있으며, 메틸설폰일, (메틸설폰일)메틸, (메틸설폰일)에틸, 에틸설폰일, (에틸설폰일)메틸, 및 (에틸설폰일)에틸을 포함할 수 있으나, 이에 제한되는 것은 아니다.

[51] 본 발명에 있어서, "알킬카보닐"은 -(R′-C(=O)-R″)을 의미할 수 있으며, 여기서 R′은 단일 결합 및 C_{1-6}알킬로 이루어진 군 중에서 선택될 수 있고, R″은 수소 및 C_{1-6}알킬로 이루어진 군 중에서 선택될 수 있다. 상기 선택된 R′ 및 R″은 각각 독립적으로 치환되거나 비치환될 수 있다. 또한, "C_{0-6}알킬카보닐"은 알킬을 함유하지 않는 알데하이드기(-C(=O)H) 또는 C_{1-6}알킬을 함유하는 케톤기, 즉, -C(=O)-(C_{1-6}알킬) 또는 -(C_{1-6}알킬)-C(=O)-(C_{1-6}알킬)을 의미할 수 있다.

[52] 본 발명에 있어서, "사이클로알킬"은 고리 내에 헤테로 원자(N, O, P, P(=O), 또는 S 등)를 포함하지 않는 탄화수소 고리를 의미할 수 있고, 포화 또는 부분적으로 불포화될 수 있다. 여기서, 불포화된 경우, 사이클로알켄으로 지칭될 수 있다. 달리 언급하지 않는 한, 사이클로알킬은 단일 고리이거나, 스피로(spiro) 고리, 다리(bridged) 고리 또는 융합(fused) 고리와 같은 다중 고리일 수 있다.

[53] 본 발명에 있어서, "헤테로사이클로알킬"은 고리 내에 N, O, P, P(=O), 및 S로부터 선택된 1 이상을 함유하는 고리를 의미할 수 있고, 포화 또는 부분적으로 불포화될 수 있다. 여기서, 불포화된 경우, 헤테로사이클로알켄으로 지칭될 수 있다. 달리 언급하지 않는 한, 헤테로사이클로알킬은 단일 고리이거나, 스피로(spiro) 고리, 다리(bridged) 고리 또는 융합(fused) 고리와 같은 다중 고리일 수 있다. 또한, "3 내지 12 원자의 헤테로사이클로알킬"은 고리를 형성하는 원자를 3 내지 12

개 포함하는 헤테로사이클로알킬을 의미할 수 있으며, 일 예로서, 헤테로사이클로알킬은 피롤리딘, 피페리딘, 이미다졸리딘, 피라졸리딘, 부티로락탐, 발레로락탐, 이미다졸리딘온, 하이단토인, 다이옥솔란, 피리미딘-2,4(1*H*,3*H*)-다이온, 1,4-다이옥산, 모폴린, 싸이오모폴린, 싸이오모폴린-*S*-옥사이드, 싸이오모폴린-*S*,*S*-옥사이드, 피페라진, 피란, 피리돈, 3-피롤린, 싸이오피란, 테트라하이드로퓨란, 테트라하이드로싸이오펜, 퀴누클리딘, 트로판, 2-아자스피로[3.3]헵탄, (1*r*,5*s*)-3-아자바이사이클로[3.2.1]옥탄, (1*s*,4*s*)-2-아자바이사이클로[2.2.2]옥탄, 또는 (1*r*,4*r*)-2-옥사-5-아자바이사이클로[2.2.2]옥탄 등을 포함할 수 있으나, 이에 제한되는 것은 아니다.

[54] 본 발명에 있어서, "헤테로바이사이클로알킬"은 고리 내에 N, O, P, P(=O), 및 S로부터 선택된 1 이상을 함유하는 스피로(spiro) 고리, 다리(bridged) 고리 또는 융합(fused) 고리와 같은 다중 고리를 의미할 수 있고, 포화 또는 부분적으로 불포화될 수 있다. 여기서, 불포화된 경우, 헤테로바이사이클로알켄으로 지칭될 수 있다. 헤테로바이사이클로알킬의 예로서, 퀴누클리딘, 트로판, 2-아자스피로[3.3]헵탄, (1*r*,5*s*)-3-아자바이사이클로[3.2.1]옥탄, (1*s*,4*s*)-2-아자바이사이클로[2.2.2]옥탄, 또는 (1*r*,4*r*)-2-옥사-5-아자바이사이클로[2.2.2]옥탄 등을 포함할 수 있으나, 이에 제한되는 것은 아니다.

[55] 본 발명에 있어서, "아렌"은 방향족 탄화수소 고리를 의미할 수 있다. 아렌은 단환식 아렌 또는 다환식 아렌일 수 있다. 아렌의 고리 형성 탄소수는 5 이상 30 이하, 5 이상 20 이하, 또는 5 이상 15 이하일 수 있다. 아렌의 예로는 벤젠, 나프탈렌, 플루오렌, 안트라센, 페난트렌, 바이벤젠, 터벤젠, 쿼터벤젠, 퀸크벤젠, 섹시벤젠, 트라이페닐렌, 피렌, 벤조 플루오란텐, 크리센 등을 예시할 수 있지만, 이들에 한정되지 않는다. 본 명세서에서 상기 "아렌"에서 수소 원자 하나를 제거한 잔기를 "아릴"로 지칭한다.

[56] 본 발명에 있어서, "헤테로아렌"은 이종 원소로 O, N, P, Si, 및 S 중 1 개 이상을 포함하는 고리일 수 있다. 헤테로아렌의 고리 형성 원자수는 3 이상 30 이하, 3 이상 20 이하, 또는 3 이상 15 이하일 수 있다. 헤테로아렌은 단환식 헤테로아렌 또는 다환식 헤테로아렌일 수 있다. 다환식 헤테로아렌은 예를 들어, 2 환 또는 3 환 구조를 갖는 것일 수 있다. 헤테로아렌의 예로는 싸이오펜, 퓨린, 피롤, 피라졸, 이미다졸, 싸이아졸, 옥사졸, 아이소싸이아졸, 옥사다이아졸, 트라이아졸, 피리딘, 피리딘-2-온, 피리딘-3-온, 피리딘-4-온, 바이피리딘, 트라이아진, 아크리딜, 피리다진, 피라진, 퀴놀린, 퀴나졸린, 퀴녹살린, 페녹사진, 프탈라진, 피리미딘, 피리도 피리미딘, 피리도 피라진, 피라지노 피라진, 아이소퀴놀린, 인돌, 카바졸, 이미다조피리다진, 이미다조피리딘, 이미다조피리미딘, 피라졸로피리미딘, 이미다조피라진 또는 피라졸로피리딘, *N*-아릴카바졸, *N*-헤테로아릴카바졸, *N*-알킬카바졸, 벤조옥사졸, 벤조이미다졸, 벤조카바졸, 벤조싸이오펜, 다이벤조싸이오펜, 싸이에노싸이오펜, 벤조퓨란, 페난트롤린, 아이소옥사졸, 싸이아다이아졸, 벤조싸이아졸, 테트라졸, 페녹싸이아진, 다이벤조실롤 및 다이벤조퓨란 등이 있

으나, 이들에 한정되지 않는다. 본 발명의 일 실시 태양에서 헤테로아렌은 또한 헤테로사이클로알킬 고리에 융합된 아렌 고리 또는 사이클로알킬 고리에 융합된 헤테로아렌을 포함하는 바이사이클릭 헤테로사이클로아렌을 포함할 수 있다. 본 명세서에서 상기 "헤테로아렌"에서 수소 원자 하나를 제거한 잔기를 "헤테로아릴"로 지칭한다.

[57] 본 발명에 있어서, "하이드로아렌" 또는 "하이드로아릴"은 방향족 탄화수소 고리에서 하나 이상의 이중결합을 포화시킨 것이다.

[58] 본 발명에 있어서, "헤테로하이드로아렌"은 고리를 형성하는 원자로 N, O, 및 S로부터 선택된 1 내지 5 개의 헤테로 원자를 함유하는 다중 고리(2환 내지 4환)를 의미할 수 있고, 상기 다중 고리 중 적어도 하나는 포화 또는 부분 불포화 고리이고, 적어도 다른 하나는 방향족 고리를 갖는 것일 수 있다. 본 명세서에서 상기 "헤테로하이드로아렌"에서 수소 원자 하나를 제거한 잔기를 "헤테로하이드로아릴"로 지칭한다.

[59] 본 발명에 있어서, "고리"는 단일 고리이거나 다중 고리일 수 있다. 상기 다중 고리는 스피로(spiro) 고리, 다리(bridged) 고리, 또는 융합(fused) 고리일 수 있다.

[60] 본 발명에 있어서, "입체 이성질체(stereoisomer)"는 동일한 화학식 또는 분자식을 가지지만 입체적으로 다른 화합물을 의미한다. 본 명세서에서 입체 이성질체는 광학 이성질체(optical isomer), 거울상 이성질체(enantiomer), 부분입체 이성질체(diastereomer), 시스(cis)/트랜스(trans) 이성질체, 회전 이성질체(rotamer), 및 회전장애 이성질체(atropisomer)를 포함하며, 이들 각각의 이성질체, 라세미, 및 이들의 혼합물도 본 발명의 범위에 포함된다. 예를 들어 본 발명의 화학식 1로 표시되는 화합물은 입체 화학구조가 특정되지 않기 때문에 화학식 1의 상기 입체 이성질체들을 포함할 수 있다. 다른 설명이 없는 한, 비대칭 탄소 원자와 연결되는 실선 결합()은 입체 중심의 절대적 배열을 나타내는 쐐기형 실선 결합() 또는 쐐기형 점선 결합()을 포함할 수 있다.

[61] 본 발명의 화학식 1로 표시되는 화합물은 "약학적으로 허용가능한 염"의 형태로 존재할 수 있다. 이에 본 발명의 화합물의 범주에는 상기 화학식 1로 표시되는 화합물의 약학적으로 허용가능한 염이 포함된다. 본 발명의 용어 "약학적으로 허용가능한 염"이란 환자에게 비교적 비독성이고 무해한 유효작용을 갖는 농도로서 이 염에 기인한 부작용이 화학식 1로 표시되는 화합물의 이로운 효능을 저하시키지 않는 상기 화합물의 임의의 모든 유기산 또는 무기산 부가염을 의미한다.

[62] 특히, 상기 약학적으로 허용가능한 염은, 유리산(free acid)에 의해 형성된 산 부가염일 수 있다. 여기서, 산 부가염은 염산, 질산, 인산, 황산, 브롬화수소산, 아이오딘화수소산, 아질산, 아인산 등과 같은 무기산류, 지방족 모노 및 다이카복실레이트, 페닐 치환된 알카노에이트, 하이드록시 알카노에이트 및 알칸다이오에이트, 방향족 산류, 지방족 및 방향족 설폰산류 등과 같은 무독성 유기산, 트라이플루오로아세트산, 아세테이트, 안식향산, 구연산, 젖산, 말레인산, 글루콘산, 메

탄설폰산, 4-톨루엔설폰산, 주석산, 푸마르산 등과 같은 유기산으로부터 얻을 수 있다.

[63] 이러한 약학적으로 허용가능한 염의 종류로는 설페이트, 설파이트, 니트레이트, 포스페이트, 피로포스페이트, 클로라이드, 브로마이드, 아이오다이드, 플루오라이드, 아세테이트, 프로피오네이트, 데카노에이트, 카프릴레이트, 아크릴레이트, 포메이트, 아이소부티레이트, 카프레이트, 헵타노에이트, 프로피올레이트, 옥살레이트, 말로네이트, 석시네이트, 수베레이트, 세바케이트, 푸마레이트, 말리에이트, 벤조에이트, 프탈레이트, 벤젠설포네이트, 톨루엔설포네이트, 페닐아세테이트, 페닐프로피오네이트, 페닐부티레이트, 시트레이트, 락테이트, 글리콜레이트, 말레이트, 타트레이트, 만델레이트 등을 포함할 수 있다.

[64] 상기 산 부가염은 통상의 방법으로 제조할 수 있으며, 예를 들면 화학식 1의 유도체를 메탄올, 에탄올, 아세톤, 메틸렌클로라이드, 아세토나이트릴 등과 같은 유기용매에 녹이고 유기산 또는 무기산을 가하여 생성된 침전물을 여과, 건조시켜 제조하거나, 용매와 과량의 산을 감압 증류한 후 건조시켜 유기용매 하에서 결정화시켜서 제조할 수 있다.

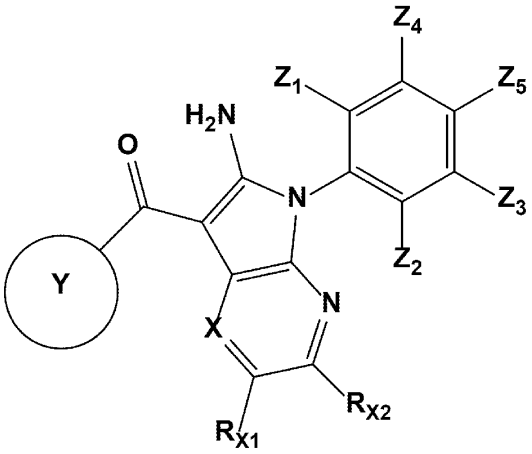
[65] 또한, 상기 약학적으로 허용가능한 염은, 염기를 사용하여 얻어진 염 또는 금속염일 수 있다. 금속염의 일 예로서, 알칼리 금속 또는 알칼리 토금속 염은, 화합물을 과량의 알칼리 금속 수산화물 또는 알칼리 토금속 수산화물 용액 중에 용해하고, 비용해 화합물 염을 여과하고, 여액을 증발 및 건조시켜 얻을 수 있다. 알칼리 금속염으로는 나트륨, 칼륨 또는 칼슘염이 제약상 적합할 수 있다. 또한, 이에 대응하는 염은 알칼리 금속 또는 알칼리 토금속 염을 적당한 은염(예, 질산은)과 반응시켜 얻을 수 있으며, 당업계에 알려진 염의 제조방법을 통하여 제조될 수 있다.

[66] **헤테로아릴 유도체 화합물의 제조방법**

[67] 본 발명은 하기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염의 제조방법을 제공한다.

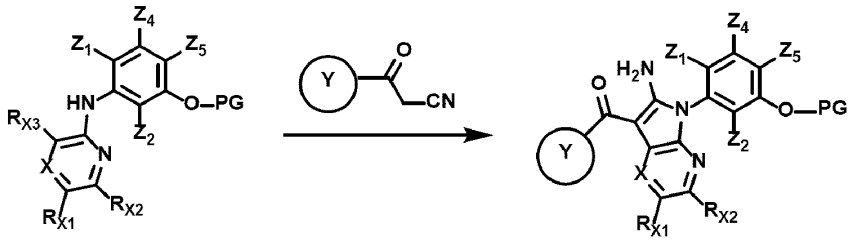
[68] [화학식 1]

[69]



[70] 본 발명의 구체예에 따르면, 상기 제조방법은 하기 반응식 I로 표시되는 단계를 포함할 수 있다:

[71] [반응식 I]

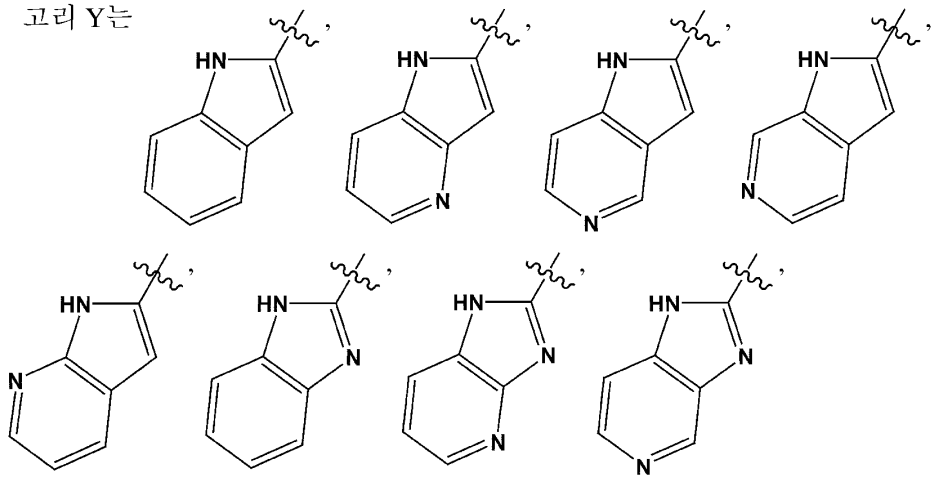
[72] 

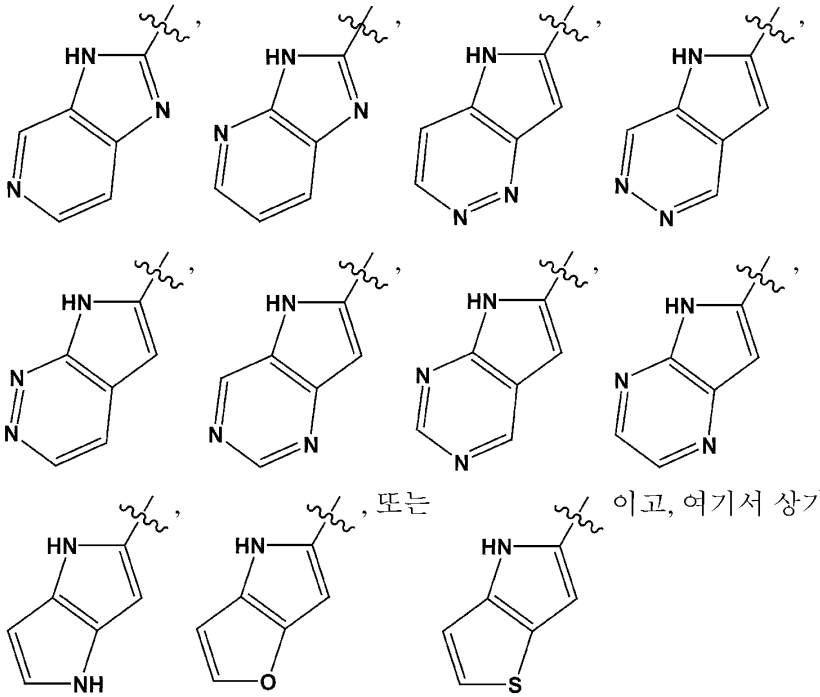
[73] 상기 반응식 I에서,

[74] R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -(3-6원 사이클로알킬), 또는 -(4-6원 헤테로사이클로알킬)이고, 여기서 상기 -(3-6원 사이클로알킬) 또는 -(4-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬로 치환될 수 있음;

[75] R_{X3}는 -할로이고;

[76] 고리 Y는





이고, 여기서 상기 고리 Y의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}아미노알킬, -C_{1-3}하이드록시알킬, -C_{1-3}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -$S(=O)_2$-C_{1-3}알킬, 또는 -P(=O)-(C_{1-3}알킬)(C_{1-3}알킬)로 치환될 수 있음;

[77] m은 0 또는 1이고;

[78] R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}알킬-O-C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

[79] R_b 및 R_c는 각각 독립적으로 -C_{1-3}알킬, -C_{1-3}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-3}알킬, -$S(=O)_2$-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

[80] n은 0, 1 또는 2이고;

[81] Z_1 및 Z_2는 각각 독립적으로 -C_{1-3}알킬이고;

[82] Z_4는 -H이고;

[83] Z_5는 -H 또는 -할로이고;

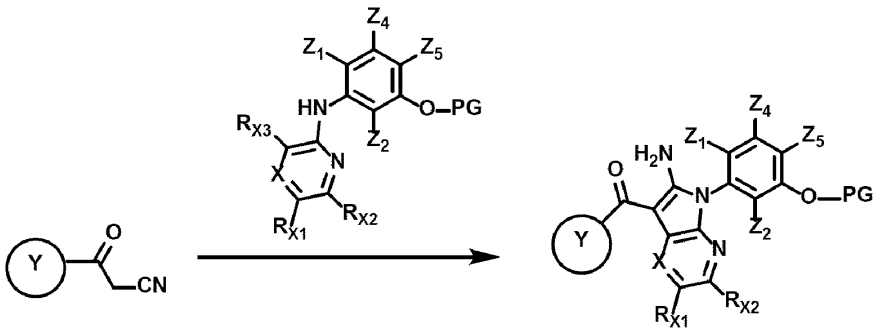
[84] PG는 -OH 보호기이다.

[85] 본 발명에 있어서, 상기 -OH 보호기는 MOM(메톡시메틸) 또는 SEM(2-(트라이메틸실릴)에톡시메틸)일 수 있다. 다만, 이에 제한되지 않는다.

[86] 본 발명의 다른 구체예에 따르면, 상기 제조방법은 하기 반응식 II로 표시되는 단계를 포함할 수 있다:

[87] [반응식 II]

[88]



[89] 상기 반응식 II에서,

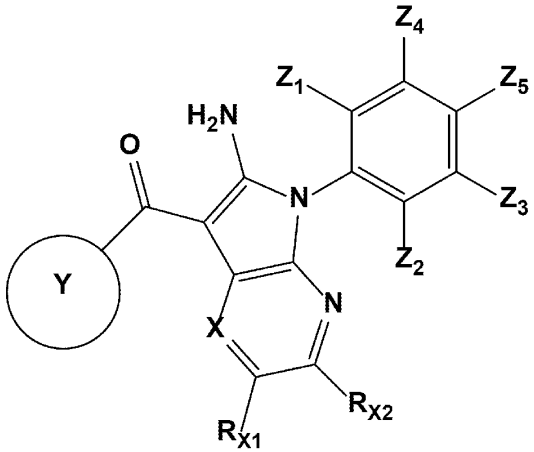
[90] R_{X1} 내지 R_{X3}, 고리 Y, Z_1, Z_2, Z_4, Z_5는 및 PG는 반응식 I에서 정리된 바와 같다.

[91] <u>헤테로아릴 유도체 화합물의 용도</u>

[92] 본 발명은 하기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염의 용도를 제공한다.

[93] [화학식 1]

[94]



[95] 상기 화학식 1은 위에서 정의한 바와 같다.

[96] 본 발명의 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염은 다양한 키나아제에 대하여 억제 활성을 나타낸다.

[97] 본 발명의 일 구체예에 따르면, 상기 화학식 1로 표시되는 헤테로아릴 유도체는 PKMYT1에 대하여 높은 억제 활성을 나타내고, PKMYT1가 활성화된 세포의 증

식을 억제하는 것을 확인할 수 있었다. 또한, 본 발명의 상기 화학식 1로 표시되는 헤테로아릴 유도체는 CCNE1 과잉 활성화, 증폭, 또는 과발현되어 있는 세포에 대하여도 높은 저해 활성을 나타낸다. 따라서, PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환에 대하여 치료 또는 예방에 유용하게 사용될 수 있다.

[98] 상기 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환은 예를 들어 암일 수 있다. 상기 암은 PKMYT1과 연관된 질환 또는 장애에 연관된 것으로 PKMYT1을 활성화하는 이상을 포함하는 악성 종양일 수 있고, 또는 CCNE1의 과잉 활성화, 증폭, 또는 과발현에 의해 특징화되는 악성 종양일 수 있다. 상기 암은 고형암 또는 혈액암일 수 있으며, 원발성 암뿐 아니라 전이성 암도 포함한다.

[99] 구체적인 예로서, 고형암은 자궁암 (Uterine Cancer), 자궁경부암 (Cervical Cancer), 난소암 (Ovarian Cancer), 유방암 (Breast Cancer), 소화기암 (Gastrointestinal Tract Cancer), 담도암 (Biliary Tract Cancer), 폐암 및 흉부암 (Lung and Thoracic Cancer), 흉선암 (Thymic Cancer), 비뇨생식기암 (Genitourinary Cancer), 두경부암 (Head and Neck Cancer), 뇌 및 신경계 종양 (Brain and Nervous System Tumor), 신경내분비암 (Neuroendocrine Tumor), 골 및 연조직 종양 (Bone and Soft Tissue Tumor), 및 피부암 (Skin Cancer)으로 이루어진 군으로부터 1종 이상인 것일 수 있으나, 이에 제한되지 않는다.

[100] 상기 자궁암 (Uterine Cancer)은 자궁내막암 (Endometrial Cancer), 유두상 장액성 자궁내막암 (UPSC; Uterine Papillary Serous Carcinoma), 자궁 육종 (Uterine Carcinosarcoma), 자궁체부암 (Uterine Corpus Cancer), 또는 자궁체부내막암 (Uterine corpus endometrial carcinoma)일 수 있다.

[101] 상기 난소암 (Ovarian cancer)은 장액성 난소암 (Serous Ovarian Cancer) 또는 고등급 장액성 난소암 (HGSOC; High grade serous Ovarian cancer)일 수 있다.

[102] 상기 유방암 (Breast Cancer)은 삼중음성유방암 (TNBC)일 수 있다.

[103] 상기 소화기암 (Gastrointestinal Tract Cancer)은 췌장 도관 선종암 (PDAC; Pancreatic ductal adenocarcinoma) 등 췌장암 (Pancreatic Cancer), 대장암 (Colorectal Cancer, CRC), 직장암 (Rectal Cancer), 위암 (Gastric Cancer), 식도암 (Esophageal Cancer), 또는 간세포암 (LIHC; Liver Hepatocellular Carcinoma) 등 간암 (Liver Cancer)일 수 있다.

[104] 상기 폐암 (Lung Cancer)은 소세포폐암 (SCLC), 비소세포폐암 (NSCLC) 또는 폐편평상피세포암 (Squamous Cell Carcinoma of the Lung)일 수 있다.

[105] 상기 흉선암 (Thymic Cancer)은 흉선종 (Thymoma)일 수 있다.

[106] 상기 비뇨생식기암 (Genitourinary Cancer)은 전립선암 (Prostate Cancer), 방광암 (Bladder Cancer), 고환암 (Testicular Cancer), 또는 유두상 신세포암 (KIRP; Kidney renal papillary cell carcinoma), 투명세포형 신세포암 (KIRC; Kidney renal clear cell carcinoma) 등 신장암 (Kidney Cancer)일 수 있다.

[107] 상기 두경부암 (Head and Neck Cancer)은 두경부 편평세포암 (Head and Neck Squamous Cell Carcinoma, HNSCC) 또는 선낭암종 (ACC; Adenoid Cystic Carcinoma)일 수 있다.

[108] 상기 뇌 및 신경계 종양 (Brain and Central Nervous System Tumor)은 뇌암 (Brain Cancer), 교모세포종 (Glioblastoma), 신경교종 (Glioma), 또는 뇌 하급 신경교종 (LGG; Brain Lower Grade Glioma)일 수 있다.

[109] 상기 골 및 연조직 종양 (Bone and Soft Tissue Tumor)은 골육종 (Osteosarcoma), 유잉육종 (Ewing Sarcoma), 연골육종 (Chondrosarcoma) 등 뼈암 (Bone Cancer) 또는 연조직암 (Soft Tissue Sarcoma)일 수 있다.

[110] 상기 피부암 (Skin Cancer)은 흑색종 (Melanoma)일 수 있다.

[111] 구체적인 예로서, 혈액암은 만성 골수성 백혈병 (CML; Chronic Myeloid Leukemia), 만성 림프구성 백혈병 (CLL; Chronic Lymphocytic Leukemia), 급성 골수성 백혈병 (AML; Acute Myeloid Leukemia), 급성 림프구성 백혈병 (ALL; Acute Lymphoblastic Leukemia) 등 백혈병 (Leukemia), 다발성 골수종 (Multiple Myeloma), 또는 림프종 (Lymphoma)일 수 있다.

[112] 본 발명의 일 구체예에 따르면, 본 발명은 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염을 유효성분으로 함유하는 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방용 약학적 조성물을 제공한다. 구체적으로, 상기 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환은 암일 수 있다. 상기 암의 종류는 위에서 언급한 바와 같다.

[113] 본 발명의 일 구체예에 따르면, 본 발명은 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염을 유효성분으로 함유하는 PPP2R1A 및/또는 FBXW7 불활성화 돌연변이 (inactivating mutation)와 관련된 질환의 치료 또는 예방용 약학적 조성물을 제공한다. 구체적으로, 상기 PPP2R1A 및/또는 FBXW7 불활성화 돌연변이 (inactivating mutation)와 관련된 질환은 암일 수 있다. 상기 암의 종류는 위에서 언급한 바와 같다.

[114] 본 발명의 상기 약학적 조성물은 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염 외에 동일 또는 유사한 약효를 나타내는 유효성분을 1 종 이상을 더 포함할 수 있다.

[115] 본 발명의 약학적 조성물은, 임상 투여시에 이용될 수 있으며, 경구 및 비경구의 여러 가지 제형으로 투여될 수 있도록 제조될 수 있다.

[116] 또한 본 발명의 일 구체예에 따르면, 본 발명은 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방용 약제(medicament)의 제조를 위한 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이들의 약학적으로 허용가능한 염의 용도(use)를 제공한다. 구체적으로, 상기 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환은 암일 수 있다. 상기 암의 종류는 위에서 언급한 바와 같다.

[117] 또한 본 발명의 일 구체예에 따르면, 본 발명은 암의 질환의 치료 또는 예방용 약제의 제조에 사용하기 위한, 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염의 용도를 제공한다. 상기 암의 종류는 위에서 언급한 바와 같다.

[118] 또한 본 발명의 일 구체예에 따르면, 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염의 치료학적으로 유효한 양을, 이를 필요로 하는 대상(subject)에게 투여하는 단계를 포함하는, PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환을 치료 또는 예방하는 방법을 제공한다. 상기 대상(subject)은 인간을 포함하는 포유류일 수 있다. 구체적으로, 상기 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환은 암일 수 있다. 상기 암의 종류는 위에서 언급한 바와 같다.

[119] 또한 본 발명의 일 구체예에 따르면, 본 발명은 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염의 치료학적으로 유효한 양을, 이를 필요로 하는 대상에게 투여하는 단계를 포함하는 암을 치료 또는 예방하는 방법을 제공한다. 상기 암의 종류는 위에서 언급한 바와 같다.

[120] 또한 본 발명의 일 구체예에 따르면, 본 발명은 상기 화학식 1로 표시되는 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용 가능한 염의 치료학적으로 유효한 양을, 이를 필요로 하는 대상에게 투여하는 단계를 포함하는, PKMYT1 및/또는 CCNE1을 억제하는 방법을 제공한다.

[121] 본 발명에서 사용되는 "치료학적으로 유효한 양"이라는 용어는 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방에 유효한 상기 화학식 1로 표시되는 화합물의 양을 나타낸다. 구체적으로, "치료학적으로 유효한 양"은 의학적 치료에 적용 가능한 합리적인 수혜/위험 비율로 질환을 치료하기에 충분한 양을 의미하며, 유효 용량 수준은 개체 종류 및 중증도, 연령, 성별, 질병의 종류, 약물의 활성, 약물에 대한 민감도, 투여 시간, 투여 경로 및 배출 비율, 치료기간, 동시 사용되는 약물을 포함한 요소 및 기타 의학 분야에 잘 알려진 요소에 따라 결정될 수 있다. 본 발명의 약학적 조성물은 개별 치료제로 투여하거나 다른 치료제와 병용하여 투여될 수 있고 시판되는 치료제와는 순차적으로 또는 동시에 투여될 수 있다. 그리고 단일 또는 다중 투여될 수 있다. 상기 요소를 모두 고려하여 부작용 없이 최소한의 양으로 최대 효과를 얻을 수 있는 양을 투여하는 것이 중요하며, 당업자에 의해 용이하게 결정될 수 있다. 본 발명의 약학적 조성물의 투여 용량은, 환자의 상태, 연령, 성별 및 합병증 등의 다양한 요인에 따라 전문가에 의해 결정될 수 있다. 본 발명의 약학적 조성물의 유효성분은 안전성이 우수하므로, 결정된 투여 용량 이상으로도 사용될 수 있다.

[122] 본 발명에서 사용되는 "예방"이란 상기 화합물의 투여로 상기 질환의 발생, 확산 및 재발을 억제시키거나 지연시키는 모든 행위를 의미하고, "치료"는 상기 화합물의 투여로 상기 질환의 증세가 호전되거나 이롭게 변경되는 모든 행위를 의미한다.

[123] 또한 본 발명의 일 구체예에 따르면, 상기 약학적 조성물은 약학적으로 허용되는 담체, 희석제 또는 부형제를 추가로 포함할 수 있다. 일 구현예에 있어서, 본 발명은 화학식 1로 표시되는 화합물, 또는 이의 약학적으로 허용가능한 염 또는 입체 이성질체, 및 약학적으로 허용가능한 첨가제를 포함하는 약학적 조성물을 제공한다.

[124] 상기 약학적 조성물에 사용되는 첨가제의 예는 감미제, 결합제, 용매, 용해 보조제, 습윤제, 유화제, 등장화제, 흡수제, 붕해제, 산화방지제, 보존제, 윤활제, 충전제, 향미제 등을 포함할 수 있다. 예를 들어, 상기 첨가제는 락토오스, 덱스트로스, 수크로스, 만니톨, 소르비톨, 셀룰로스, 글리신, 실리카, 활석, 스테아르산, 스테아린, 마그네슘 스테아레이트, 마그네슘 알루미노실리케이트, 전분, 젤라틴, 트라가칸트 검, 알긴산, 나트륨 알기네이트, 메틸셀룰로스, 나트륨 카복시메틸셀룰로스, 한천, 물, 에탄올, 폴리에틸렌글리콜, 폴리비닐피롤리돈, 염화나트륨, 염화칼슘, 오렌지 에센스, 딸기 에센스, 바닐라 향 등을 포함할 수 있다.

[125] 상기 약학적 조성물은 경구 투여(예컨대, 정제, 환제, 산제, 캡슐제, 시럽 또는 에멀젼) 또는 비경구 투여(예컨대, 근육내, 정맥내 또는 피하 주사)를 위한 다양한 제제 형태로 배합될 수 있다.

[126] 예를 들어 상기 약학적 조성물은 경구 투여용 제제로 배합될 수 있으며, 이때 사용되는 첨가제로는 셀룰로스, 칼슘 실리케이트, 옥수수 전분, 락토오스, 수크로스, 덱스트로스, 칼슘 포스페이트, 스테아르산, 마그네슘 스테아레이트, 칼슘 스테아레이트, 젤라틴, 활석, 계면활성제, 현탁제, 유화제, 희석제 등이 포함될 수 있다. 구체적으로, 경구 투여를 위한 고형 제제에는 정제, 환제, 산제, 과립제, 캡슐제 등이 포함되며, 이러한 고형 제제는 상기 조성물에 적어도 하나 이상의 부형제, 예를 들면 전분, 탄산칼슘, 수크로스, 락토즈, 젤라틴 등을 혼합하여 제형화될 수 있다. 또한, 단순한 부형제 이외에 마그네슘 스테아레이트, 탈크와 같은 윤활제가 사용될 수 있다. 또한, 경구 투여를 위한 액상 제제로는 현탁제, 유제, 시럽제 등이 예시될 수 있으며, 흔히 사용되는 단순 희석제인 물, 액체 파라핀 이외에 여러 가지 부형제, 예를 들면 습윤제, 감미제, 방향제, 보존제 등이 포함될 수 있다.

[127] 또한, 비경구 투여를 위한 제제에는 멸균된 수용액제, 비수성용제, 현탁제, 유제, 동결건조 제제 및 좌제가 포함된다. 비수성용제, 현탁제로는 프로필렌글리콜, 폴리에틸렌글리콜, 올리브 오일과 같은 식물성 기름, 에틸올레이트와 같은 주사 가능한 에스테르 등이 사용될 수 있다. 좌제의 기제로는 위텝솔, 마크로골, 트윈61. 카카오지, 라우린지, 글리세로제라틴 등이 사용될 수 있다. 한편, 주사제에는 용해제, 등장화제, 현탁화제, 유화제, 안정화제, 방부제 등과 같은 종래의 첨가제가 포함될 수 있다.

[128] 또한, 기타 활성제제와 함께 복합 제제로 제조되어 활성 성분들의 상승 작용을 가질 수 있다.

[129] 본 발명의 용도, 조성물, 치료 방법에서 언급된 사항은 서로 모순되지 않는 한 동일하게 적용된다.

발명의 효과

[130] 본 발명의 헤테로아릴 유도체 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염은 키나아제, 특히 PKMYT1 및/또는 CCNE1에 대한 우수한 억제 활성을 나타내므로 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방에 유용하게 사용될 수 있고, 특히 암의 치료제로 유용하게 사용될 수 있다.

발명의 실시를 위한 형태

[131] 이하, 본 발명을 실시예 및 실험예에 의하여 상세히 설명한다. 단, 하기 실시예 및 실험예는 본 발명을 예시하는 것일 뿐, 본 발명의 내용이 이에 한정되는 것은 아니다.

[132] **<분석 및 정제 조건>**

[133] 본 발명의 제조예 및 실시예에서 합성된 화합물은 하기 조건에 의해 정제하거나 또는 구조 분석을 실시하였다.

[134] **1. LC-MS, Prep-HPLC, MPLC**

[135] 분석용 LC-MS (Liquid Chromatography-Mass Spectrometry)

[136] Waters사 제조 UPLC system (ACQUITY UPLC PDA Detector)에 Waters사 제조 mass QDa Detector가 장착된 장비를 사용하였다. Waters사의 ACQUITY UPLC® BEH C18 (1.7 ㎛, 2.1 X 50 mm) 컬럼을 사용하였고, 컬럼온도는 30 ℃로 하였다.

[137] 이동상 A는 0.1 % 포름산이 포함된 물, 이동상 B는 0.1 %의 포름산이 포함된 아세토나이트릴을 사용하였다.

[138] Gradient condition (10-100 % B로 3분, 유속 = 0.6 mL/min)

[139] 정제용 Prep-HPLC (Preparative-Liquid chromatography UV spectrometry)

[140] Teledyne사 제조 ACCQPrep HP150 장비를 사용하였다. Water사의 XTERRA® Prep RP18 OBD™ (10 ㎛, 30 X 300 mm) 컬럼을 사용하였고, 컬럼 온도를 실온으로 하였다.

[141] 정제용 중압액체크로마토그래피 (Medium pressure liquid chromatography; MPLC)

[142] Teledyne ISCO사의 CombiFlash Rf +UV 장비를 사용하여 중압액체크로마토그래피를 수행하였다.

[143] **2. NMR 해석**

[144] NMR 분석은 Bruker사 제조 NMR AVANCE NEO 400 MHz을 사용해서 수행하였고, 데이터는 ppm (parts per million(δ))으로 나타내었다.

[145] 사용된 시판 시약은 추가 정제 없이 사용하였다. 본 발명에서 실온 또는 상온이란 5 ℃ 내지 40 ℃, 일 예로서, 10 ℃ 내지 30 ℃, 다른 예로서 20 ℃ 내지 27 ℃ 정도의 온도를 말하는 것으로, 상기 범위 내로 엄밀하게 한정되는 것은 아니다. 감

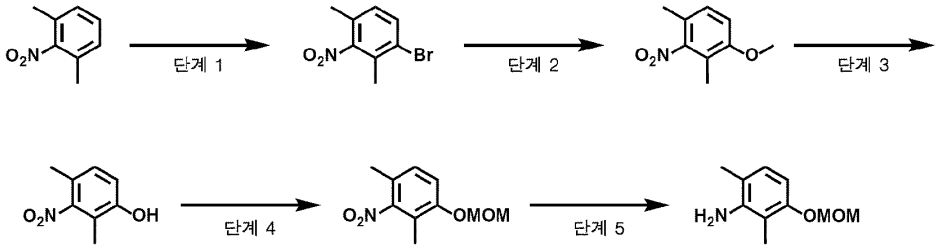
압 하 농축 또는 용매 증류 제거는 회전식 증발기 (rotary evaporator)를 사용하였다.

[146] 제조예: 본 발명의 중간체 화합물의 제조

[147] **제조예 1. 3-(메톡시메톡시)-2,6-다이메틸아닐린의 제조**

[148] [반응식 1]

[149]



[150] [단계 1] 1-브로모-2,4-다이메틸-3-나이트로벤젠의 제조

[151] 1,3-다이메틸-2-나이트로벤젠 (20 g, 132 mmol)을 다이클로로메테인 (66 mL)에 녹인 후, 철 (1.85 g, 33.1 mmol)과 무수 브롬화철(III) (0.78g, 2.65 mmol)을 첨가하였다. 반응 혼합물에 브롬 (23.26 g, 146 mmol, 7.5 mL)을 천천히 적가한 후 3시간 동안 교반하였다. 반응 혼합물을 얼음물에 천천히 넣어 희석한 후 에틸에테르 (50 mL X 3)로 유기층을 추출하였다. 모아진 유기층은 20 % 싸이오황산나트륨 수용액과 포화 소금물로 씻고 황산나트륨으로 건조 후 감압 농축하였다. 얻어진 목적 화합물 (30.31 g, crude)은 추가 정제 없이 다음 반응에 사용하였다.

[152] [단계 2] 1-메톡시-2,4-다이메틸-3-나이트로벤젠의 제조

[153] 단계 1에서 제조한 1-브로모-2,4-다이메틸-3-나이트로벤젠 (30 g, 130 mmol)을 다이메틸포름아마이드 (87 mL)에 녹인 후, 브롬화구리 (1.87 g, 13.04 mmol)를 넣어 주었다. 반응 혼합물에 25 % 나트륨메톡사이드 (89 mL, 메탄올 용액, 391 mmol)를 천천히 적가한 후 95 ℃에서 2시간 동안 교반하였다. 반응 혼합물에 염화암모늄 포화수용액 (500 mL)을 넣어준 후 에틸에테르 (200 mL X 3)로 유기층을 추출하였다. 모아진 유기층은 포화 소금물로 씻어준 후 황산나트륨으로 건조 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 헥세인:에틸아세테이트 0~50 %)로 정제하였고, 목적 화합물 (20.5 g, 87 % 수율)을 수득하였다.

[154] [단계 3] 2,4-다이메틸-3-나이트로페놀의 제조

[155] 단계 2에서 제조한 1-메톡시-2,4-다이메틸-3-나이트로벤젠 (21.81 g, 120 mmol)을 다이클로로메테인 (120 mL)에 녹인 후, -78 ℃에서 다이클로로메테인에 녹여진 1M 삼브롬화붕소 (181 mL, 181 mmol)을 천천히 적가하였다. 반응 혼합물을 상온에서 16시간 동안 교반 한 후 0 ℃의 탄산수소나트륨 포화수용액에 천천히 넣어주었다. 다이클로로메테인 (500 mL X 3)으로 유기층을 추출하였다. 모아진 유기층은 포화 소금물로 씻어준 후 황산나트륨으로 건조 후 감압 농축하였다. 얻어진 목적 화합물 (19.52 g, 97 % 수율)은 추가 정제 없이 다음 반응에 사용하였다.

[156] [단계 4] 1-(메톡시메톡시)-2,4-다이메틸-3-나이트로벤젠의 제조

[157] 단계 3에서 제조한 2,4-다이메틸-3-나이트로페놀 (20.38 g, 122 mmol)을 다이클로로메테인 (406 mL)에 녹인 후, *N*,*N*-다이아이소프로필에틸아민 (39.4 g, 305 mmol, 53.2 mL)을 넣어주었다. 반응 혼합물에 클로로메틸메틸에테르 (9.81 g, 122 mmol, 9.26 mL)를 천천히 넣어준 후 상온에서 2시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 다이클로로메테인 (1 L)을 추가로 넣고 물과 0.1M 염산 수용액으로 씻어 주었다. 유기층을 황산나트륨으로 건조 후 감압 농축하였다. 농축된 혼합물은 MPLC (SiO_2, 헥세인:에틸아세테이트 0~40 %)로 정제하여 목적 화합물 (24.41 g, 95 % 수율)을 수득하였다.

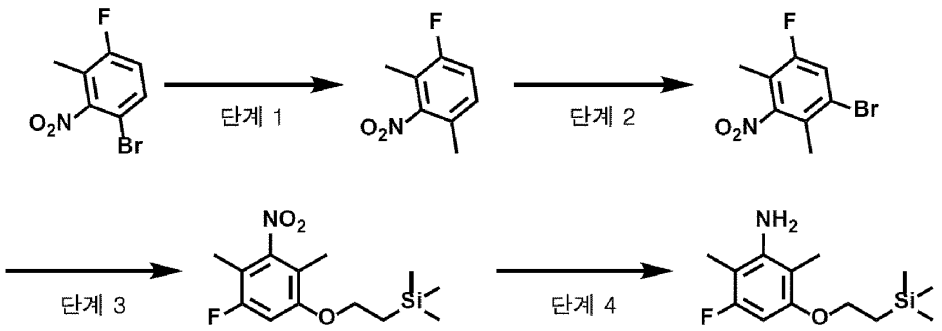
[158] [단계 5] 3-(메톡시메톡시)-2,6-다이메틸아닐린의 제조

[159] 단계 4에서 제조한 1-(메톡시메톡시)-2,4-다이메틸-3-나이트로벤젠 (24.41 g, 116 mmol)을 메탄올 (385 mL)에 녹인 후, Pd/C (2.46 g, 10 % 순도)을 첨가한 후 수소가스 하에서 16시간 동안 교반하였다. LC-MS를 이용하여 목적 화합물을 확인한 후, 반응 혼합물을 셀라이트로 여과한 뒤 농축하였다. 얻어진 목적 화합물 (18.93 g, 90 % 수율)은 추가 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z 182 $[M+H]^+$

[160] **제조예 2. 3-플루오로-2,6-다이메틸-5-(2-트라이메틸실릴)에톡시)아닐린의 제조**

[161] [반응식 2]

[162]



[163] [단계 1] 1-플루오로-2,4-다이메틸-3-나이트로벤젠의 제조

[164] 1-브로모-4-플루오로-3-메틸-2-나이트로벤젠 (1 g, 4.27 mmol)을 1,4-다이옥세인 (20 mL)에 녹인 후 물 (4 mL), 2,4,6-트라이메틸-1,3,5,2,4,6-트라이옥사트라이보리네인 (0.54 g, 4.27 mmol), 탄산칼륨 (1.18 g, 8.55 mmol), Pd(dppf)Cl_2·다이클로로메테인 (0.35 g, 0.43 mmol)를 첨가하였다. 반응 혼합물을 110 ℃에서 1시간 동안 교반 후 상온으로 식힌 뒤 물 (100 mL)을 첨가하고 에틸아세테이트 (60 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~5 %)로 정제하여 목적 화합물 (400 mg, 50 % 수율)을 수득하였다.

[165] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.43 - 7.32 (m, 2H), 2.23 (s, 3H), 2.15 (d, J = 2.0 Hz, 3H).

[166] [단계 2] 1-브로모-5-플루오로-2,4-다이메틸-3-나이트로벤젠의 제조

[167] 단계 1에서 제조한 1-플루오로-2,4-다이메틸-3-나이트로벤젠 (350 mg, 2.07 mmol)을 황산 (3.5 mL)에 녹인 후 트라이플루오로아세트산 (1 mL), N-브로모숙신이미드 (368 mg, 2.07 mmol)를 첨가하였다. 그 다음 상온에서 12시간 동안 교반하고 반응 혼합물을 얼음물 (20 mL)에 천천히 적가하였다. 그리고 에틸아세테이트 (10 mL X 3)를 사용해 추출한 뒤 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~5 %)로 정제하여 목적 화합물 (360 mg, 70 % 수율)을 수득하였다.

[168] ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.42 (d, J = 8.4 Hz, 1H), 2.31 (s, 3H), 2.17 (d, J = 2.0 Hz, 3H).

[169] [단계 3] (2-(5-플루오로-2,4-다이메틸-3-나이트로페녹시)에틸)트라이메틸실란의 제조

[170] 단계 2에서 제조한 1-브로모-5-플루오로-2,4-다이메틸-3-나이트로벤젠 (100 mg, 0.40 mmol), 2-트라이메틸실릴에탄올 (234 mg, 1.98 mmol)을 1,4-다이옥세인 (5 mL)에 녹인 후 탄산세슘 (193 mg, 0.59 mmol), t-BuBrettPhos Pd G3 (17 mg)을 첨가하였다. 반응 혼합물을 80 ℃에서 16시간 동안 교반하고 셀라이트로 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~5 %)로 정제하여 목적 화합물 (50 mg, 40 % 수율)을 수득하였다.

[171] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.19 (d, J = 11.6 Hz, 1H), 4.13 (t, J = 8.0 Hz, 2H), 2.09 - 1.97 (m, 6H), 1.10 (t, J = 8.0 Hz, 2H), 0.06 (s, 9H).

[172] [단계 4] 3-플루오로-2,6-다이메틸-5-(2-(트라이메틸실릴)에톡시)아닐린의 제조

[173] 단계 3에서 제조한 (2-(5-플루오로-2,4-다이메틸-3-나이트로페녹시)에틸)트라이메틸실란 (50 mg, 0.16 mmol)을 2-프로판올 (5 mL)에 녹인 후 Pd/C (17 mg, 10 % 순도)을 첨가하였다. 반응 혼합물을 수소가스 하에 상온에서 2시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 셀라이트로 여과하고 감압 농축하여 목적 화합물 (50 mg, 90 % 순도)를 수득하였다.

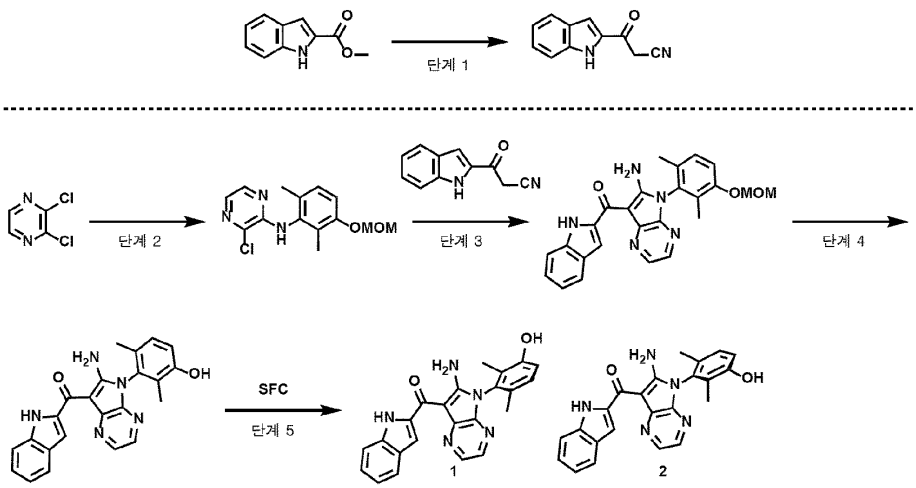
[174] ^{1}H NMR (400 MHz, $CDCl_3$): δ 6.11 (d, J = 11.6 Hz, 1H), 4.00 (t, J = 8.0 Hz, 2H), 3.70 (s, 2H), 2.04 (d, J = 1.6 Hz, 3H), 2.02 (s, 3H), 1.17 - 1.11 (m, 2H), 0.08 (s, 9H).

[175] 실시예: 본 발명의 화합물의 제조

[176] **실시예 1 및 2. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 및 (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조**

[177] [반응식 3]

[178]



[179] [단계 1] 3-(1H-인돌-2-일)-3-옥소프로페인나이트릴의 제조

[180] 메틸 1H-인돌-2-카복실레이트 (5 g, 28.54 mmol)를 테트라하이드로퓨란 (50 mL)에 녹인 후, 아세토나이트릴 (6.44 g, 156.98 mmol, 8.26 mL)을 첨가하였다. 반응 혼합물의 온도를 -78 ℃까지 내리고 질소 가스하에서 리튬 비스(트라이메틸실릴)아마이드 (LiHMDS; 1 M, 테트라하이드로퓨란 용액, 85.62 mL)를 천천히 적가한 후 2시간 동안 교반하였다. 0 ℃에서 반응 혼합물을 염화암모늄 포화수용액 (300 mL)에 넣은 후 에틸아세테이트 (200 mL X 2)로 추출하였다. 모아진 유기층은 포화 소금물 (200 mL)로 씻어준 후 무수 황산나트륨을 이용해 남은 물을 제거하고 농축하였다. 농축된 혼합물은 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~30 %)로 정제하여 목적 화합물 (3 g, 57 % 수율)을 수득하였다. MS (ESI): m/z = 185.0 $[M+H]^+$

[181] [단계 2] 3-클로로-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민의 제조

[182] 2,3-다이클로로피라진 (1.64 g, 11.04 mmol) 및 제조예 1에서 얻어진 3-(메톡시메톡시)-2,6-다이메틸아민 (2 g, 11.04 mmol)을 톨루엔 (20 mL)에 녹인 다음 포타슘 tert-부톡사이드 (t-BuOK; 1.86 g, 16.55 mmol), Xantphos (319.27 mg, 0.552 mmol), $Pd_2(dba)_3$ (1.01 g, 1.10 mmol)을 넣고 80 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물을 농축하였다. 농축된 혼합물은 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~15 %)를 이용하여 정제하고 추가로 prep-HPLC로 정제하여 목적 화합물 (500 mg, 15 % 수율)을 수득하였다. MS (ESI): m/z = 294.0 $[M+H]^+$

[183] [단계 3] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[184] 상기 단계 1에서 제조한 3-(1H-인돌-2-일)-3-옥소-프로페인나이트릴 (62.7 mg, 0.34 mmol)을 다이옥세인 (5 mL)에 녹인 다음 0 ℃에서 소듐 tert-부톡사이드 (98.15 mg, 1.02 mmol)을 넣고 30분 동안 교반하였다. 상기 단계 2에서 제조한

3-클로로-*N*-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (100 mg, 0.34 mmol)과 BINAP Pd G_3 (33.82 mg, 0.034 mmol)을 넣고 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물을 농축한 다음 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 노란색 오일의 목적 화합물 (30 mg, 17 % 수율)을 수득하였다.

[185] ^{1}H NMR (400 MHz, DMSO-d_6): δ 13.80 (s, 1H), 9.14 - 8.49 (m, 1H), 8.44 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.88 (s, 1H), 7.72 (s, 1H), 7.68 (d, *J* = 8.4 Hz, 1H), 7.36 - 7.20 (m, 3H), 7.12 (t, *J* = 7.6 Hz, 1H), 3.44 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H).

[186] [단계 4] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[187] 상기 단계 3에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 (30 mg, 0.058 mmol)을 메탄올 (2 mL)에 녹인 다음 2N 염산 (0.6 mL)을 넣고 25℃에서 2시간 동안 교반하였다. 반응 혼합물을 농축한 후 prep-HPLC로 정제하여 목적 화합물 (10 mg, 44 % 수율)을 수득하였다.

[188] ^{1}H NMR (400 MHz, DMSO-d_6): δ 13.84 (s, 1H), 9.68 (s, 1H), 8.42 (d, *J* = 2.8 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.84 (d, *J* = 1.2 Hz, 1H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.68 (d, *J* = 8.4 Hz, 1H), 7.31 - 7.26 (m, 1H), 7.15 - 7.07 (m, 2H), 6.96 (d, *J* = 8.4 Hz, 1H), 1.84 (s, 3H), 1.76 (s, 3).

[189] [단계 5] (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 및 (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[190] 상기 단계 4에서 얻어진 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 (95 mg, 0.239 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK IC (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/EtOH (0.1 % NH_3H_2O)])로 정제하여 실시예 1, 2 화합물을 수득하였다.

[191] **실시예 1. ((S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온)**

[192] 두번째 용출; 43.1 mg, 43 % 수율; ^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 1.6 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.72 (d, *J* = 8.2 Hz, 1H), 7.64 (d, *J* = 8.2 Hz, 1H), 7.56 (s, 1H), 7.32 (t, *J* = 7.5 Hz, 1H), 7.17 - 7.06 (m, 2H), 6.96 (br d, *J* = 8.1 Hz, 1H), 1.92 (s, 3H), 1.87 (s, 3H); MS (ESI): m/z = 398.1 $[M+H]^+$

[193] **실시예 2. ((*R*)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5*H*-피롤로[2,3-*b*]피라진-7-일)(1*H*-인돌-2-일)메탄온)**

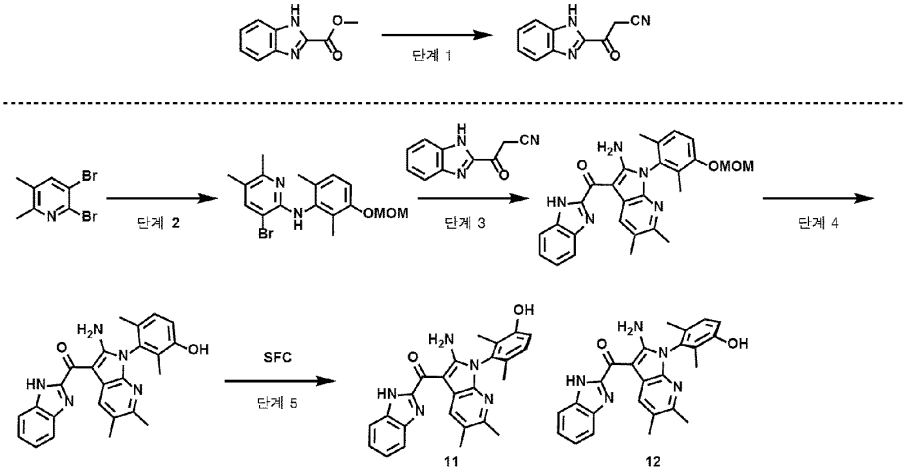
[194] 첫번째 용출; 41.2 mg, 42 % 수율; ^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 1.6 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.72 (d, *J* = 8.2 Hz, 1H), 7.64 (d, *J* = 8.2 Hz, 1H),

7.56 (s, 1H), 7.32 (t, *J* = 7.5 Hz, 1H), 7.17 - 7.06 (m, 2H), 6.96 (br d, *J* = 8.1 Hz, 1H), 1.92 (s, 3H), 1.87 (s, 3H); MS (ESI): m/z = 398.1 $[M+H]^+$

[195] **실시예 11 및 12. (S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온 및 (R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온의 제조**

[196] [반응식 4]

[197]



[198] [단계 1] 3-(1H-벤조[d]이미다졸-2-일)-3-옥소프로페인나이트릴의 제조

[199] 메틸 1H-벤조[d]이미다졸-2-카복실레이트 (3.7 g, 21 mmol)를 테트라하이드로퓨란 (40 mL)에 녹인 후, 아세토나이트릴 (5.17 g, 126 mmol)을 첨가하였다. 반응 혼합물의 온도를 -78 ℃까지 내리고 질소 가스하에서 LiHMDS (1 M, 테트라하이드로퓨란 용액, 84.01 mL)를 천천히 적가한 후 1시간 동안 교반하였다. 반응 혼합물을 0 ℃에서 염화암모늄 포화수용액으로 반응을 종결시킨 뒤 prep-HPLC로 정제하여 목적 화합물 (1.37 g, 35 % 수율)을 수득하였다. MS (ESI): m/z 186.1 = $[M+H]^+$

[200] ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.32 (s, 1H), 7.92 (d, *J* = 8.4 Hz, 1H), 7.64-7.56 (m, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.46 - 7.40 (m, 1H), 4.48 (s, 2H).

[201] [단계 2] 3-브로모-*N*-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸피리딘-2-아민의 제조

[202] 상기 제조예 1에서 제조한 3-(메톡시메톡시)-2,6-다이메틸아닐린 (1 g, 5.52 mmol)을 톨루엔 (50 mL)에 녹인 다음 2,3-다이브로모-5,6-다이메틸피리딘 (1.61 g, 6.07 mmol), Xantphos (319 mg, 0.552 mmol), 탄산세슘 (5.39 g, 16.55 mmol) 및 $Pd_2(dba)_3$ (505 mg, 0.552 mmol)을 넣고 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물을 농축한 후 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)로 정제하여 목적 화합물 (1.5 g, 69 % 수율)을 수득하였다. MS (ESI): m/z = 365.1 $[M+H]^+$

[203] [단계 3] (2-아미노-1-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온의 제조

[204] 상기 단계 1에서 제조한 3-(1H-벤조[d]이미다졸-2-일)-3-옥소프로페인나이트릴 (38.02 mg, 0.205 mmol)과 상기 단계 2에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸피리딘-2-아민 (50 mg, 0.137 mmol)을 다이옥세인 (1 mL)에 녹인 다음 BINAP Pd G_3 (13.60 mg, 0.014 mmol)와 제3인산칼륨 (87.17 mg, 0.411 mmol)을 넣고 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물을 농축한 후 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (50 mg, 16 % 수율)을 수득하였다. MS (ESI): m/z = 470.2 $[M+H]^+$

[205] [단계 4] (2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온의 제조

[206] 상기 단계 3에서 제조한 (2-아미노-1-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온 (74 mg, 157.60 μmol)을 메탄올 (3 mL)에 녹인 다음 4N 염산 (3 mL)을 넣고 25℃에서 1시간 동안 교반하였다. 반응 혼합물을 농축한 후 perp-HPLC로 정제하여 목적 화합물 (20 mg, 30 % 수율)을 수득하였다. MS (ESI): m/z = 426.1 $[M+H]^+$

[207] [단계 5] (S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온 및 (R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온의 제조

[208] 상기 단계 4에서 얻어진 (2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온 (20 mg, 0.047 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK OD (250 mm X 30 mm, 10㎛); 이동상: [CO_2/메탄올 (0.1 % NH_3H_2O)])로 정제하여 실시예 11, 12 화합물을 수득하였다.

[209] **실시예 11. ((S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온)**

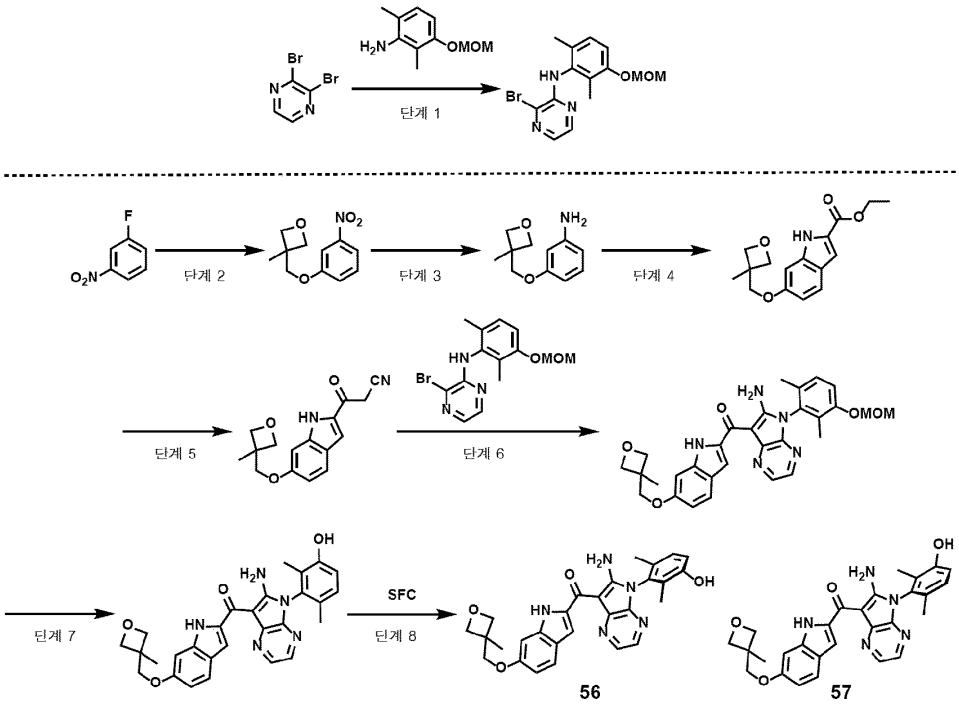
[210] 두번째 용출; 8.4 mg (42 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.72 - 8.41 (m, 1H), 7.76 (dd, *J* = 2.8, 6.0 Hz, 2H), 7.48 (s, 2H), 7.36 - 7.21 (m, 2H), 7.04 (d, *J* = 8.4 Hz, 1H), 2.48 (s, 3H), 2.36 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 426.1 $[M+H]^+$

[211] **실시예 12. ((*R*)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1*H*-피롤로[2,3-*b*]피리딘-3-일)(1*H*-벤조[*d*]이미다졸-2-일)메탄온)**

[212] 첫번째 용출; 6.8 mg (34 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.66 - 8.35 (m, 1H), 7.72 (dd, *J* = 2.8, 6.0 Hz, 2H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.30 - 7.15 (m, 2H), 7.00 (d, *J* = 8.4 Hz, 1H), 2.44 (s, 3H), 2.32 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H); MS (ESI): m/z = 426.1 $[M+H]^+$

[213] **실시예 56 및 57. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온의 제조**

[214] [반응식 5]

[215] 

[216] [단계 1] 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민의 제조

[217] 2,3-다이브로모피라진 (10 g, 42 mmol) 및 상기 제조예 1에서 얻어진 3-(메톡시메톡시)-2,6-다이메틸아닐린 (7.6 g, 42 mmol)을 테트라하이드로퓨란 (100 mL)에 녹인 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 63 mL)를 첨가하였다. 반응 혼합물을 상온에서 2시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 염화암모늄 수용액 (200 mL)을 0 ℃에서 천천히 첨가하여 반응을 종결하였다. 그리고 에틸아세테이트 (100 mL X 3)를 사용해 유기층을 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축한 뒤 prep-HPLC로 정제하여 목적 화합물 (10.5 g, 74 % 수율)을 수득하였다. MS (ESI): m/z = 338.0 $[M+H]^+$

[218] [단계 2] 3-메틸-3-((3-나이트로페녹시)메틸)옥세탄의 제조

[219] (3-메틸옥세탄-3-일)메탄올 (50.18 g, 491.35 mmol, 48.53 mL)을 다이메틸포름아마이드 (500 mL)에 녹인 다음 0 ℃에서 수소화나트륨 (18.14 g, 60 % 순도)을 30분 동안 천천히 첨가하고 0 ℃에서 30분 동안 교반하였다. 그 다음 1-플루오로-3-나이트로-벤젠 (53.33 g, 377.96 mmol, 40.25 mL)을 반응 혼합물에 30분간 천천히 적

가하고 질소가스 하에 12시간 동안 상온에서 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (5 L)를 붓고 에틸아세테이트 (1 L X 3)를 사용해 유기층을 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축 한 뒤 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)를 사용하여 정제하였고 목적 화합물 (45 g, 53 % 수율)을 수득하였다.

[220] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.83 (dd, J = 1.6, 8.0 Hz, 1H), 7.75 (t, J = 2.0 Hz, 1H), 7.59 (t, J = 8.4 Hz, 1H), 7.46 (dd, J = 2.4, 8.4 Hz, 1H), 4.51 (d, J = 6.0 Hz, 2H), 4.31 (d, J = 5.6 Hz, 2H), 4.18 (s, 2H), 1.37 (s, 3H).

[221] [단계 3] 3-((3-메틸옥세탄-3-일)메톡시)아닐린의 제조

[222] 상기 단계 2에서 제조한 3-메틸-3-((3-나이트로페녹시)메틸)옥세탄 (30 g, 134.39 mmol)을 테트라하이트로퓨란 (500 mL)에 녹인 후 Pd/C (5 g, 10 % 순도)을 넣고 수소가스 하에 상온에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인 후 셀라이트로 여과하였다. 여과하여 얻어진 유기층을 감압 농축하여 목적 화합물 (27 g)을 수득하였다.

[223] ^{1}H NMR (400 MHz, DMSO-d_6): δ 6.90 (t, J = 8.0 Hz, 1H), 6.21 - 6.14 (m, 2H), 6.12 (dd, J = 1.6, 8.8 Hz, 1H), 4.46 (d, J = 5.6 Hz, 2H), 4.28 (d, J = 5.6 Hz, 2H), 3.92 (s, 2H), 1.34 (s, 3H).

[224] [단계 4] 에틸 6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-카복실레이트의 제조

[225] 상기 단계 3에서 제조한 3-((3-메틸옥세탄-3-일)메톡시)아닐린 (5 g, 25.87 mmol)을 다이메틸설폭사이드 (100 mL)에 녹이고 에틸 2-옥소프로파노에이트 (6.01 g, 51.75 mmol, 5.75 mL), 아세트산 (6.22 g, 103.50 mmol, 5.92 mL), 4 Å MS (10 g) 및 $Pd(OAc)_2$ (581 mg, 2.59 mmol) 첨가하였다. 반응 혼합물을 산소가스 하에 80 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (2 L)를 붓고 에틸아세테이트 (500 mL X 3)를 사용하여 유기층을 추출하였다. 모아진 유기층을 포화 소금물 (500 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축한 뒤 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~35 %)로 정제하여 목적 화합물 (3.14 g, 42 % 수율)를 수득하였다.

[226] ^{1}H NMR (400 MHz, DMSO-d_6): δ 11.70 (s, 1H), 7.53 (d, J = 8.8 Hz, 1H), 7.08 (d, J = 2.0 Hz, 1H), 6.92 (d, J = 1.6 Hz, 1H), 6.78 (dd, J = 2.0, 8.8 Hz, 1H), 4.52 (d, J = 5.6 Hz, 2H), 4.31 (d, J = 6.4 Hz, 4H), 4.05 (s, 2H), 1.38 (s, 3H), 1.33 (t, J = 7.2 Hz, 3H).

[227] [단계 5] 3-(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)-3-옥소프로페인나이트릴의 제조

[228] 상기 단계 4에서 제조한 에틸 6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-카복실레이트 (3.14 g, 10.85 mmol)를 테트라하이드로퓨란 (120 mL)에 녹인 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 41 mL)를 첨가하였다. 그 다음 0 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인 후 반응 혼합물에 염화암모늄 수용액을 (100 mL)을 붓고 에틸아세테이트 (30 mL X 3)를 사용하여 유

기층을 추출하였다. 황산나트륨으로 건조 후 감압 농축하여 목적 화합물 (2.09 g, 68 % 수율)을 수득하였다. MS (ESI): m/z = 283.2 $[M-H]^-$

[229] [단계 6] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온의 제조

[230] 상기 단계 5에서 제조한 3-(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)-3-옥소프로페인나이트릴 (2.09 g, 7.35 mmol) 및 상기 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (2.48 g, 7.35 mmol)을 1,4-다이옥세인 (500 mL)에 녹인 후 탄산세슘 (6.88g, 21.1 mmol), BINAP Pd G3 (0.7 g)을 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물을 감압 농축하고 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (1.75 g, 44 % 수율)을 수득하였다.

[231] [단계 7] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온의 제조

[232] 단계 6에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온 (1 g, 1.85 mmol)을 물 (100 mL), 트라이플루오로아세트산 (100 mL)에 녹인 후 상온에서 2시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (200 mL)을 붓고 탄산 칼륨을 사용해 pH를 8로 조절하였다. 그 다음 에틸아세테이트 (50 mL X 3)를 사용해 유기층을 추출하고 모은 유기층을 포화 소금물 (100 mL X 2)을 사용해 씻어 주었다. 유기층을 황산나트륨으로 건조하고 감압 농축한 뒤 prep-HPLC로 정제하여 목적 화합물 (0.43 g, 47 % 수율)을 수득하였다. MS (ESI): m/z = 498.2 $[M+H]^+$

[233] [단계 8] (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온의 제조

[234] 단계 7에서 제조한 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온 (0.43 g, 0.86 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK IC (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2-아세토나이트릴/아이소프로판올 (0.1 % NH_3 H_2O)])로 정제하여 실시예 56, 57 화합물을 수득하였다.

[235] **실시예 56. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온**

[236] 첫번째 용출; 162 mg, 38 % 수율; ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.58 (d, *J* = 8.8 Hz, 1H), 7.51 (s, 1H), 7.19 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.01 - 6.93 (m, 1H), 6.83 (dd, *J* = 2.0, 8.8 Hz, 1H), 4.73 (d, *J*

= 6.0 Hz, 2H), 4.48 (d, *J* = 6.0 Hz, 2H), 4.14 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.48 (s, 3H); MS (ESI): m/z = 498.2 $[M+H]^+$

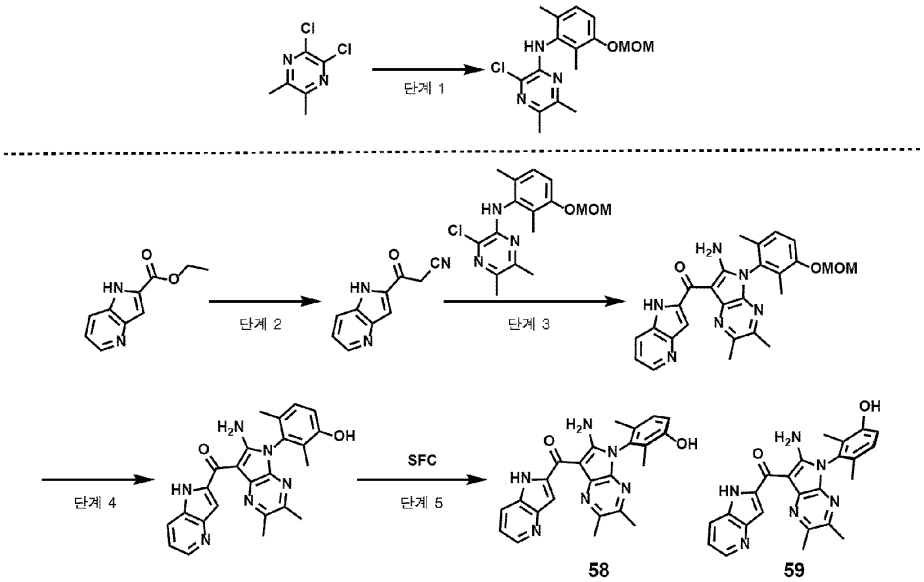
[237] **실시예 57. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온**

[238] 두번째 용출; 158 mg; 37 % 수율; ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.58 (d, *J* = 8.8 Hz, 1H), 7.51 (s, 1H), 7.20 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.05 - 6.97 (m, 1H), 6.83 (dd, *J* = 2.0, 8.8 Hz, 1H), 4.73 (d, *J* = 6.0 Hz, 2H), 4.49 (d, *J* = 6.0 Hz, 2H), 4.14 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H); MS (ESI): m/z = 498.2 $[M+H]^+$

[239] **실시예 58 및 59. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조**

[240] [반응식 6]

[241]



[242] [단계 1] 3-클로로-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸피라진-2-아민의 제조

[243] 2,3-다이클로로-5,6-다이메틸-피라진 (5 g, 28.24 mmol), 상기 제조예 1에서 얻어진 3-(메톡시메톡시)-2,6-다이메틸아닐린 (3.41 g, 18.83 mmol)을 톨루엔 (350 mL)에 녹인 후 K_3PO_4 (4.0 g, 18.83 mmol), Xantphos Pd G_4 (1.8 g, 1.88 mmol)를 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 셀라이트로 여과 후 감압 농축하였다. 농축한 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~20 %)로 정제하여 목적 화합물 (1.1 g, 18 % 수율)을 수득하였다.

[244] ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.09 - 7.02 (m, 1H), 7.01 - 6.94 (m, 1H), 6.26 (s, 1H), 5.21 (s, 2H), 3.51 (s, 3H), 2.37 (s, 3H), 2.26 (s, 3H), 2.16 (s, 3H), 2.12 (s, 3H).

[245] [단계 2] 3-옥소-3-(1H-피롤로[3,2-b]피리딘-2-일)프로페인나이트릴의 제조

[246] 에틸 1H-피롤로[3,2-b]피리딘-2-카복실레이트 (10 g, 52.58 mmol)를 2-메틸테트라하이드로퓨란 (200 mL)에 녹인 후 아세토나이트릴 (15 mL)을 추가하였다. 그 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 184 mL)를 반응 혼합물에 천천히 적가하였다. 반응 혼합물을 0 ℃에서 1시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 물 (400 mL)을 0 ℃에서 천천히 첨가하여 반응을 종결하였다. 그리고 2-MeTHF (300 mL X 3)를 사용해 유기층을 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (8 g, 82 % 수율)을 수득하였다.

[247] ^{1}H NMR (400 MHz, MeOD): δ 8.24 (dd, J = 1.2, 4.8 Hz, 1H), 7.80 (d, J = 8.0 Hz, 1H), 7.13 (dd, J = 4.8, 8.0 Hz, 1H), 6.82 (s, 1H), 4.85 (s, 2H).

[248] [단계 3] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[249] 상기 단계 1에서 제조한 3-클로로-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5,6-다이메틸피라진-2-아민 (1.1 g, 3.42 mmol) 및 상기 단계 2에서 제조한 3-옥소-3-(1H-피롤로[3,2-b]피리딘-2-일)프로페인나이트릴 (1.27 g, 6.86 mmol)을 1,4-다이옥세인 (150 mL)에 녹인 후 탄산세슘 (3.3g, 10.26 mmol), BINAP Pd G3 (0.34 g, 0.34 mmol)을 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 12시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (100 mL)을 붓고 에틸아세테이트 (100 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축한 뒤 prep-HPLC로 정제하여 목적 화합물 (144 mg, 9 % 수율)을 수득하였다. MS (ESI): m/z = 471.1 $[M+H]^+$

[250] [단계 4] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[251] 상기 단계 3에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온 (144 mg, 0.31 mmol)을 HCl (4M, 1,4-다이옥세인 용액, 40 mL)에 녹인 후 상온에서 1시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 고체 탄산수소나트륨을 사용하여 pH를 6으로 조절하였다. 그 다음 반응 혼합물에 물을 붓고 에틸아세테이트 (50 mL X 3)을 사용하여 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (124 mg, 95 % 수율)을 수득하였다.

[252] [단계 5] (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[253] 상기 단계 4에서 제조한 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온 (124 mg, 0.29 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK OD (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/메탄올 (0.1 % NH_3H_2O)])로 정제하여 실시예 58, 59 화합물을 수득하였다.

[254] **실시예 58. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온**

[255] 첫번째 용출; 40 mg (32 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.45 (dd, *J* = 1.2, 4.8 Hz, 1H), 8.15 (d, *J* = 8.4 Hz, 1H), 7.60 (s, 1H), 7.37 (dd, *J* = 4.8, 8.4 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 2.79 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 427.1 $[M+H]^+$

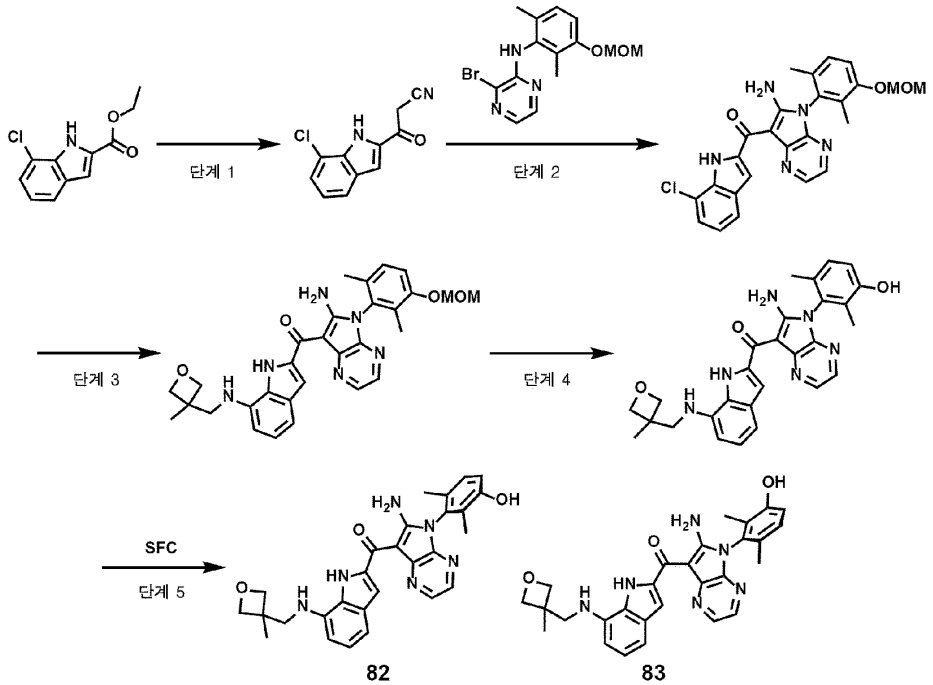
[256] **실시예 59. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온**

[257] 두번째 용출; 45 mg (36 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.45 (dd, *J* = 1.2, 4.8 Hz, 1H), 8.15 (d, *J* = 8.4 Hz, 1H), 7.60 (s, 1H), 7.37 (dd, *J* = 4.8, 8.4 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 2.79 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 427.1 $[M+H]^+$

[258] **실시예 82 및 83. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온의 제조**

[259] [반응식 7]

[260]



[261] [단계 1] 3-(7-클로로-1H-인돌-2-일)-3-옥소프로페인나이트릴의 제조

[262] 에틸 7-클로로-1H-인돌-2-카복실레이트 (10 g, 44.71 mmol)를 테트라하이드로퓨란 (100 mL)에 녹인 후 아세토나이트릴 (13 mL)을 첨가하였다. 그 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 196 mL)를 첨가하고, 반응 혼합물을 0 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (300 mL)을 붓고 2-메틸테트라하이드로퓨란 (150 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (23 g, crude)을 수득하였다. MS (ESI): m/z = 217.1 $[M-H]^-$

[263] [단계 2] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온의 제조

[264] 상기 단계 1에서 제조한 3-(7-클로로-1H-인돌-2-일)-3-옥소프로페인나이트릴 (5.82 g, 26.61 mmol) 및 상기 실시예 56, 57 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (5 g, 14.78 mmol)을 1,4-다이옥세인 (150 mL)에 녹인 후 탄산세슘 (14.45 g, 44.35 mmol), BINAP Pd G_3 (1.47 g, 1.48 mmol)을 첨가하였다. 반응 혼합물을 100 ℃에서 12시간 동안 교반 후 LC-MS로 반응이 끝난 것을 확인하고 셀라이트로 여과하였다. 여과한 유기층을 감압 농축 후 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~30 %)로 정제하여 목적 화합물 (1.8 g, 24 % 수율)을 수득하였다. MS (ESI): m/z = 476.1 $[M+H]^+$

[265] [단계 3] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일))메틸)아미노)-1H-인돌-2-일)메탄온의 제조

[266] 상기 단계 2에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온 (300 mg, 0.63 mmol)을 톨루엔 (15 mL)에 녹인 후 (3-메틸옥세탄-3-일)메탄아민 (637 mg, 6.30 mmol), 소듐 tert-부톡사이드 (420 mg, 4.37 mmol), Pd-PEPPSI쩨-IPent (50 mg)을 첨가하였다. 반응 혼합물을 100 ℃에서 12시간 동안 교반 후 LC-MS로 반응이 끝난 것을 확인하고 셀라이트로 여과하였다. 여과한 유기층을 감압 농축 후 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)로 정제하여 목적 화합물 (300 mg, 88 % 수율)을 수득하였다. MS (ESI): m/z = 541.3 $[M+H]^+$

[267] [단계 4] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온의 제조

[268] 상기 단계 3에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일))메틸)아미노)-1H-인돌-2-일)메탄온 (150 mg, 0.28 mmol)을 물 (90 mL)과 트라이플루오로아세트산 (90 mL)에 녹인 후 상온에서 1시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인하고 반응 혼합물의 pH를 탄산수소나트륨을 사용하여 8로 조절하였다. 그 다음 다이클로로메테인 (150 mL X 3)을 사용하여 유기층을 추출하였고 모인 유기층을 황산나트륨으로 건조하고 감압 농축하였다. 농축된 혼합물을 prep-HPLC로 정제하여 목적 화합물 (35 mg, 13 % 수율)을 수득하였다. MS (ESI): m/z = 497.3 $[M+H]^+$

[269] [단계 5] (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온의 제조

[270] 상기 단계 4에서 제조한 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온 (35 mg, 0.07 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK IC (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2-아세토나이트릴/아이소프로판올 (0.1 % NH_3H_2O)])로 정제하여 실시예 82, 83 화합물을 수득하였다.

[271] **실시예 82. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온**

[272] 첫번째 용출; 16.8 mg (48 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 2.8 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.22 - 7.10 (m, 2H), 7.03 - 6.94 (m, 2H), 6.63 (d, *J* = 7.6 Hz, 1H), 4.81 (d, *J* = 6.0 Hz, 2H), 4.54 (d, *J* = 6.0 Hz, 2H), 3.51 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.56 (s, 3H); MS (ESI): m/z = 497.2 $[M+H]^+$

[273] **실시예 83. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온**

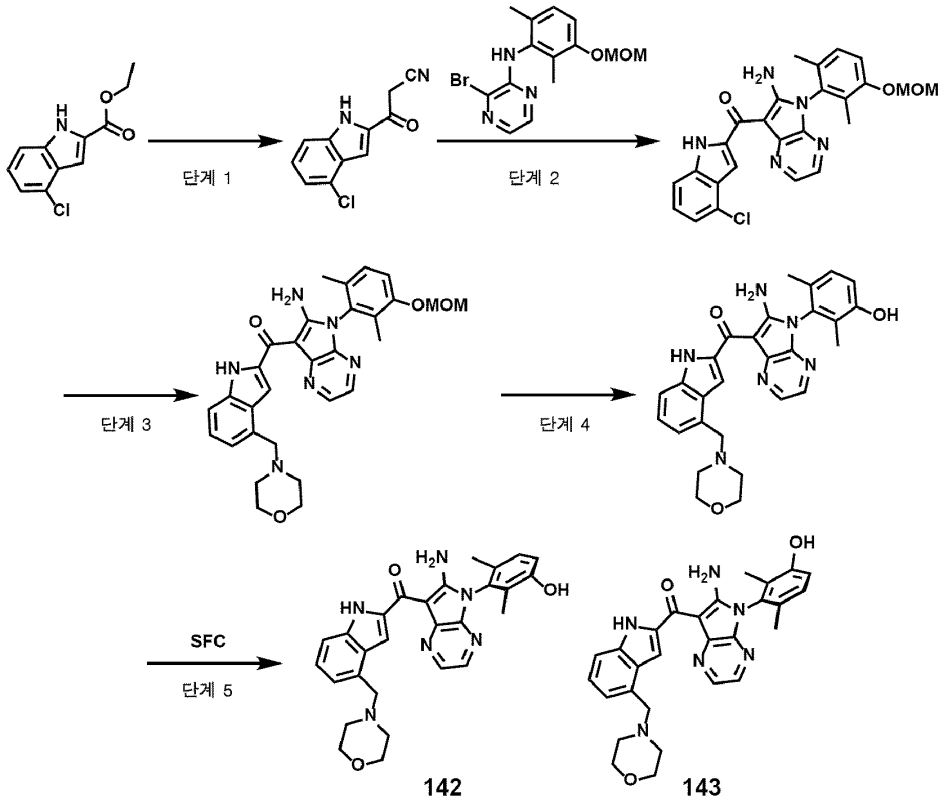
[274] 두번째 용출; 15.7 mg (45 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.15 (dd, *J* = 8.4, 10.8 Hz, 2H), 7.03

- 6.94 (m, 2H), 6.63 (d, *J* = 7.6 Hz, 1H), 4.81 (d, *J* = 6.0 Hz, 2H), 4.54 (d, *J* = 6.0 Hz, 2H), 3.51 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.56 (s, 3H); MS (ESI): m/z = 497.2 [M +H]$^+$

[275] 실시예 **142** 및 **143. (R)-(6-**아미노**-5-(3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(4-(**모폴리노메틸**)-1H-**인돌**-2-**일**)**메탄온 및 **(S)-(6-**아미노**-5-(3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(4-(**모폴리노메틸**)-1H-**인돌**-2-**일**)**메탄온의 제조

[276] [반응식 8]

[277]



[278] [단계 1] 3-(4-클로로-1H-인돌-2-일)-3-옥소프로페인나이트릴의 제조

[279] 에틸 4-클로로-1H-인돌-2-카복실레이트 (4 g, 17.88 mmol)를 테트라하이드로퓨란 (40 mL)에 녹인 후 아세토나이트릴 (5 mL)을 첨가하였다. 그 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 80 mL)를 첨가하였다. 반응 혼합물을 0 ℃에서 1시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 염화암모늄 수용액 (200 mL)을 0 ℃에서 천천히 첨가하여 반응을 종결하였다. 그리고 에틸아세테이트 (100 mL X 3)를 사용해 유기층을 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (4.5 g, crude)을 수득하였다. MS (ESI): m/z = 217.1 [M-H]$^-$

[280] [단계 2] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온의 제조

[281] 단계 1에서 제조한 3-(4-클로로-1H-인돌-2-일)-3-옥소프로페인나이트릴 (4.5 g, 20.58 mmol) 및 상기 실시예 56, 57 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (3.87 g, 11.43 mmol)을 1,4-다이옥세인 (200 mL)에 녹인 후 탄산세슘 (11.18 g, 34.30 mmol), BINAP Pd G_3 (1.14 g, 1.14 mmol)을 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물을 감압 농축하고 prep-HPLC로 정제하여 목적 화합물 (3.2 g, 58 % 수율)을 수득하였다. MS (ESI): m/z = 476.1 $[M+H]^+$

[282] [단계 3] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온의 제조

[283] 단계 2에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온 (300 mg, 0.62 mmol), 포타슘 트라이플루오로(모폴리노메틸)보레이트를 1,4-다이옥세인 (20 mL)에 녹인 후 물 (0.2 mL), 탄산칼륨 (0.55 mg, 3.94 mmol), RhPhos Pd G_3 (52 mg)을 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물에 물 (30 mL)을 붓고 에틸아세테이트 (100 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축한 뒤 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~80 %)로 정제하여 목적 화합물 (230 mg, 68 % 수율)을 수득하였다. MS (ESI): m/z = 541.3 $[M+H]^+$

[284] ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.37 (d, *J* = 2.8 Hz, 1H), 8.05 (d, *J* = 2.8 Hz, 1H), 7.78 (s, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.36-7.27 (m, 2H), 7.24 (s, 1H), 7.20-7.10 (m, 1H), 5.31-5.22 (m, 2H), 3.91 (d, *J* = 2.0 Hz, 2H), 3.80-3.72 (m, 4H), 3.54 (s, 3H), 2.71-2.52 (m, 4H), 2.00 (s, 3H), 1.95 (s, 3H).

[285] [단계 4] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온의 제조

[286] 단계 3에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온 (220 mg, 0.40 mmol)을 HCl (4M, 1,4-다이옥세인 용액, 25 mL)에 녹인 후 상온에서 30분 동안 교반하였다. 그 다음 반응 혼합물에 탄산수소나트륨 수용액 (100 mL)을 붓고 에틸아세테이트 (100 mLX3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (200 mg)을 수득하였다. MS (ESI): m/z = 497.2 $[M+H]^+$

[287] [단계 5] (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온 및 (S)-(6-아미노-5-(3-하이드

록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온의 제조

[288] 단계 4에서 제조한 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온 (85 mg, 0.17 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK IC (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2-아세토나이트릴/아이소프로판올 (0.1 % NH_3H_2O)])로 정제하여 실시예 142, 143 화합물을 수득하였다.

[289] **실시예 142. (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온**

[290] 첫번째 용출; 39.4 mg (45 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.79 (d, *J* = 0.8 Hz, 1H), 7.61 (d, *J* = 8.4 Hz, 1H), 7.34-7.25 (m, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.11 (d, *J* = 7.2 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 3.93 (s, 2H), 3.73 (t, *J* = 4.8 Hz, 4H), 2.63 (s, 4H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 497.3 $[M+H]^+$

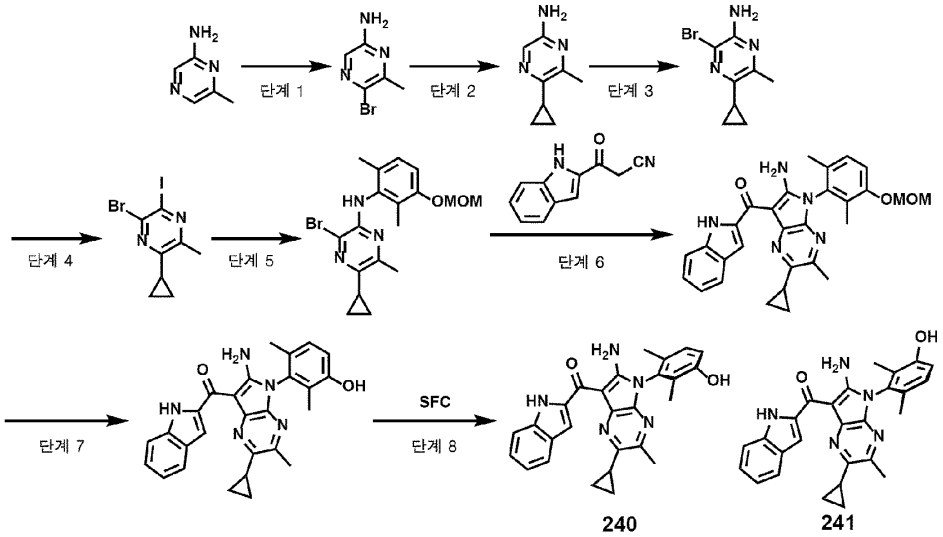
[291] **실시예 143. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온**

[292] 두번째 용출; 39.6 mg (46 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.78 (s, 1H), 7.59 (d, *J* = 8.4 Hz, 1H), 7.35-7.23 (m, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.10 (d, *J* = 7.2 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 3.87 (s, 2H), 3.71 (t, *J* = 4.8 Hz, 4H), 2.57 (s, 4H), 1.92 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 497.3 $[M+H]^+$

[293] **실시예 240 및 241. (R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 및 (S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조**

[294] [반응식 9]

[295]



[296] [단계 1] 5-브로모-6-메틸피라진-2-아민의 제조

[297] 6-메틸피라진-2-아민 (6 g, 54.98 mmol)을 다이메틸설폭사이드 (300 mL)와 물 (12 mL)에 녹인 후 N-브로모숙신이미드 (10.76 g, 60.48 mmol)를 첨가하였다. 반응 혼합물을 상온에서 10시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 반응 혼합물에 물 (500 mL)을 붓고 에틸아세테이트 (200 mL X 2)로 추출하였다. 모인 유기층을 포화 탄산나트륨 수용액 (300 mL)과 포화 소금물 (500 mL X 3)로 씻어주고 황산나트륨으로 건조 후 여과하였다. 그 다음 유기층을 감압 농축하고 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~30 %)로 정제하여 목적 화합물 (10 g, 97 % 수율)을 수득하였다.

[298] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.49 (s, 1H), 6.54 (s, 2H), 2.33 (s, 3H).

[299] [단계 2] 5-사이클로프로필-6-메틸피라진-2-아민의 제조

[300] 상기 단계 1에서 제조한 5-브로모-6-메틸피라진-2-아민 (10 g, 53.18 mmol), 사이클로프로필보론산 (9.14 g, 106.37 mmol)을 1,4-다이옥세인 (300 mL)과 물 (100 mL)에 녹인 후 탄산칼륨 (22.05 g, 159.55 mmol), Pd(dppf)Cl_2·다이클로로메테인 (6.5 g)를 첨가하였다. 그 다음 반응 혼합물을 100 ℃에서 18시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 셀라이트로 여과 후 얻어진 여액에 물 (200 mL)을 붓고 에틸아세테이트 (200 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~20 %)로 정제하여 목적 화합물 (3.92 g, 41 % 수율)을 수득하였다.

[301] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.56 (s, 1H), 5.92 (s, 2H), 2.36 (s, 3H), 2.02 - 1.91 (m, 1H), 0.82 - 0.76 (m, 2H), 0.75 - 0.69 (m, 2H).

[302] [단계 3] 3-브로모-5-사이클로프로필-6-메틸피라진-2-아민의 제조

[303] 상기 단계 2에서 제조한 5-사이클로프로필-6-메틸피라진-2-아민 (3.76 g, 25.20 mmol)을 아세토나이트릴 (80 mL)에 녹인 후 N-브로모숙신이미드 (4.93 g, 27.72 mmol)를 0 ℃에서 첨가하였다. 반응 혼합물을 0 ℃에서 30분 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 포화 탄산나트륨 수용액 (100 mL)을 천천히 부어 주었다. 그 다음 에틸아세테이트 (80 mL X 2)를 사용하여 추출하고 포화 소금물로 유기층을 씻어 주었다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (5.67g, 99 % 수율)을 수득하였다.

[304] ^{1}H NMR (400 MHz, DMSO-d_6): δ 6.23 (s, 2H), 2.37 (s, 3H), 2.00 - 1.93 (m, 1H), 0.88 - 0.81 (m, 2H), 0.74 - 0.67 (m, 2H).

[305] [단계 4] 2-브로모-6-사이클로프로필-3-아이오도-5-메틸피라진의 제조

[306] 상기 단계 3에서 제조한 3-브로모-5-사이클로프로필-6-메틸피라진-2-아민 (3.4 g, 14.91 mmol)을 테트라하이드로퓨란 (90 mL)에 녹인 후 0 ℃에서 아이소펜틸아질산염 (6.02 mL, 44.72 mmol)을 천천히 첨가하였다. 그 다음 0 ℃에서 CuI (4.26 g, 22.36 mmol)와 I_2 (4.5 mL, 22.36 mmol)을 첨가하고, 반응 혼합물을 60 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 포화 탄산수소나트륨 수용액 (200 mL)을 천천히 첨가하였다. 에틸아세테이트 (50 mL X 4)를 사용해 유기층을 추출하고 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~10 %)로 정제하여 목적 화합물 (2.4 g, 44 % 수율)을 수득하였다.

[307] ^{1}H NMR (400 MHz, $CDCl_3$): δ 2.60 (s, 3H), 2.01 - 1.93 (m, 1H), 1.13 - 1.05 (m, 4H).

[308] [단계 5] 3-브로모-5-사이클로프로필-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)-6-메틸피라진-2-아민의 제조

[309] 상기 단계 4에서 제조한 2-브로모-6-사이클로프로필-3-아이오도-5-메틸피라진 (1g, 2.95 mmol), 상기 제조예 1에서 얻어진 3-(메톡시메톡시)-2,6-다이메틸아닐린 (0.54 g, 2.95 mmol)을 톨루엔 (20 mL)에 녹인 후 탄산세슘 (2.88 g, 8.85 mmol), XantPhos (0.34 g, 0.59mmol), $Pd_2(dba)_3$ (0.27 g, 0.3 mmol)을 첨가하였다. 반응 혼합물을100 ℃에서 2시간 동안 교반하고, LC-MS로 반응이 종결된 것을 확인 후 셀라이트로 여과하였다. 여과 후 얻어진 여액을 감압 농축하고 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~20 %)로 정제하여 목적 화합물 (0.68 g, 58 % 수율)을 수득하였다.

[310] ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.08 - 7.01 (m, 1H), 7.00 - 6.93 (m, 1H), 6.29 (s, 1H), 5.21 (s, 2H), 3.51 (s, 3H), 2.36 (s, 3H), 2.15 (s, 3H), 2.11 (s, 3H), 1.94 - 1.86 (m, 1H), 0.97 - 0.88 (m, 4H).

[311] [단계 6] (6-아미노-2-사이클로프로필-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[312] 단계 5에서 제조한 3-브로모-5-사이클로프로필-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)-6-메틸피라진-2-아민 (350 mg, 0.89 mmol) 및 상기 실시예 1, 2 단계 1에

서 제조한 3-(1H-인돌-2-일)-3-옥소프로페인나이트릴 (164 mg, 0.89 mmol)을 tert-아밀알코올 (100 mL)에 녹인 후 탄산세슘 (1.45 mg, 4.45 mmol), BINAP Pd G_3 (91 mg)을 첨가하였다. 반응 혼합물을 100 ℃에서 12시간 동안 교반하고, 셀라이트로 여과한 뒤 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 15~100 %)로 정제하여 목적 화합물 (220 mg, 50 % 수율)을 수득하였다.

[313] ^{1}H NMR (400 MHz, $CDCl_3$): δ 14.55 (s, 1H), 7.80 (dd, *J* = 5.2, 8.0 Hz, 2H), 7.54 (d, *J* = 1.2 Hz, 1H), 7.37 (t, *J* = 7.6 Hz, 1H), 7.26 - 7.21 (m, 2H), 7.18 (t, *J* = 7.6 Hz, 1H), 5.32 - 5.21 (m, 2H), 3.55 (s, 3H), 2.66 (s, 3H), 2.42 - 2.29 (m, 1H), 1.96 (d, *J* = 18.8 Hz, 6H), 1.46 - 1.39 (m, 2H), 1.38 - 1.32 (m, 2H).

[314] [단계 7] (6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[315] 상기 단계 6에서 제조한 (6-아미노-2-사이클로프로필-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 (100 mg, 0.20 mmol)을 트라이플루오로아세트산 (100 mL), 물 (100 mL)에 녹인 후 상온에서 1시간 동안 교반하였다. 반응 혼합물에 포화 탄산수소나트륨 수용액 (2500 mL)을 천천히 첨가하고 에틸아세테이트 (150 mL X 3)를 사용하여 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 혼합물을 prep-HPLC를 사용해 정제하여 목적 화합물 (100 mg, 89 % 수율)을 수득하였다. MS (ESI): m/z = 452.2 $[M+H]^+$

[316] [단계 8] (R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 및 (S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온의 제조

[317] 상기 단계 7에서 제조한 (6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온 (100 mg, 0.22 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK IC (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2-아세토나이트릴/아이소프로판올 (0.1 % NH_3 H_2O)])로 정제하여 실시예 240, 241 화합물을 수득하였다.

[318] **실시예 240. (R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온**

[319] 첫번째 용출; 22.6 mg (23 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 7.76 (d, *J* = 8.4 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 1H), 7.46 (s, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.18 - 7.09 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 2.63 (s, 3H), 2.50 - 2.41 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.39 - 1.32 (m, 4H); MS (ESI): m/z = 452.2 $[M+H]^+$

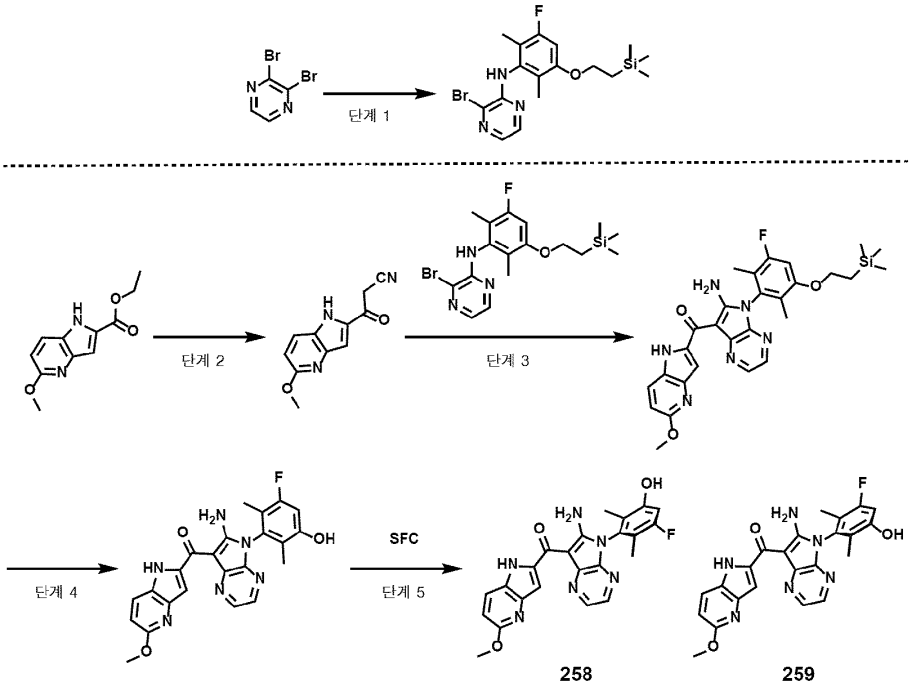
[320] **실시예 241. (S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온**

[321] 두번째 용출; 24.4 mg (24 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 7.76 (d, *J* = 8.4 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 1H), 7.46 (s, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.18 - 7.09 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 2.63 (s, 3H), 2.49 - 2.41 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.38 - 1.32 (m, 4H); MS (ESI): m/z = 452.2 $[M+H]^+$

[322] **실시예 258 및 259. (R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온 및 (S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조**

[323] [반응식 10]

[324]



[325] [단계 1] 3-브로모-N-(3-플루오로-2,6-다이메틸-5-(2-(트라이메틸실릴)에톡시)페닐)피라진-2-아민의 제조

[326] 상기 제조예 2에서 얻어진 3-플루오로-2,6-다이메틸-5-(2-트라이메틸실릴)에톡시)아닐린 (50 mg, 0.16 mmol), 2,3-다이브로모피라진 (47 mg, 0.16mmol)을 테트라하이드로퓨란 (3 mL)에 녹인 다음 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 0.4 mL)를 첨가하였다. 반응 혼합물을 상온에서 1시간 동안 교반하고, LC-MS로 반응이 끝난 것을 확인한 후 염화암모늄 수용액 (10 mL)을 0 ℃에서 천천히 첨가하여 반응을 종결하였다. 그리고 에틸아세테이트 (5 mL X 3)를 사용해 유기층을 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (80 mg, 99 % 수율)을 수득하였다. MS (ESI): m/z = 412.0 $[M+H]^+$

[327] [단계 2] 3-(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)-3-옥소프로페인나이트릴의 제조

[328] 에틸 5-메톡시-1H-피롤로[3,2-b]피리딘-2-카복실레이트 (0.5 g, 2.27 mmol)를 테트라하이드로퓨란 (10 mL)에 녹인 후 아세토나이트릴 (1 mL)을 첨가하였다. 반응 혼합물의 온도를 0 ℃로 냉각하고, LiHMDS (1 M, 테트라하이드로퓨란 용액, 6 mL)를 천천히 적가한 후 1시간 동안 교반하였다. 0 ℃에서 반응 혼합물에 포화 염화암모늄용액 (50 mL)을 넣은 후 에틸아세테이트 (25 mL X 3)로 추출하였다. 모인 유기층은 포화 소금물 (50 mL)로 씻어준 후 무수 황산나트륨을 사용해 건조하고 여과하여 감압 농축하여 목적 화합물 (0.34 g, 70 % 수율)을 수득하였다. MS (ESI): m/z = 216.1 $[M+H]^+$

[329] [단계 3] (6-아미노-5-(3-플루오로-2,6-다이메틸-5-(2-(트라이메틸실릴)에톡시)페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[330] 상기 단계 1에서 제조한 3-브로모-N-(3-플루오로-2,6-다이메틸-5-(2-(트라이메틸실릴)에톡시)페닐)피라진-2-아민 (80 mg, 0.19 mmol) 및 상기 단계 2에서 제조한 3-(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)-3-옥소프로페인나이트릴 (63 mg, 0.29 mmol)을 tert-아밀알코올 (5 mL)에 녹인 후 탄산세슘 (189 mg, 0.58 mmol), BINAP Pd G_3 (19 mg)을 첨가하였다. 반응 혼합물을 100 ℃에서 12시간 동안 교반하고 셀라이트로 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~30 %)로 정제하여 목적 화합물 (62 mg, 57 % 수율)을 수득하였다. MS (ESI): m/z = 547.2 $[M+H]^+$

[331] [단계 4] (6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[332] 상기 단계 3에서 제조한 (6-아미노-5-(3-플루오로-2,6-다이메틸-5-(2-(트라이메틸실릴)에톡시)페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온 (60 mg, 0.11 mmol)을 트라이플루오로아세트산 (6 mL)에 녹인 후 상온에서 1시간 동안 교반하였다. LC-MS로 반응이 끝난 것을 확인한 후 포화 탄산수소나트륨 수용액을 첨가하여 pH를 7까지 조절하였다. 그 다음 에틸아세테이트 (10 mL X 3)로 추출하고 황산나트륨으로 건조 후 여과하여 감압 농축하였다. 농축된 혼합물을 prep-HPLC로 정제하여 목적 화합물 (45 mg, 95 % 수율)을 수득하였다. MS (ESI): m/z = 447.1 $[M+H]^+$

[333] [단계 5] (R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온 및 (S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[334] 상기 단계 4에서 제조한 (6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온 (45 mg, 0.10 mmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK

AD (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/아이소프로판올 (0.1 % NH_3H_2O)])로 정제하여 실시예 258, 259 화합물을 수득하였다.

[335] **실시예 258. (R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온**

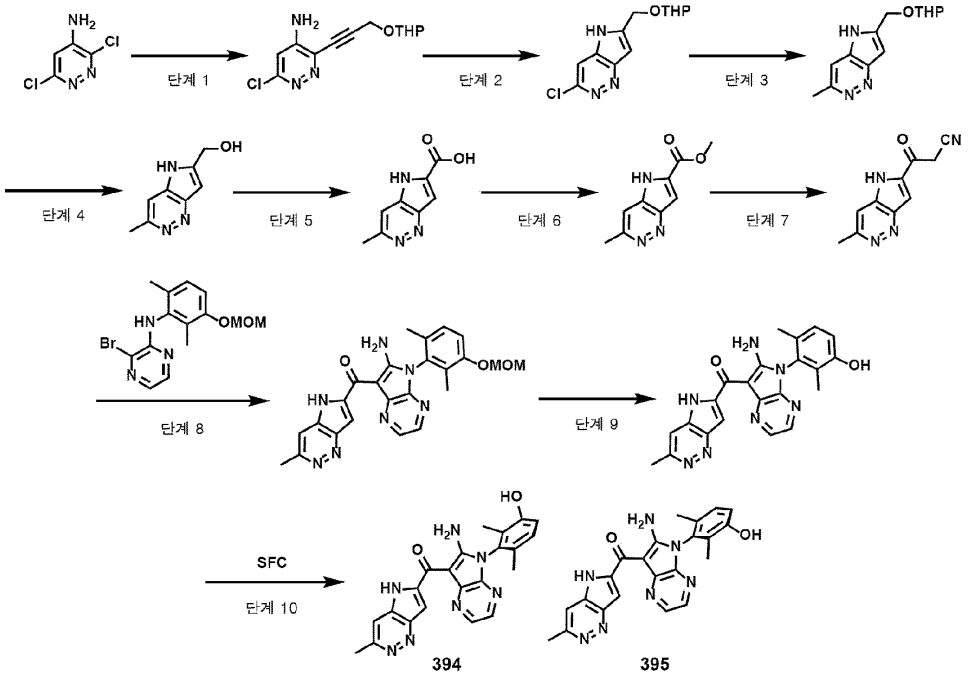
[336] 첫번째 용출; 15.6 mg (35 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.53 (s, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 6.76 (d, *J* = 11.2 Hz, 1H), 3.99 (s, 3H), 1.82 (s, 6H); MS (ESI): m/z = 447.2 $[M+H]^+$

[337] **실시예 259. (S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온**

[338] 두번째 용출; 19.5 mg (43 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 8.8 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.53 (d, *J* = 0.8 Hz, 1H), 6.83 (d, *J* = 2.4 Hz, 1H), 6.81 (d, *J* = 4.4 Hz, 1H), 4.00 (s, 3H), 1.85 (s, 6H); MS (ESI): m/z = 447.2 $[M+H]^+$

[339] **실시예 394 및 395. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온 및 (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온의 제조**

[340] [반응식 11]

[341] 

[342] [단계 1] 6-클로로-3-(3-((테트라하이드로-2H-피란-2-일)옥시)프로프-1-인-1-일)피리다진-4-아민의 제조

[343] 3,6-다이클로로피리다진-4-아민 (5.00 g, 30.49 mmol), 2-(프로프-2-인-1-일옥시)테트라하이드로-2H-피란 (10.68 g, 76.22 mmol)을 아세토나이트릴 (100 mL)에 녹인 후 트라이에틸아민 (15.43 g, 152.45 mmol), $Pd(PPh_3)_2Cl_2$ (2.14 g, 3.05 mmol), CuI (580.67 mg, 3.05 mmol)을 반응 혼합물에 첨가하였다. 반응 혼합물을 60 ℃에서 4시간 교반하였다. 기질이 모두 소모된 것을 확인 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~100 %)로 정제하여 목적 화합물 (3.6 g, 43 % 수율)을 수득하였다.

[344] ^{1}H NMR (400 MHz, DMSO-d_6): δ 6.94 (br s, 2H), 6.80 (s, 1H), 4.83 (s, 1H), 4.67 - 4.45 (m, 2H), 3.85 - 3.71 (m, 1H), 3.56 - 3.45 (m, 1H), 1.77 - 1.62 (m, 2H), 1.59 - 1.42 (m, 4H).

[345] [단계 2] 3-클로로-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-c]피리다진의 제조

[346] 상기 단계 1에서 제조한 6-클로로-3-(3-((테트라하이드로-2H-피란-2-일)옥시)프로프-1-인-1-일)피리다진-4-아민 (3.20 g, 11.71 mmol), 포타슘 tert-부톡사이드 (3.29 g, 29.29 mmol)을 다이메틸아세트아마이드 (120 mL)에 녹인 후 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물을 상온으로 식힌 뒤 물 (200 mL)을 붓고 에틸아세테이트 (150 mL X 3)로 추출하였다. 모인 유기층을 포화 소금물 (200 mL X 2)로 씻어주고 황산나트륨으로 건조 후 여과하였다. 그 다음 유기층을 감압 농축하여 목적 화합물 (2.7 g, 80 % 수율)을 수득하였다.

[347] ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.03 (s, 1H), 7.71 (s, 1H), 6.84 (s, 1H), 4.84 (d, J = 13.6 Hz, 1H), 4.74 (t, J = 3.2 Hz, 1H), 4.69 (d, J = 13.6 Hz, 1H), 3.86 - 3.76 (m, 1H), 3.55 - 3.45 (m, 1H), 1.79 - 1.64 (m, 2H), 1.61 - 1.44 (m, 4H).

[348] [단계 3] 3-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-c]피리다진의 제조

[349] 상기 단계 2에서 제조한 3-클로로-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-c]피리다진 (1.5 g, 5.60 mmol), 2,4,6-트라이메틸-1,3,5,2,4,6-트라이옥사트라이보리네인 (14.07 g, 56.03 mmol), 탄산칼륨 (2.32 g, 16.81 mmol)을 다이옥세인 (40 mL), 물 (2 mL)에 녹인 후 $Pd(dppf)Cl_2$ (0.41 g, 0.56 mmol)를 첨가하였다. 반응 혼합물을 90 ℃에서 21시간 동안 교반하였다. 기질이 모두 소모된 것을 확인 후 반응 혼합물에 물 (200 mL)을 넣고 에틸아세테이트 (100 mLX3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 혼합물을 MPLC (SiO_2, 에틸아세테이트:메탄올 0~10 %)로 정제하여 목적 화합물 (0.86 g, 49 % 수율)을 수득하였다. MS (ESI): m/z = 248.1 $[M+H]^+$

[350] [단계 4] (3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄올의 제조

[351] 상기 단계 3에서 제조한 3-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-c]피리다진 (0.66 g, 2.67 mmol)을 염산 (2 M, 다이옥세인 용액,

18mL)에 녹인 후 상온에서 3시간 동안 교반하였다. 생성된 고체를 여과하여 목적 화합물 (0.45 g, 99 % 수율)을 수득하였다.

[352] ^{1}H NMR (400 MHz, DMSO-d_6): δ 13.15 (s, 1H), 8.14 (s, 1H), 6.95 (s, 1H), 4.81 (s, 2H), 2.85 (s, 3H).

[353] [단계 5] 3-메틸-5H-피롤로[3,2-c]피리다진-6-카복실산의 제조

[354] 상기 단계 4에서 제조한 (3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄올 (600 mg, 3.68 mmol)을 다이메틸포름아마이드 (15 mL)에 녹인 후 수산화나트륨 (294.14 mg, 7.35 mmol), (1-하이드록시사이클로헥실)-페닐-메탄온 (1.50 g, 7.35 mmol)을 첨가하였다. 반응 혼합물을 80 ℃에서 16시간 동안 교반하였다. 생성된 고체를 여과하고 메틸 tert-부틸 에테르 (60 mL)로 씻어준 뒤 건조하여 목적 화합물 (442 mg, 68 % 수율)을 수득하였다.

[355] ^{1}H NMR (400 MHz, DMSO-d_6): δ 7.25 (s, 1H), 6.77 (s, 1H), 2.64 (s, 3H).

[356] [단계 6] 메틸 3-메틸-5H-피롤로[3,2-c]피리다진-6-카복실레이트의 제조

[357] 상기 단계 5에서 제조한 3-메틸-5H-피롤로[3,2-c]피리다진-6-카복실산 (442 mg, 2.50 mmol)을 메탄올 (10 mL)에 녹인 후 염화 싸이오닐 (594 mg, 4.99 mmol)을 첨가하였다. 반응 혼합물을 60 ℃에서 16시간 동안 교반하였다. 기질이 모두 소모된 것을 확인 후 반응 혼합물을 감압 농축하였다. 농축된 혼합물에 포화 탄산수소나트륨 (30 mL)을 0 ℃에서 천천히 첨가하였다. 그 다음 에틸아세테이트 (60 mL X 5)로 추출하였고 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (305 mg, 64 % 수율)을 수득하였다.

[358] ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.43 (s, 1H), 7.49 (s, 1H), 7.48 (s, 1H), 3.93 (s, 3H), 2.74 (s, 3H).

[359] [단계 7] 3-(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)-3-옥소프로페인나이트릴의 제조

[360] 상기 단계 6에서 제조한 메틸 3-메틸-5H-피롤로[3,2-c]피리다진-6-카복실레이트 (200 mg, 1.05 mmol), 아세토나이트릴 (257.67 mg, 6.28 mmol)을 테트라하이드로퓨란 (5 mL)에 녹인 후 0 ℃에서 LiHMDS (1M 테트라하이드로퓨란 용액, 5.23 mL)를 천천히 적가하였다. 반응 혼합물을 0 ℃에서 1시간 동안 교반하고 물 (10 mL)을 첨가하였다. 석유에테르 (15 mL X 3)로 물층을 씻어내고 물층을 회수하여 감압 농축한 뒤 Prep-HPLC로 정제하여 목적 화합물 (180 mg, 90 % 수율)을 수득하였다.

[361] ^{1}H NMR (400 MHz, MeOD): δ 7.37 (d, J = 3.6 Hz, 1H), 7.02 (d, J = 4.0 Hz, 1H), 5.04 (s, 2H), 2.68 (d, J = 4.0 Hz, 3H).

[362] [단계 8] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온의 제조

[363] 이 반응은 7개의 병렬 배치로 수행하였다.

[364] 상기 단계 7에서 제조한 3-(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)-3-옥소프로페인나이트릴 (30 mg, 0.149 mmol) 및 상기 실시예 56, 57의 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (25.34 mg, 74.93 μmol)을 tert-아밀알코올 (12 mL)에 녹인 후 탄산세슘 (244.12 mg, 749.26 μmol), BINAP Pd G_3 (14.87 mg, 14.99 μmol)를 첨가하고 반응 혼합물을 100 ℃에서 16시간 동안 교반하였다. 반응 혼합물을 상온으로 식힌 뒤 물 (80 mL)을 넣고 에틸아세테이트 (50 mL X 4)로 추출하였다. 모인 유기층을 감압 농축한 뒤 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)를 사용하여 정제하였고 목적 화합물 (100 mg, 20 % 수율)을 수득하였다.

[365] ^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.05 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.87 (s, 1H), 7.31 (d, *J* = 2.0 Hz, 2H), 5.30 (s, 2H), 3.51 (s, 3H), 2.85 (s, 3H), 1.97 (s, 3H), 1.94 (s, 3H).

[366] [단계 9] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온의 제조

[367] 상기 단계 8에서 제조한 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온 (90 mg, 196.73 μmol)을 HCl (2 M, 다이옥세인 용액, 9 mL)에 녹인 후 25℃에서 1시간 동안 교반하였다. 반응 혼합물에 포화 탄산수소나트륨 수용액 (50 mL)을 넣어 반응을 종결시키고 에틸아세테이트 (30 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하여 목적 화합물 (85 mg, 98 % 수율)을 수득하였다. MS (ESI): m/z = 414.1 $[M+H]^+$

[368] [단계 10] (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온 및 (R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온의 제조

[369] 상기 단계 9에서 얻어진 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온 (90 mg, 217.69 μmol)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK AD (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/에탄올 (0.1 % NH_3H_2O)])로 정제하여 실시예 394, 395 화합물을 수득하였다.

[370] **실시예 394. (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온**

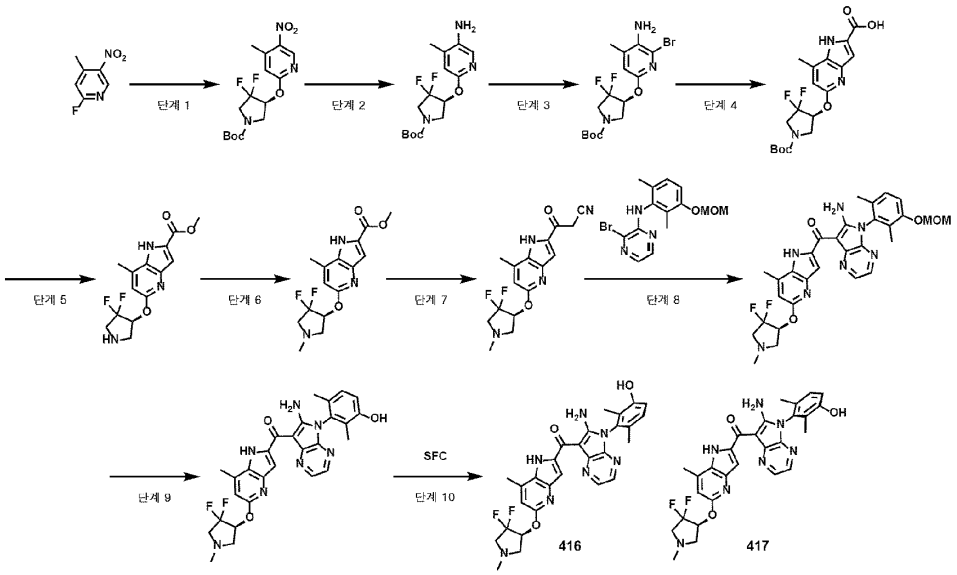
[371] 첫번째 용출; 17 mg (18 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.87 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.85 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 414.1 $[M+H]^+$

[372] 실시예 **395. (R)-(6-**아미노**-5-(3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(3-**메틸**-5H-**피롤로**[3,2-c]**피리다진**-6-**일**)**메탄온

[373] 두번째 용출; 27 mg (28 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.88 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.85 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 414.0 $[M+H]^+$

[374] 실시예 **416** 및 **417. (6-**아미노**-5-((S)-3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(5-(((S)-4,4-**다이플루오로**-1-**메틸피롤리딘**-3-**일)옥시)-7-**메틸**-1H-**피롤로**[3,2-b]**피리딘**-2-**일)메탄온 및 **(6-**아미노**-5-((R)-3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(5-(((S)-4,4-**다이플루오로**-1-**메틸피롤리딘**-3-**일)옥시)-7-**메틸**-1H-**피롤로**[3,2-b]**피리딘**-2-**일)메탄온의 제조

[375] [반응식 12]

[376] 

[377] [단계 1] tert-부틸 (S)-3,3-다이플루오로-4-((4-메틸-5-나이트로피리딘-2-일)옥시)피롤리딘-1-카복실레이트의 제조

[378] 2-플루오로-4-메틸-5-나이트로피리딘 (560 mg, 3.59 mmol), tert-부틸 (S)-3,3-다이플루오로-4-하이드록시피롤리딘-1-카복실레이트 (800 mg, 3.59 mmol)를 테트라하이드로퓨란 (10 mL)에 녹인 후 탄산세슘 (2.34 g, 7.17 mmol)을 첨가하였다. 반응 혼합물을 65℃에서 4시간 동안 교반하였다. 반응 혼합물을 상온으로 식히고 여과 후 여액을 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (900 mg, 70 % 수율)을 수득하였다. MS (ESI): m/z = 304.0 $[M+H-56]^+$

[379] ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.91 (s, 1H), 6.78 (s, 1H), 5.72 (s, 1H), 3.93 - 3.83 (m, 3H), 3.70 - 3.59 (m, 1H), 2.65 (s, 3H), 1.48 (s, 9H).

[380] [단계 2] tert-부틸 (S)-4-((5-아미노-4-메틸피리딘-2-일)옥시)-3,3-다이플루오로피롤리딘-1-카복실레이트의 제조

[381] 상기 단계 1에서 제조한 tert-부틸 (S)-3,3-다이플루오로-4-((4-메틸-5-나이트로피리딘-2-일)옥시)피롤리딘-1-카복실레이트 (760 mg, 2.12 mmol)를 테트라하이드로퓨란 (16 mL), 물 (4 mL)에 녹인 후 0 ℃에서 염화암모늄 (565 mg, 10.58 mmol), Zn-Cu couple (1.36 g, 10.58 mmol)을 첨가하였다. 반응 혼합물을 상온에서 12시간 동안 교반하였다. LC-MS로 기질이 모두 소모된 것을 확인 후 반응 혼합물에 황산나트륨을 넣어 건조 후 여과하였다. 여액을 감압 농축하여 목적 화합물 (700 mg, crude)을 수득하였고 별도의 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 330.2 $[M+H]^+$

[382] [단계 3] tert-부틸 (S)-4-((5-아미노-6-브로모-4-메틸피리딘-2-일)옥시)-3,3-다이플루오로피롤리딘-1-카복실레이트의 제조

[383] 상기 단계 2에서 제조한 tert-부틸 (S)-4-((5-아미노-4-메틸피리딘-2-일)옥시)-3,3-다이플루오로피롤리딘-1-카복실레이트 (700 mg, 2.13 mmol)를 아세트산 (8 mL)에 녹인 후 피리디늄 퍼브로마이드 (680 mg, 2.13 mmol)를 첨가하였다. 반응 혼합물을 25℃에서 1시간 동안 교반하였다. 반응 혼합물을 얼음물 (50 mL)에 천천히 부어주고 탄산나트륨을 사용해 pH를 7~8로 맞춰주었다. 그 다음 에틸아세테이트 (40 mL X 3)로 추출하였고 유기층을 모아 황산나트륨으로 건조하고 여과하였다. 여액을 감압 농축하고 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)로 정제하여 목적 화합물 (600 mg, 62 % 수율)을 수득하였다. MS (ESI): m/z = 352.0 $[M+H-56]^+$

[384] [단계 4] (S)-5-((1-(tert-부톡시카보닐)-4,4-다이플루오로피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실산의 제조

[385] 이 반응은 2개의 병렬 배치로 수행하였다.

[386] 상기 단계 3에서 제조한 tert-부틸 (S)-4-((5-아미노-6-브로모-4-메틸피리딘-2-일)옥시)-3,3-다이플루오로피롤리딘-1-카복실레이트 (250 mg, 0.612 mmol), DABCO (206 mg, 1.84 mmol), $Pd(dppf)Cl_2$·다이클로로메테인 (50 mg, 0.061 mmol)를 다이메틸포름아마이드 (7.5 mL)에 녹인 후 질소가스 하에 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물을 물 (100 mL)에 붓고 1N 수산화나트륨 수용액을 사용해 pH를 9로 맞춰주었다. 그 다음 물층을 에틸아세테이트 (50 mL X 3)로 씻어주었다. 3N 염산을 사용해 물층의 pH를 5로 조절하고 2-메틸 테트라하이드로퓨란 (50 mL X 3)으로 추출하고 모인 유기층을 포화 소금물 (100 mL X 3)로 씻어주고 황산나트륨으로 건조 후 여과하였다. 여액을 감압 농축하여 목적 화합물 (500 mL, crude)을 수득하였고 별도의 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 398.1 $[M+H]^+$

[387] [단계 5] 메틸 (S)-5-((4,4-다이플루오로피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실레이트의 제조

[388] 상기 단계 4에서 제조한 (S)-5-((1-(tert-부톡시카보닐)-4,4-다이플루오로피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실산 (500 mg, 1.26 mmol)을 염산 (2 M, 메탄올 용액, 25 mL)에 녹인 후 35℃에서 12시간 동안 교반하였다. LC-MS로 기질이 모두 소모된 것을 확인 후 감압 농축하여 목적 화합물 (400 mg, crude)을 수득하였고 별도의 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 312.1 $[M+H]^+$

[389] [단계 6] 메틸 (S)-5-((4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실레이트의 제조

[390] 상기 단계 5에서 제조한 메틸 (S)-5-((4,4-다이플루오로피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실레이트 (500 mg, 1.61 mmol)를 메탄올에 녹인 후 포름알데하이드 수용액 (37 %, 0.48 mL)을 첨가 후 상온에서 10분간 교반하였다. 그 다음 $NaBH_3CN$ (302 mg, 4.82 mmol)을 천천히 첨가하고 상온에서 1시간 동안 교반하였다. 반응 혼합물에 물 (60 mL)을 붓고 탄산수소나트륨을 사용해 pH를 7~8로 조절하였다. 그 다음 에틸아세테이트 (50 mL X 3)로 추출하고 유기층을 모아 황산나트륨으로 건조 후 여과하였다. 여액을 감압 농축 후 prep-HPLC로 정제하여 목적 화합물 (220 mg, 42 % 수율)을 수득하였다. MS (ESI): m/z = 326.1 $[M+H]^+$

[391] ^1H NMR (400 MHz, $CDCl_3$): δ 8.87 (br s, 1H), 6.99 (s, 1H), 6.70 (s, 1H), 5.74 - 5.61 (m, 1H), 3.96 (s, 3H), 3.34 (dd, *J* = 6.4, 10.4 Hz, 1H), 3.11 - 2.97 (m, 2H), 2.78 (dd, *J* = 4.0, 10.8 Hz, 1H), 2.49 (s, 3H), 2.43 (s, 3H).

[392] [단계 7] (S)-3-(5-((4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)-3-옥소프로페인나이트릴의 제조

[393] 상기 단계 6에서 제조한 메틸 (S)-5-((4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-카복실레이트 (200 mg, 0.615 mmol), 아세토나이트릴 (126 mg, 3.07 mmol)을 테트라하이드로퓨란 (1.2 mL)에 녹인 후 0 ℃에서 LiHMDS (1M, 테트라하이트로퓨란 용액, 2.46 mL)를 천천히 첨가하였다. 반응 혼합물을 상온에서 1시간 동안 교반하였다. 그 다음 0 ℃에서 물 (3 mL)을 첨가하고 석유에테르 (5 mL X 2)로 물층을 씻어주었다. 1N HCl을 사용해 물층의 pH를 6으로 조절하였고 생성된 고체를 여과 후 회수하여 목적 화합물 (80 mg, crude)을 수득하였다. MS (ESI): m/z = 335.1 $[M+H]^+$

[394] ^1H NMR (400 MHz, DMSO-d_6): δ 12.21 (s, 1H), 7.37 (d, *J* = 2.0 Hz, 1H), 6.73 (s, 1H), 5.60 - 5.47 (m, 1H), 4.68 (s, 2H), 2.30 (s, 3H).

[395] [단계 8] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[396] 이 반응은 2개의 병렬 배치로 수행하였다.

[397] 상기 단계 7에서 제조한 (S)-3-(5-((4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)-3-옥소프로페인나이트릴 (35 mg, 0.105 mmol) 및 상기 실시예 56, 57의 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (35.4 mg, 0.105 mmol)을 tert-아밀알코올 (3.5 mL)에 녹인 후 BINAP Pd G_3 (10.4 mg, 0.015 mmol), 탄산세슘 (170 mg, 0.523 mmol)을 첨가하였다. 반응 혼합물을 질소가스 하에 100 ℃에서 12시간 동안 교반하였다. 반응 혼합물에 물 (20 mL)을 붓고 에틸아세테이트 (30 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 10~60 %)를 사용하여 정제하였고 목적 화합물 (60 mg, 48 % 수율)을 수득하였다. MS (ESI): m/z = 592.3 $[M+H]^+$

[398] ^{1}H NMR (400 MHz, $CDCl_3$): δ 15.06 (s, 1H), 8.31 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 2.8 Hz, 1H), 7.49 (s, 1H), 7.26 - 7.18 (m, 2H), 6.73 (s, 1H), 5.85 - 5.68 (m, 1H), 5.30 - 5.23 (m, 2H), 3.54 (s, 3H), 3.48 - 3.36 (m, 1H), 3.13 - 3.05 (m, 1H), 2.72 (s, 3H), 2.46 (s, 2H), 2.07 - 2.01 (m, 3H), 1.99 (s, 3H), 1.95 (s, 3H).

[399] [단계 9] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[400] 상기 단계 8에서 제조한 6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온 (60 mg, 0.101 mmol)을 염산 (2 M, 다이옥세인 용액, 12 mL)에 녹인 후 상온에서 1시간 동안 교반하였다. 반응 혼합물에 물 (20 mL)을 붓고 0 ℃에서 탄산칼륨을 천천히 첨가하여 pH를 7~8로 조절하였다. 그 다음 에틸아세테이트 (20 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 반응 혼합물을 prep-HPLC로 정제하여 목적 화합물 (50 mg, 88 % 수율)을 수득하였다. MS (ESI): m/z = 548.3 $[M+H]^+$

[401] [단계 10] (6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온 및 (6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온의 제조

[402] 상기 단계 9에서 얻어진 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온 (50 mg)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK OX (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/에탄올 (0.1 % NH_3H_2O)])로 정제하여 실시예 416, 417 화합물을 수득하였다.

[403] 실시예 **416. (6-**아미노**-5-((S)-3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(5-(((S)-4,4-**다이플루오로**-1-**메틸피롤리딘**-3-**일**)옥시**)-7-**메틸**-1H-**피롤로**[3,2-b]**피리딘**-2-**일**)**메탄온

[404] 첫번째 용출; 15 mg (29 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.72 (s, 1H), 5.71 - 5.56 (m, 1H), 3.40 (dd, *J* = 6.4, 10.4 Hz, 1H), 3.16 - 2.94 (m, 2H), 2.78 (dd, *J* = 4.8, 11.2 Hz, 1H), 2.74 (s, 3H), 2.42 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 548.2 $[M+H]^+$

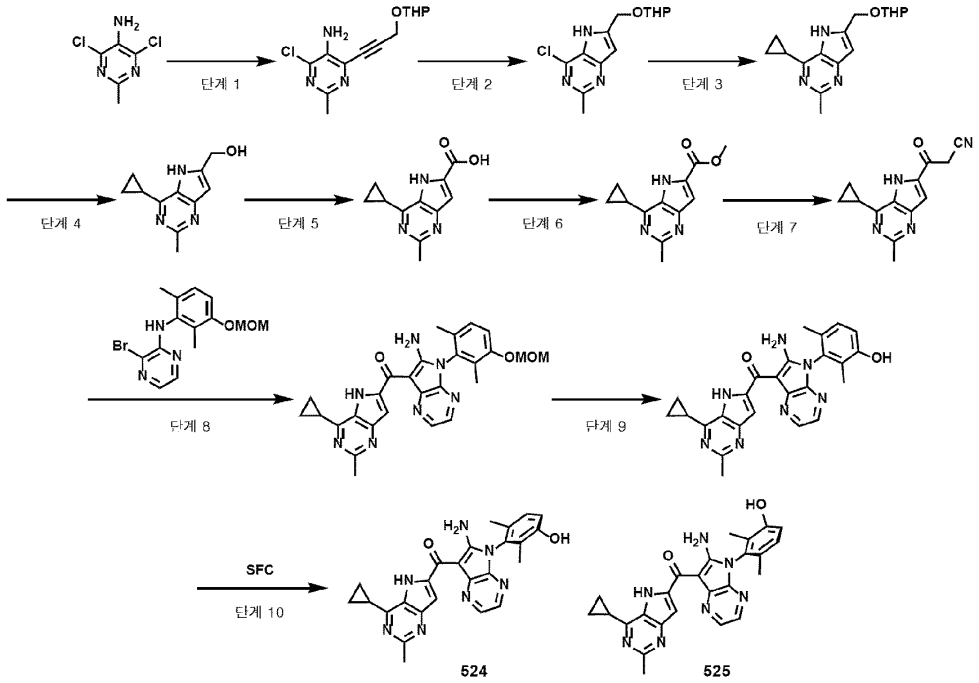
[405] 실시예 **417. (6-**아미노**-5-((R)-3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(5-(((S)-4,4-**다이플루오로**-1-**메틸피롤리딘**-3-**일**)옥시**)-7-**메틸**-1H-**피롤로**[3,2-b]**피리딘**-2-**일**)**메탄온

[406] 두번째 용출; 16.5 mg (31 % 수율); ^{1}H NMR (400 MHz, MeOD: δ 8.36 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.72 (s, 1H), 5.72 - 5.58 (m, 1H), 3.44 (dd, *J* = 6.4, 10.8 Hz, 1H), 3.20 - 3.01 (m, 2H), 2.88 - 2.81 (m, 1H), 2.75 (s, 3H), 2.46 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H); MS (ESI): m/z = 548.2 $[M+H]^+$

[407] 실시예 **524** 및 **525. (R)-(6-**아미노**-5-(3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(4-**사이클로프로필**-2-**메틸**-5H-**피롤로**[3,2-d]**피리미딘**-6-**일**)**메탄온 및 **(S)-(6-**아미노**-5-(3-**하이드록시**-2,6-**다이메틸페닐**)-5H-**피롤로**[2,3-b]**피라진**-7-**일**)(4-**사이클로프로필**-2-**메틸**-5H-**피롤로**[3,2-d]**피리미딘**-6-**일**)**메탄온의 제조

[408] [반응식 13]

[409]



[410] [단계 1] 4-클로로-2-메틸-6-(3-((테트라하이드로-2H-피란-2-일)옥시)프로프-1-인-1-일)피리미딘-5-아민의 제조

[411] 4,6-다이클로로-2-메틸-피리미딘-5-아민 (9.00 g, 50.56 mmol), 2-(프로프-2-인-1-일옥시)테트라하이드로-2H-피란 (6.38 g, 45.50 mmol)을 아세토나이트릴 (180 mL)에 녹인 후 CuI (481.42 mg, 2.53 mmol), 트라이에틸아민 (15.35 g, 151.67 mmol), $Pd(PPh_3)_2Cl_2$ (1.77 g, 2.53 mmol)을 첨가하였다. 반응 혼합물을 질소가스 하에 50 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물을 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)로 정제하여 목적 화합물 (5.3g, 37 % 수율)을 수득하였다.

[412] ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.87 (t, J = 3.2 Hz, 1H), 4.57 (s, 2H), 3.91 - 3.85 (m, 1H), 3.62 - 3.51 (m, 1H), 2.57 (s, 3H), 1.86 - 1.74 (m, 2H), 1.68 - 1.61 (m, 2H), 1.59 - 1.54 (m, 2H).

[413] [단계 2] 4-클로로-2-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-d]피리미딘의 제조

[414] 상기 단계 1에서 얻어진 4-클로로-2-메틸-6-(3-((테트라하이드로-2H-피란-2-일)옥시)프로프-1-인-1-일)피리미딘-5-아민 (4.30 g, 15.26 mmol)을 N-메틸-2-피롤리돈 (45 mL)에 녹인 후 칼륨 tert-부톡사이드 (3.43 g, 30.52 mmol)를 0 ℃에서 첨가하였다. 그 다음 반응 혼합물을 0 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물에 물 (500 mL)을 붓고 에틸아세테이트 (100 mL X 3)로 추출하였다. 모인 유기층을 황산나트륨으로 건조하고 여과 후 감압

농축하였다. 농축된 목적 화합물 (4.2g, crude)을 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 281.9 $[M+H]^+$

[415] [단계 3] 4-사이클로프로필-2-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-d]피리미딘의 제조

[416] 상기 단계 2에서 얻어진 4-클로로-2-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-d]피리미딘 (4.2 g, 14.91 mmol), 사이클로프로필보론산 (32.01 g, 372.69 mmol), 탄산칼륨 (20.60 g, 149.07 mmol)을 1,4-다이옥세인 (50 mL), 물 (5 mL)에 녹인 후 cataCXium® A Pd G3 (1.09 g, 1.49 mmol)을 첨가하였다. 반응 혼합물을 질소가스 하에 110 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물에 물 (1000 mL)을 붓고 에틸아세테이트 (200 mL X 3)로 추출하였다. 모인 유기층을 포화 소금물 (300 mL)로 씻어주고 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (2.40 g, 56 % 수율)을 수득하였다. MS (ESI): m/z = 288.0 $[M+H]^+$

[417] [단계 4] (4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄올의 제조

[418] 상기 단계 3에서 얻어진 4-사이클로프로필-2-메틸-6-(((테트라하이드로-2H-피란-2-일)옥시)메틸)-5H-피롤로[3,2-d]피리미딘 (1.30 g, 4.52 mmol)을 다이클로로메테인 (15 mL)에 녹인 후 트라이플루오로아세트산 (1.5 mL)을 첨가하였다. 반응 혼합물을 20 ℃에서 1시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물을 감압 농축하여 목적 화합물 (900 mg, crude)을 수득하였고 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 204.0 $[M+H]^+$

[419] [단계 5] 4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-카복실산의 제조

[420] 상기 단계 4에서 얻어진 (4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄올 (900 mg, 4.43 mmol), (1-하이드록시사이클로헥실)-페닐-메탄온 (1.81 g, 8.86 mmol)을 다이메톡시에테인 (30 mL)에 녹인 후 수산화나트륨 (708.47 mg, 17.71 mmol)을 첨가하였다. 반응 혼합물을 80 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물을 여과하였다. 여과하여 얻어진 고체를 다이메톡시에테인 (20 mL)로 씻어주고 건조하여 목적 화합물 (960 mg, crude)을 수득하였다. MS (ESI): m/z = 218.0 $[M+H]^+$

[421] [단계 6] 메틸 4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-카복실레이트의 제조

[422] 상기 단계 5에서 얻어진 4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-카복실산 (960 mg, 4.42 mmol)을 메탄올 (20 mL)에 녹인 후 25℃에서 황산 (1.33 g, 13.26 mmol)을 천천히 적가하였다. 반응 혼합물을 70 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 감압 농축하여 메탄올을 제거하였

다. 농축된 혼합물에 포화 탄산수소나트륨 용액을 첨가하여 pH를 8로 조절하였다. 반응 혼합물에 물 (30 mL)을 붓고 에틸아세테이트 (30 mL X 3)로 추출하였다. 모아진 유기층을 포화 소금물 (50 mL)로 씻어주고 황산나트륨으로 건조하고 여과 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (240 mg, 23 % 수율)을 수득하였다. MS (ESI): m/z = 232.0 $[M+H]^+$

[423] [단계 7] 3-(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)-3-옥소프로페인나이트릴의 제조

[424] 상기 단계 6에서 얻어진 메틸 4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-카복실레이트 (240 mg, 1.04 mmol), 아세토나이트릴 (255.63 mg, 6.23 mmol)을 테트라하이드로퓨란 (5 mL)에 녹인 후 0 ℃에서 LiHMDS (1 M, 테트라하이드로퓨란 용액, 4.15 mL)를 첨가하였다. 반응 혼합물을 0 ℃에서 30분 동안 교반하였다. 반응 혼합물에 얼음물 (2 mL)을 천천히 첨가하여 반응을 종결하고 석유에테르 (10 mL)를 사용해 물층을 씻어주고 회수하였다. 회수한 물층을 감압 농축하고 Prep-HPLC로 정제하여 목적 화합물 (130 mg, 52 %)을 수득하였다. MS (ESI): m/z = 239.0 $[M+H]^+$

[425] [단계 8] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[426] 상기 단계 7에서 얻어진 3-(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)-3-옥소프로페인나이트릴 (127.89 mg, 532.23 μmol), 실시예 56, 57의 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (120 mg, 354.82 μmol)을 tert-아밀알코올 (20 mL)에 녹인 후 탄산세슘 (346.82 mg, 1.06 mmol), BINAP Pd G_3 (35.25 mg)을 첨가하였다. 반응 혼합물을 100 ℃에서 4시간 동안 교반하고 셀라이트로 여과한 뒤 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트:테트라하이드로퓨란 1:0:0 ~ 2:1:1)로 정제하여 목적 화합물 (158 mg, 89 % 수율)을 수득하였다. MS (ESI): m/z = 498.1 $[M+H]^+$

[427] [단계 9] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[428] 상기 단계 8에서 얻어진 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 (155 mg, 317.56 μmol)을 트라이플루오로아세트산 (1 mL), 물 (1 mL)에 녹인 후 25℃에서 2시간 동안 교반하였다. 반응 혼합물을 얼음물 (20 mL)에 붓고 탄산칼륨을 사용해 pH를 8로 조절하였다. 그 다음 에틸아세테이트 (20 mL X 3)로 추출하였다. 모아진 유기층을 황산나트륨으로 건조하고 여과 후 감압 농축

하였다. 농축된 반응 혼합물을 prep-HPLC로 정제하여 목적 화합물 (90 mg, 62 % 수율)을 수득하였다. MS (ESI): m/z = 454.1 $[M+H]^+$

[429] [단계 10] ((R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 및 (S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[430] 상기 단계 9에서 얻어진 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 (90 mg)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK OD (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/메탄올 (0.1 % NH_3H_2O)])로 정제하여 실시예 524, 525 화합물을 수득하였다.

[431] **실시예 524. ((R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온**

[432] 첫번째 용출; 28 mg (30 % 수율); ^{1}H NMR (400 MHz, DMSO-d_6): δ 15.13 (s, 1H), 9.80 (s, 1H), 8.45 (d, J = 2.8 Hz, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.48 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.67 - 2.66 (m, 1H), 2.58 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.32 - 1.26 (m, 4H); MS (ESI): m/z = 454.2 $[M+H]^+$

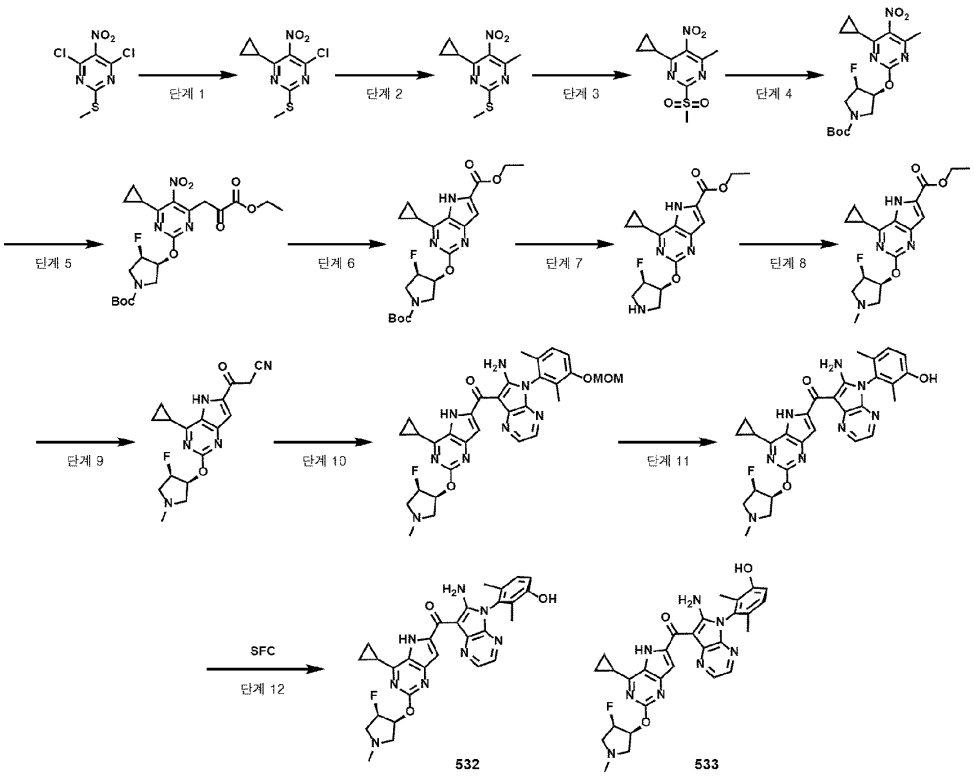
[433] **실시예 525. ((S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온**

[434] 두번째 용출; 33 mg (34 % 수율); ^{1}H NMR (400 MHz, DMSO-d_6): δ 15.13 (s, 1H), 9.74 (s, 1H), 8.45 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.48 (d, J = 1.6 Hz, 1H), 7.13 (d, J = 8.0 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.68 - 2.65 (m, 1H), 2.58 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.31 - 1.25 (m, 4H); MS (ESI): m/z = 454.2 $[M+H]^+$

[435] **실시예 532 및 533. (6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 및 (6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조**

[436] [반응식 14]

[437]



[438] [단계 1] 4-클로로-6-사이클로프로필-2-(메틸싸이오)-5-나이트로피리미딘의 제조

[439] 이 반응은 3개의 병렬 배치로 수행하였다.

[440] 4,6-다이클로로-2-(메틸싸이오)-5-나이트로피리미딘 (20 g, 83.31 mmol), 사이클로프로필보론산 (7.16 g, 83.31 mmol), 탄산나트륨 (26.49 g, 249.93 mmol)을 톨루엔 (400 mL), 물 (40 mL)에 녹인 후 $Pd(PPh_3)_4$ (9.63 g, 8.33 mmol)을 첨가하였다. 반응 혼합물을 질소가스 하에 80 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물에 에틸아세테이트 (500 mL), 물 (1000 mL)을 첨가하고 여과하여 여액을 회수하였다. 회수한 여액을 에틸아세테이트 (500 mL × 2)로 추출하였다. 모아진 유기층을 포화 소금물 (2000 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~5 %)로 정제하여 목적 화합물 (46.00 g, 75 % 수율)을 수득하였다. MS (ESI): m/z = 245.8 $[M+H]^+$

[441] [단계 2] 4-사이클로프로필-6-메틸-2-(메틸싸이오)-5-나이트로피리미딘의 제조

[442] 이 반응은 2개의 병렬 배치로 수행하였다.

[443] 상기 단계 1에서 얻어진 4-클로로-6-사이클로프로필-2-(메틸싸이오)-5-나이트로피리미딘 (23 g, 93.62 mmol), 2,4,6-트라이메틸-1,3,5,2,4,6-트라이옥사트라이보리네인 (51.71 g, 205.95 mmol), 탄산칼륨 (38.81 g, 280.85 mmol)을 1,4-다이옥세인 (300 mL), 물 (30 mL)에 녹인 후 $Pd(dppf)Cl_2$·다이클로로메테인 (7.64 g, 9.36 mmol)

을 첨가하였다. 반응 혼합물을 질소가스 하에 90 ℃에서 12시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 반응 혼합물에 에틸아세테이트 (500 mL), 물 (1000 mL)을 첨가하고 여과하여 여액을 회수하였다. 회수한 여액을 에틸아세테이트 (500 mL × 2)로 추출하였다. 모아진 유기층을 포화 소금물 (2000 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~4 %)로 정제하여 목적 화합물 (17.00 g, 40 % 수율)을 수득하였다. MS (ESI): m/z = 225.9 $[M+H]^+$

[444] [단계 3] 4-사이클로프로필-6-메틸-2-(메틸설폰일)-5-나이트로피리미딘의 제조

[445] 상기 단계 2에서 얻어진 4-사이클로프로필-6-메틸-2-(메틸싸이오)-5-나이트로피리미딘 (15.50 g, 68.81 mmol)을 다이클로로메테인 (300 mL)에 녹인 후 3-클로로퍼옥시벤조산 (34.92 g, 172.02 mmol, 85 % 순도)을 0 ℃에서 천천히 첨가하였다. 그 다음 반응 혼합물을 20 ℃에서 2시간 동안 교반하였다. 반응 혼합물을 0 ℃로 냉각하고 포화 싸이오황산나트륨 수용액 (500 mL)에 천천히 부어준 뒤 포화 탄산나트륨 수용액 (500 mL) 첨가하였다. 다이클로로메테인 (500 mL × 2)으로 반응 혼합물을 추출한 뒤 모인 유기층을 포화 소금물 (100 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~25 %)로 정제하여 목적 화합물 (17.00 g, 96 % 수율)을 수득하였다.

[446] ^1H NMR (400 MHz, $CDCl_3$): δ 3.33 (s, 3H), 2.65 (s, 3H), 2.12 - 2.05 (m, 1H), 1.49 - 1.42 (m, 2H), 1.42 - 1.35 (m, 2H); MS (ESI): m/z = 257.9 $[M+H]^+$

[447] [단계 4] tert-부틸 (3S,4R)-3-((4-사이클로프로필-6-메틸-5-나이트로피리미딘-2-일)옥시)-4-플루오로피롤리딘-1-카복실레이트의 제조

[448] 이 반응은 3개의 병렬 배치로 수행하였다.

[449] tert-부틸 (3R,4S)-3-플루오로-4-하이드록시-피롤리딘-1-카복실레이트 (730 mg, 3.56 mmol)을 테트라하이드로퓨란 (50 mL)에 녹인 후 포타슘 tert-부톡사이드 (1 M, 테트라하이드로퓨란용액, 7.11 mL)을 0 ℃에서 천천히 적가하였다. 반응 혼합물을 0 ℃에서 30분 동안 교반하고 -60 ℃로 냉각하였다. 상기 단계 3에서 얻어진 4-사이클로프로필-6-메틸-2-(메틸설폰일)-5-나이트로피리미딘 (915.11 mg, 3.56 mmol)을 천천히 첨가하였다. LC-MS로 반응이 종결된 것을 확인 후 포화 염화암모늄 수용액 (200 mL)을 첨가하여 반응을 종결하였다. 반응 혼합물을 에틸아세테이트 (50 mL × 3)로 추출하고 모인 유기층을 포화 소금물 (100 mL)로 씻어준 뒤 황산나트륨으로 건조 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~33 %)로 정제하여 목적 화합물 (2.1 g, 40 % 수율)을 수득하였다. MS (ESI): m/z = 327.0 $[M+H-tBu]^+$

[450] [단계 5] tert-부틸 (3S,4R)-3-((4-사이클로프로필-6-(3-에톡시-2,3-다이옥소프로필)-5-나이트로피리미딘-2-일)옥시)-4-플루오로피롤리딘-1-카복실레이트의 제조

[451] 이 반응은 2개의 병렬 배치로 수행하였다.

[452] 다이에틸옥살레이트 (496.84 mg, 3.40 mmol)를 테트라하이드로퓨란 (50 mL)에 녹인 후 포타슘 tert-부톡사이드 (1 M, 테트라하이드로퓨란용액, 3.14 mL)을 0 ℃에서 천천히 적가하였다. 그 다음 0 ℃에서 30분 동안 교반하고 상기 단계 4에서 얻어진 tert-부틸 (3S,4R)-3-((4-사이클로프로필-6-메틸-5-나이트로피리미딘-2-일)옥시)-4-플루오로피롤리딘-1-카복실레이트 (1.00 g, 2.62 mmol)를 천천히 첨가하였다. 반응 혼합물을 0 ℃에서 30분 동안 교반하고 LC-MS로 반응이 종결된 것을 확인 후 물 (200 mL)을 첨가하였다. 반응 혼합물을 에틸아세테이트 (100 mL × 3)로 추출하고 모인 유기층을 포화 소금물 (200 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축하여 목적 화합물 (3.00 g, crude)을 수득하였으며 추가 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 483.1 $[M+H]^+$

[453] [단계 6] 에틸 2-(((3S,4R)-1-(tert-부톡시카보닐)-4-플루오로피롤리딘-3-일)옥시)-4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-카복실레이트의 제조

[454] 상기 단계 5에서 얻어진 tert-부틸 (3S,4R)-3-((4-사이클로프로필-6-(3-에톡시-2,3-다이옥소프로필)-5-나이트로피리미딘-2-일)옥시)-4-플루오로피롤리딘-1-카복실레이트 (3.00 g, 6.22 mmol)를 아세트산 (100 mL)에 녹인 후 철 (Fe, 1.39 g, 24.87 mmol)을 첨가하였다. 반응 혼합물을 50 ℃에서 1시간 동안 교반하고, LC-MS로 반응이 종결된 것을 확인 후 감압 농축하였다. 농축된 혼합물에 포화 탄산수소나트륨 수용액 (100 mL)을 넣고 에틸아세테이트 (50 mL × 3)으로 추출하였다. 모아진 유기층을 포화 소금물 (100 mL)로 씻고 황산나트륨으로 건조 후 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 석유에테르:에틸아세테이트 0~50 %)로 정제하여 목적 화합물 (1.40 g, 33 % 수율)을 수득하였다. MS (ESI): m/z = 435.2 $[M+H]^+$

[455] [단계 7] 에틸 4-사이클로프로필-2-(((3S,4R)-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-카복실레이트의 제조

[456] 상기 단계 6에서 얻어진 에틸 2-(((3S,4R)-1-(tert-부톡시카보닐)-4-플루오로피롤리딘-3-일)옥시)-4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-카복실레이트 (1.40 g, 3.22 mmol)를 염산 용액 (2 M, 메탄올 용액, 50 mL)에 녹인 후 25℃에서 3시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 감압 농축하여 목적 화합물 (1.10 g, 92 % 수율, HCl 염)을 수득하였다. MS (ESI): m/z = 335.0 $[M+H]^+$

[457] [단계 8] 에틸 4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-카복실레이트의 제조

[458] 상기 단계 7에서 얻어진 에틸 4-사이클로프로필-2-(((3S,4R)-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-카복실레이트 (1.10 g, 2.97 mmol, HCl 염)을 메탄올 (50 mL)에 녹인 후 37 % 포름알데하이드 수용액 (1.20 g, 14.83 mmol)을 첨가하였다. 반응 혼합물을 25℃에서 30분 동안 교반한 뒤 사이아노보로하이드라이드 나트륨 (372.84 mg, 5.93 mmol)을 첨가하고 10분 동안 교반하였

다. 반응 혼합물에 물 (300 mL)을 붓고 에틸아세테이트 (100 mL × 3)로 추출하였다. 모아진 유기층을 포화 소금물 (100 mL)로 씻어주고 황산나트륨으로 건조 후 감압 농축하여 목적 화합물 (1.00 g, crude)을 수득하였다. 수득한 목적 화합물은 별도의 정제 없이 다음 반응에 사용하였다. MS (ESI): m/z = 349.1 $[M+H]^+$

[459] [단계 9] 3-(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)-3-옥소프로페인나이트릴의 제조

[460] 상기 단계 8에서 얻어진 에틸 4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-카복실레이트 (900.00 mg, 2.58 mmol)를 테트라하이드로퓨란 (50 mL)에 녹인 후 아세토나이트릴 (530.28 mg, 12.92 mmol)을 첨가하고 0 ℃에서 LiHMDS (1 M, 테트라하이드로퓨란 용액, 12.92 mL)를 천천히 적가한 후 2시간 동안 교반하였다. 0 ℃에서 반응 혼합물을 염화암모늄 포화수용액 (50 mL)에 붓고 물층을 헥세인 (30 mL × 3)으로 씻어 준 뒤 감압 농축하였다. 농축된 반응 혼합물을 perp-HPLC로 정제하여 목적 화합물 (500 mg, 51 % 수율)을 수득하였다. MS (ESI): m/z = 342.1 $[M+H]^+$

[461] [단계 10] (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[462] 이 반응은 5개의 병렬 배치로 수행하였다.

[463] 상기 단계 9에서 얻어진 3-(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)-3-옥소프로페인나이트릴 (100 mg, 291.24 μmol), 실시예 56, 57의 단계 1에서 제조한 3-브로모-N-(3-(메톡시메톡시)-2,6-다이메틸페닐)피라진-2-아민 (98.50 mg, 291.24 μmol)을 tert-아밀알코올 (10 mL)에 녹인 후 탄산세슘 (284.68 mg, 873.73 μmol), BINAP Pd G_3 (28.89 mg)을 첨가하였다. 반응 혼합물을 100 ℃에서 2시간 동안 교반하고 셀라이트로 여과한 뒤 감압 농축하였다. 농축된 반응 혼합물을 MPLC (SiO_2, 헥세인:테트라하이드로퓨란 0~100 %)로 정제하여 목적 화합물 (500 mg, 50 % 수율)을 수득하였다. MS (ESI): m/z = 601.4 $[M+H]^+$

[464] [단계 11] (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[465] 이 반응은 5개의 병렬 배치로 수행하였다.

[466] 상기 단계 9에서 얻어진 (6-아미노-5-(3-(메톡시메톡시)-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 (100 mg, 166.49 μmol)을 염산 용액 (2 M, 1,4-다이옥세인 용액, 50 mL)에 녹인 후 25℃에서 1시간 동안 교반하였다. LC-MS로 반응이 종결된 것을 확인 후 감압 농축하였다. 농축된 혼합

물을 prep-HPLC로 정제하여 목적 화합물 (400 mg, 85 % 수율)을 수득하였다. MS (ESI): m/z = 557.3 $[M+H]^+$

[467] [단계 12] (6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 및 (6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온의 제조

[468] 상기 단계 11에서 얻어진 (6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온 (90 mg)을 초임계 유체 크로마토그래피 (컬럼: DAICEL CHIRALPAK OD (250 mm X 30 mm, 10 ㎛); 이동상: [CO_2/아이소프로판올 (0.1 % NH_3H_2O)])로 정제하여 실시예 532, 533 화합물을 수득하였다.

[469] **실시예 532. (6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온**

[470] 첫번째 용출; 39.50 mg (43 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.32 (t, *J* = 3.6 Hz, 1H), 8.06 - 7.87 (m, 1H), 7.25 - 7.13 (m, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.49 - 5.26 (m, 2H), 3.18 - 2.95 (m, 4H), 2.59 - 2.51 (m, 1H), 2.47 (s, 3H), 1.94 (s, 3H), 1.89 (s, 3H), 1.45 (d, *J* = 2.8 Hz, 2H), 1.41 - 1.34 (m, 2H); MS (ESI): m/z = 557.3 $[M+H]^+$

[471] **실시예 533. (6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온**

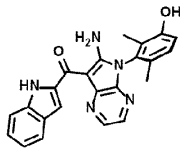
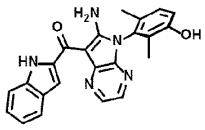
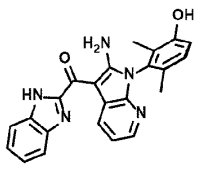
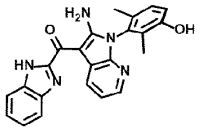
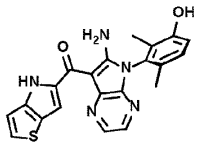
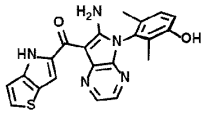
[472] 두번째 용출; 39.04 mg (41 % 수율); ^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 9.6 Hz, 1H), 8.06 - 7.87 (m, 1H), 7.24 - 7.15 (m, 2H), 7.00 (d, *J* = 8.4 Hz, 1H), 5.59 - 5.31 (m, 2H), 3.30 - 3.08 (m, 4H), 2.61 - 2.50 (m, 4H), 1.95 (s, 3H), 1.91 (s, 3H), 1.49 - 1.43 (m, 2H), 1.43 - 1.37 (m, 2H); MS (ESI): m/z = 557.3 $[M+H]^+$

[473] **<실시예 1> 내지 <실시예 539>**

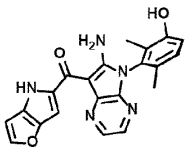
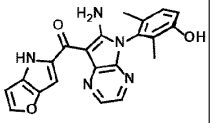
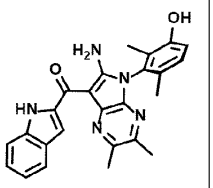
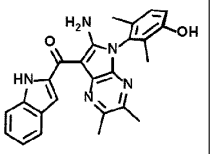
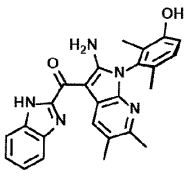
[474] 상기 기재한 실시예 1, 2, 11, 12, 56, 57, 58, 59, 82, 83, 142, 143, 240, 241, 258, 259, 394, 395, 416, 417, 524, 525, 532, 533과 유사한 방법으로 본 발명의 다른 모든 실시예 화합물을 제조하였으며, 각 실시예 화합물의 화학구조식, 화합물명, NMR, 및 LC-MS 분석 결과를 하기 [표 1]에 정리하여 나타내었다.

[475] [표 1]

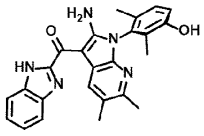
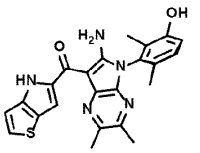
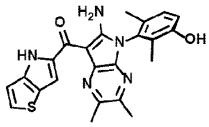
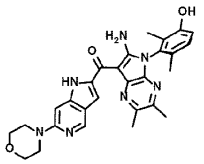
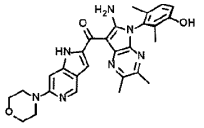
[476]

실시예	구조식	화합물명	^{1}H NMR	LC-MS [M+H]$^+$
1		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 1.6 Hz, 1H), 7.96 (d, J = 2.8 Hz, 1H), 7.72 (d, J = 8.2 Hz, 1H), 7.64 (d, J = 8.2 Hz, 1H), 7.56 (s, 1H), 7.32 (t, J = 7.5 Hz, 1H), 7.17-7.06 (m, 2H), 6.96 (br d, J = 8.1 Hz, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	398.2
2		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 1.6 Hz, 1H), 7.96 (d, J = 2.8 Hz, 1H), 7.72 (d, J = 8.2 Hz, 1H), 7.64 (d, J = 8.2 Hz, 1H), 7.56 (s, 1H), 7.32 (t, J = 7.5 Hz, 1H), 7.17-7.06 (m, 2H), 6.96 (br d, J = 8.1 Hz, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	398.2
3		(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.73 (s 1H), 7.89 (d, J = 4.8 Hz, 1H), 7.82 (d, J = 7.6 Hz, 1H), 7.67 (d, J = 8.0 Hz, 1H), 7.46-7.31 (m, 1H), 7.19 (d, J = 8.0 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 1.96 (s, 1H), 1.91 (s, 1H).	398.2
4		(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.73 (s 1H), 7.87 (d, J = 4.0 Hz, 1H), 7.72 (s, 2H), 7.36 (s, 2H), 7.16 (d, J = 7.6 Hz, 2H), 6.97 (d, J = 8.0 Hz, 1H), 1.91 (d, J = 16.4 Hz, 6H).	398.2
5		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.93 (d, J = 3.2 Hz, 1H), 7.45 (s, 1H), 7.44 (d, J = 5.2 Hz, 1H), 7.19 (d, J = 5.2 Hz, 1H), 7.12 (d, J = 8.4 Hz, 1H), 6.94 (d, J = 8.4 Hz, 1H), 1.90 (s, 3H), 1.86 (s, 3H).	404.1
6		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-싸	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.92 (d, J = 3.2 Hz, 1H), 7.44 (s, 1H), 7.43 (d, J = 5.2 Hz, 1H), 7.19 (d, J = 5.2 Hz, 1H), 7.09 (d, J = 8.4	404.1

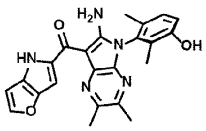
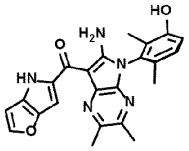
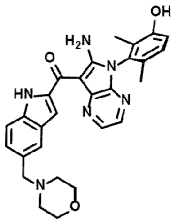
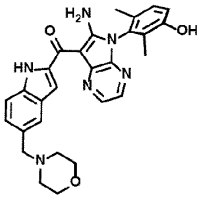
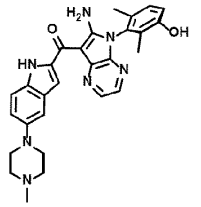
[477]

		이에노[3,2-b]피롤-5-일)메탄온	Hz, 1H), 6.92 (d, J = 8.4 Hz, 1H), 1.88 (s, 3H), 1.85 (s, 3H).	
7		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, J = 3.2 Hz, 1H), 7.92 (d, J = 3.2 Hz, 1H), 7.67 (d, J = 2.4 Hz, 1H), 7.15 (d, J = 8.4 Hz, 1H), 7.06 (s, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.70 (d, J = 2.4 Hz, 1H), 1.91 (s, 3H), 1.86 (s, 3H).	388.1
8		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, J = 3.2 Hz, 1H), 7.92 (d, J = 3.2 Hz, 1H), 7.67 (d, J = 2.4 Hz, 1H), 7.15 (d, J = 8.4 Hz, 1H), 7.06 (s, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.70 (d, J = 2.4 Hz, 1H), 1.91 (s, 3H), 1.86 (s, 3H).	388.1
9		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 15.00 (s, 1H), 7.80 (d, J = 8.0 Hz, 1H), 7.65 (d, J = 8.4 Hz, 1H), 7.55 (s, 1H), 7.36 (t, J = 7.6 Hz, 1H), 7.17 (t, J = 7.6 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.71 (d, J = 8.4 Hz, 1H), 2.83 (s, 3H), 2.60 (s, 3H), 1.95 (s, 3H), 1.93 (s, 3H).	426.2
10		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 14.99 (s, 1H), 7.80 (d, J = 8.0 Hz, 1H), 7.65 (d, J = 8.0 Hz, 1H), 7.56 (s, 1H), 7.36 (t, J = 7.6 Hz, 1H), 7.17 (t, J = 7.6 Hz, 1H), 6.95 (d, J = 8.4 Hz, 1H), 6.68 (d, J = 8.4 Hz, 1H), 2.83 (s, 3H), 2.61 (s, 3H), 1.96 (s, 3H), 1.93 (s, 3H).	426.2
11		(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.72-8.41 (m, 1H), 7.76 (dd, J = 2.8, 6.0 Hz, 2H), 7.48 (s, 2H), 7.36-7.21 (m, 2H), 7.04 (d, J = 8.4 Hz, 1H), 2.48 (s, 3H), 2.36 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	426.2

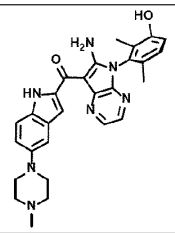
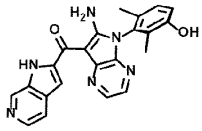
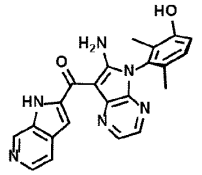
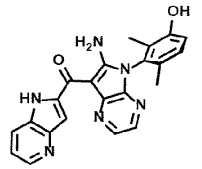
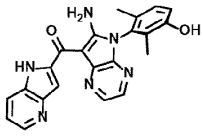
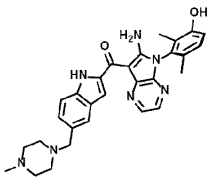
[478]

12		(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.66-8.35 (m, 1H), 7.72 (dd, *J* = 2.8, 6.0 Hz, 2H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.30-7.15 (m, 2H), 7.00 (d, *J* = 8.4 Hz, 1H), 2.44 (s, 3H), 2.32 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H).	426.2
13		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 7.49 (s, 1H), 7.37 (d, *J* = 5.2 Hz, 1H), 7.14 (d, *J* = 5.2 Hz, 1H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.68 (d, *J* = 8.4 Hz, 1H), 3.50 (s, 2H), 2.77 (s, 3H), 2.59 (s, 3H), 1.94 (s, 3H), 1.91 (s, 3H).	432.1
14		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 7.48 (s, 1H), 7.37 (d, *J* = 5.2 Hz, 1H), 7.14 (d, *J* = 5.2 Hz, 1H), 6.97 (d, *J* = 7.6 Hz, 1H), 6.71 (d, *J* = 8.4 Hz, 1H), 3.50 (s, 2H), 2.76 (s, 3H), 2.57 (s, 3H), 1.93 (s, 3H), 1.92 (s, 3H).	432.1
15		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-모폴리노-1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 8.68 (s, 1H), 8.31-8.21 (m, 1H), 7.95-7.80 (m, 2H), 7.08 (d, *J* = 8.0 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 1H), 6.85 (s, 1H), 3.80-3.72 (m, 4H), 3.45-3.42 (m, 4H), 1.82 (s, 3H), 1.75 (s, 3H).	512.2
16		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-모폴리노-1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 8.67 (s, 1H), 8.28-8.18 (m, 1H), 7.87-7.81 (m, 2H), 7.08 (d, *J* = 8.0 Hz, 1H), 6.93 (d, *J* = 7.6 Hz, 1H), 6.85 (s, 1H), 3.80-3.74 (m, 4H), 3.46-3.42 (m, 4H), 1.82 (s, 3H), 1.75 (s, 3H).	512.2

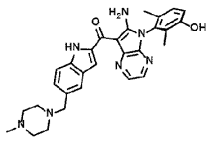
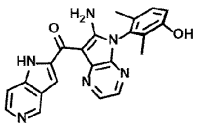
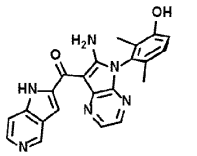
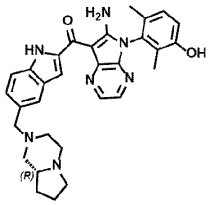
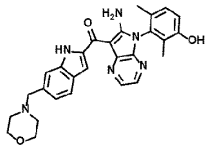
[479]

17		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.66 (d, *J* = 2.4 Hz, 1H), 7.08 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 0.8 Hz, 1H), 6.91 (d, *J* = 8.4 Hz, 1H), 6.70 (dd, *J* = 0.8, 2.0 Hz, 1H), 2.71 (s, 3H), 2.47 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H).	416.2
18		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.66 (d, *J* = 2.4 Hz, 1H), 7.07 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 0.8 Hz, 1H), 6.90 (d, *J* = 8.4 Hz, 1H), 6.70 (dd, *J* = 0.8, 2.0 Hz, 1H), 2.71 (s, 3H), 2.47 (s, 3H), 1.87 (s, 3H), 1.84 (s, 3H).	416.2
19		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.82 (s, 1H), 9.66 (s, 1H), 9.11-8.45 (m, 2H), 8.41 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.80 (s, 1H), 7.66-7.58 (m, 2H), 7.33-7.21 (m, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.0 Hz, 1H), 3.62-3.50 (m, 6H), 2.45-2.31 (m, 4H), 1.83 (s, 3H), 1.75 (s, 3H).	497.2
20		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.82 (s, 1H), 9.66 (s, 1H), 9.18-8.46 (m, 2H), 8.41 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.81 (s, 1H), 7.70-7.53 (m, 2H), 7.30-7.24 (m, 1H), 7.13 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.0 Hz, 1H), 3.68-3.48 (m, 6H), 2.46-2.34 (m, 4H), 1.83 (s, 3H), 1.75 (s, 3H).	497.2
21		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(4-메틸피페라진-1-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.81 (s, 1H), 9.69 (s, 1H), 8.40 (d, *J* = 2.8 Hz, 1H), 7.97 (d, *J* = 2.8 Hz, 1H), 7.64 (s, 1H), 7.56 (d, *J* = 8.8 Hz, 1H), 7.17-7.07 (m, 3H), 6.98 (d, *J* = 8.4 Hz, 1H), 3.16-3.05 (m, 4H), 2.64-2.53 (m, 4H), 2.24 (s, 3H), 1.82 (s, 3H), 1.75 (s, 3H).	496.2

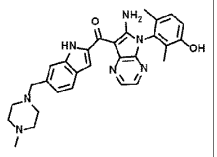
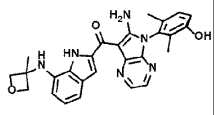
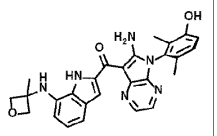
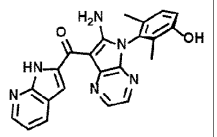
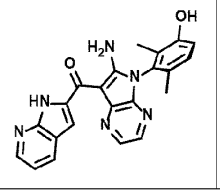
[480]

22		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(4-메틸피페라진-1-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.81 (s, 1H), 9.71 (s, 1H), 8.40 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.8 Hz, 1H), 7.64 (s, 1H), 7.56 (d, J = 8.8 Hz, 1H), 7.16-7.07 (m, 3H), 6.98 (d, J = 8.0 Hz, 1H), 3.16-3.06 (m, 4H), 2.63-2.52 (m, 4H), 2.24 (s, 3H), 1.82 (s, 3H), 1.75 (s, 3H).	496.2
23		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ14.46 (s, 1H), 9.71 (s, 1H), 9.17 (s, 1H), 8.44 (d, J = 3.2 Hz, 1H), 8.22 (d, J = 4.4 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.88 (d, J = 1.2 Hz, 1H), 7.78 (d, J = 5.2 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 1.84 (s, 3H), 1.76 (s, 3H).	399.1
24		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ14.33 (s, 1H), 9.70 (s, 1H), 9.12 (s, 1H), 8.44 (d, J = 3.2 Hz, 1H), 8.19 (d, J = 4.4 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.86 (d, J = 1.2 Hz, 1H), 7.72 (d, J = 5.2 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H).	399.1
25		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 4.0 Hz, 1H), 8.41 (d, J = 4.0 Hz, 1H), 8.18 (d, J = 8.0 Hz, 1H), 7.99 (d, J = 4.0 Hz, 1H), 7.71 (s, 1H), 7.36 (m, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	399.1
26		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 4.0 Hz, 1H), 8.41 (d, J = 4.0 Hz, 1H), 8.18 (d, J = 8.0 Hz, 1H), 7.98 (d, J = 4.0 Hz, 1H), 7.71 (s, 1H), 7.36 (m, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	399.1
27		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.81 (s, 1H), 9.80-9.54 (m, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.19 (s, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.79 (s, 1H), 7.66-7.54 (m, 2H), 7.29-7.19 (m, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.53 (s,	510.3

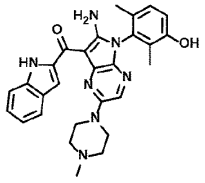
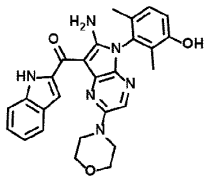
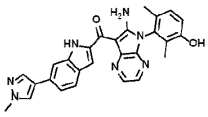
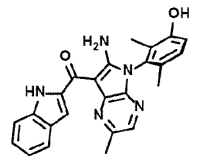
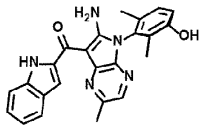
[481]

		틸)-1H-인돌-2-일)메탄온	2H), 2.46-2.25 (m, 8H), 2.16 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H).	
28		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.81 (s, 1H), 9.72-9.63 (m, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.17 (s, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.80 (s, 1H), 7.64-7.58 (m, 2H), 7.29-7.19 (m, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 3.54 (s, 2H), 2.47-2.34 (m, 8H), 2.18 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H).	510.3
29		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.01 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.29 (d, J = 6.0 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.83 (s, 1H), 7.75 (d, J = 6.0 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	399.1
30		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.09 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.32 (d, J = 6.0 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.92 (s, 1H), 7.86 (br d, J = 6.0 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	399.1
31		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((헥사하이드로피롤로[1,2-a]피라진-2(1H)-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.81 (s, 1H), 9.73 (s, 1H), 8.84 (s, 2H), 8.41 (d, J = 3.1 Hz, 1H), 7.98 (d, J = 3.1 Hz, 1H), 7.82 (d, J = 2.0 Hz, 1H), 7.64-7.62 (m, 2H), 7.26 (d, J = 8.4 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.3 Hz, 1H), 3.73-3.50 (m, 2H), 3.02-2.85 (m, 3H), 2.83-2.69 (m, 1H), 2.30-2.15 (m, 2H), 2.12-1.93 (m, 3H), 1.83 (s, 3H), 1.75 (s, 3H), 1.74-1.55 (m, 4H).	536.3
32		(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.79 (s, 1H), 9.69 (s, 1H), 8.44 (d, J = 3.0 Hz, 1H), 7.98 (d, J = 3.0 Hz, 1H), 7.83 (d, J = 1.7 Hz, 1H), 7.67 (d, J = 8.2 Hz, 1H), 7.61 (s, 1H), 7.13 (d, J = 8.3 Hz, 1H), 7.08 (dd, J = 8.2, 1.4 Hz, 1H), 6.98 (d, J	497.3

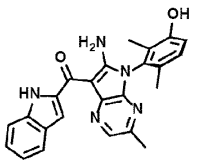
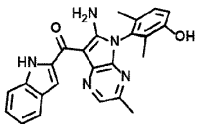
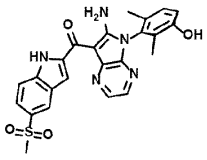
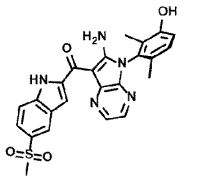
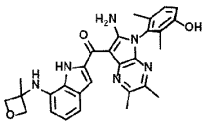
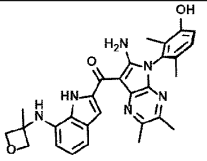
[482]

			= 8.3 Hz, 1H), 3.63-3.54 (m, 6H), 2.41 (s, 4H), 1.83 (s, 3H), 1.75 (s, 3H).	
33		(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.79 (d, J = 2.1 Hz, 1H), 9.70 (s, 1H), 8.44 (d, J = 3.0 Hz, 1H), 7.99 (d, J = 3.0 Hz, 1H), 7.83 (d, J = 2.5 Hz, 1H), 7.66 (d, J = 8.2 Hz, 1H), 7.59 (s, 1H), 7.14 (d, J = 8.3 Hz, 1H), 7.07 (dd, J = 8.3, 1.4 Hz, 1H), 6.99 (d, J = 8.3 Hz, 1H), 3.58 (s, 2H), 2.50-2.24 (m, 8H), 2.18 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	510.3
34		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.19 (s, 1H), 7.16 (d, J = 6.4 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.97-6.93 (m, 1H), 6.28 (d, J = 7.6 Hz, 1H), 5.00 (d, J = 6.0 Hz, 2H), 4.73 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H)	483.2
35		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.18 (d, J = 5.6 Hz, 1H), 7.16 (d, J = 6.4 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 6.97-6.93 (m, 1H), 6.28 (d, J = 7.6 Hz, 1H), 5.00 (d, J = 6.0 Hz, 2H), 4.73 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84 (s, 3H).	483.2
36		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46-8.44 (m, 1H), 8.43 (d, J = 1.6 Hz, 1H), 8.21 (dd, J = 1.6, 8.0 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.23 (dd, J = 4.8, 8.0 Hz, 1H), 7.11 (d, J = 8.4 Hz, 1H), 6.94 (d, J = 8.4 Hz, 1H), 1.90 (s, 3H), 1.87 (s, 3H).	399.1
37		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피	^{1}H NMR (400 MHz, MeOD): δ 8.44 (s, 1H), 8.43-8.41 (m, 1H), 8.21 (dd, J = 1.6, 8.0 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.22 (dd, J = 4.8, 8.0 Hz, 1H), 7.12 (d, J = 8.4 Hz, 1H), 6.94 (d, J = 8.4 Hz, 1H), 1.90 (s, 3H), 1.87 (s, 3H).	399.1

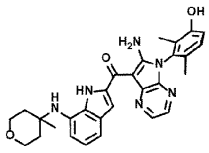
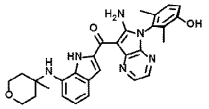
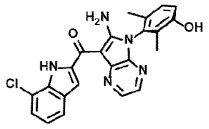
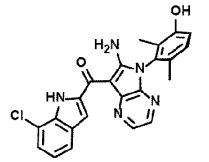
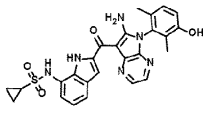
[483]

		롤로[2,3-b]피리딘-2-일)메탄온		
38		(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-(4-메틸피페라진-1-일)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.53 (s, 1H), 9.47 (s, 1H), 8.31 (s, 2H), 7.75 (dd, J = 2.1, 0.9 Hz, 1H), 7.70 (d, J = 8.0 Hz, 1H), 7.64 (s, 1H), 7.44 (dd, J = 8.3, 1.0 Hz, 1H), 7.33-7.27 (m, 1H), 7.14-7.07 (m, 2H), 6.96 (d, J = 8.3 Hz, 1H), 3.65-3.58 (m, 4H), 2.65-2.58 (m, 4H), 2.32 (s, 3H), 1.84 (s, 3H), 1.76 (s, 3H).	496.2
39		(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-모폴리노-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.41 (s, 1H), 9.65 (s, 1H), 8.42 (s, 2H), 7.83 (dd, J = 2.0, 0.9 Hz, 1H), 7.71 (d, J = 8.1 Hz, 1H), 7.67 (s, 1H), 7.44 (dd, J = 8.3, 1.1 Hz, 1H), 7.33-7.28 (m, 1H), 7.14-7.08 (m, 2H), 6.96 (d, J = 8.3 Hz, 1H), 3.93-3.84 (m, 4H), 3.63-3.55 (m, 4H), 1.83 (s, 3H), 1.76 (s, 3H).	483.2
40		(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1H-피라졸-4-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.92 (s, 1H), 9.66 (s, 1H), 8.40 (d, J = 3.0 Hz, 1H), 8.16 (s, 1H), 7.98 (d, J = 3.0 Hz, 1H), 7.90 (s, 1H), 7.84 (s, 1H), 7.74 (s, 1H), 7.68 (d, J = 8.4f Hz, 1H), 7.32 (d, J = 8.4 Hz, 1H), 7.11 (d, J = 8.4 Hz, 1H), 6.96 (d, J = 8.3 Hz, 1H), 3.87 (s, 3H), 1.81 (s, 3H), 1.73 (s, 3H).	478.3
41		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.86 (s, 1H), 7.71 (d, J = 8.0 Hz, 1H), 7.65-7.60 (m, 1H), 7.49 (s, 1H), 7.35-7.29 (m, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.11 (t, J = 8.0 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 2.79 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	412.2
42		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.85 (s, 1H), 7.71 (d, J = 8.0 Hz, 1H), 7.62 (d, J = 8.4 Hz, 1H), 7.49 (s, 1H), 7.35-7.29 (m, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.14-7.08 (m, 1H), 6.97 (d, J = 8.4 Hz, 1H), 2.79 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	412.2

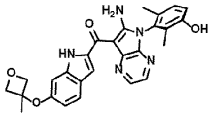
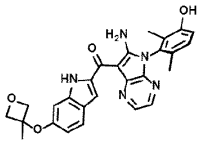
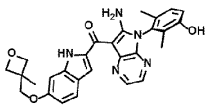
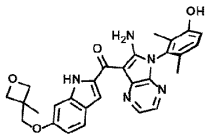
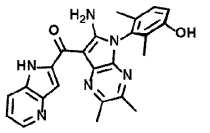
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43		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.31 (s, 1H), 7.70 (d, *J* = 8.0 Hz, 1H), 7.64 (dd, *J* = 0.8, 8.4 Hz, 1H), 7.51 (d, *J* = 0.8 Hz, 1H), 7.31 (t, *J* = 1.2, 7.6 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.13-7.07 (m, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.58 (s, 1H), 2.50 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	412.2
44		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.31 (s, 1H), 7.69 (d, *J* = 8.0 Hz, 1H), 7.63 (dd, *J* = 0.8, 8.4 Hz, 1H), 7.50 (d, *J* = 0.8 Hz, 1H), 7.30 (t, *J* = 1.2, 7.6 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.13-7.07 (m, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 2.50 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H).	412.2
45		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(메틸설폰일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 3.2 Hz, 1H), 8.41 (s, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.93-7.89 (m, 1H), 7.86-7.82 (m, 1H), 7.80 (s, 1H), 7.17 (d, *J* = 8.8 Hz, 1H), 6.99 (d, = 8.4 Hz, 1H), 3.17 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	476.1
46		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(메틸설폰일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 3.2 Hz, 1H), 8.41 (s, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.93-7.89 (m, 1H), 7.86-7.83 (m, 1H), 7.80 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.17 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	476.1
47		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.47 (s, 1H), 7.17 (dd, *J* = 8.0, 11.2 Hz, 2H), 6.99-6.91 (m, 2H), 6.20 (d, *J* = 7.2 Hz, 1H), 5.04 (d, *J* = 5.6 Hz, 2H), 4.71 (d, *J* = 5.6 Hz, 2H), 2.78 (s, 4H), 2.48 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.84 (s, 3H).	511.2
48		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라	^{1}H NMR (400 MHz, MeOD): δ 7.47 (s, 1H), 7.17 (dd, *J* = 8.0, 11.2 Hz, 2H), 6.99-6.91 (m, 2H), 6.20 (d, *J* = 7.2 Hz, 1H), 5.04 (d, *J* = 5.6 Hz, 2H), 4.71 (d, *J*	511.2

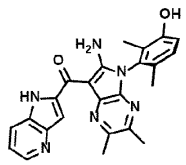
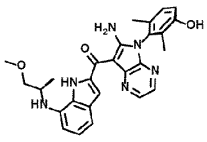
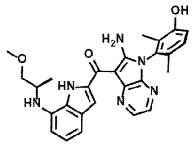
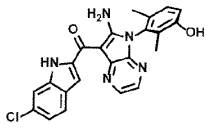
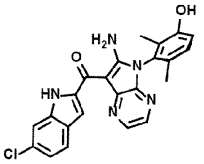
[485]

		진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	= 5.6 Hz, 2H), 2.78 (s, 4H), 2.48 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.84 (s, 3H).	
49		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((4-메틸테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.31 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.52 (s, 1H), 7.25 (d, J = 8.0 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.01-6.95 (m, 2H), 6.85 (d, J = 7.6 Hz, 1H), 4.05-3.89 (m, 2H), 3.81-3.65 (m, 2H), 2.30-2.12 (m, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.86-1.81 (m, 1H), 1.89-1.81 (m, 1H), 1.58 (s, 3H).	511.2
50		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((4-메틸테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.52 (s, 1H), 7.26 (d, J = 8.0 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.03-6.94 (m, 2H), 6.86 (d, J = 7.6 Hz, 1H), 4.05-3.88 (m, 2H), 3.79-3.70 (m, 2H), 2.23-2.18 (m, 2H), 1.92 (s, 3H), 1.89 (s, 3H), 1.86-1.81 (m, 1H), 1.89-1.81 (m, 1H), 1.52 (s, 3H).	511.2
51		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 2.8 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.65 (d, J = 8.0 Hz, 1H), 7.48 (s, 1H), 7.33 (d, J = 7.6 Hz, 1H), 7.15 (d, J = 8.4 Hz, 1H), 7.09 (t, J = 7.6 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	432.1
52		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 2.8 Hz, 1H), 7.66 (d, J = 8.0 Hz, 1H), 7.48 (s, 1H), 7.33 (d, J = 7.6 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.09 (t, J = 7.6 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	432.1
53		N-(2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-인돌-7-일)사이클로프로페인설폰아마이드	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.73 (s, 1H), 9.66 (s, 2H), 8.37 (d, J = 3.0 Hz, 1H), 7.99 (d, J = 3.0 Hz, 1H), 7.63 (s, 1H), 7.62 (d, J = 4.7 Hz, 1H), 7.23 (d, J = 7.4 Hz, 1H), 7.13-7.05 (m, 2H), 6.96 (d, J = 8.3 Hz, 1H), 2.73-2.68 (m, 1H), 1.81 (s, 3H), 1.74 (s, 3H), 0.92 (dt, J =	517.2

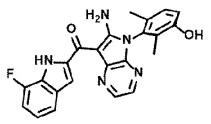
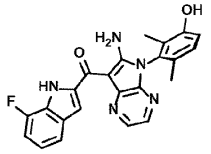
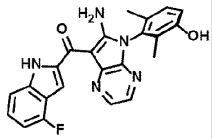
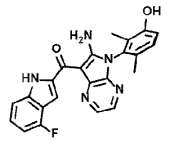
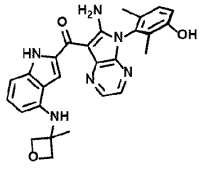
[486]

			8.3, 3.2 Hz, 2H), 0.87 (dt, J = 5.2, 2.9 Hz, 2H).	
54		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, J = 4.0 Hz, 1H), 7.95 (d, J = 4.0 Hz, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.55 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.83 (s, 1H), 6.64 (dd, J = 4.0, 8.0 Hz, 1H), 5.00 (d, J = 8.0 Hz, 2H), 4.70 (d, J = 8.0 Hz, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.80 (s, 3H).	484.2
55		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 4.0 Hz, 1H), 7.94 (d, J = 4.0 Hz, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.55 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.82 (s, 1H), 6.64 (dd, J = 4.0, 8.0 Hz, 1H), 5.00 (d, J = 8.0 Hz, 2H), 4.70 (d, J = 8.0 Hz, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.80 (s, 3H).	484.2
56		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.63 (d, J = 8.8 Hz, 1H), 7.55 (s, 1H), 7.25 (d, J = 0.8 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.4 Hz, 1H), 6.88 (dd, J = 2.0, 8.8 Hz, 1H), 4.77 (d, J = 6.0 Hz, 2H), 4.53 (d, J = 6.0 Hz, 2H), 4.20 (s, 2H), 1.96 (s, 3H), 1.91 (s, 3H), 1.53 (s, 3H).	498.2
57		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.63 (d, J = 8.8 Hz, 1H), 7.55 (s, 1H), 7.25 (d, J = 0.8 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.4 Hz, 1H), 6.88 (dd, J = 2.0, 8.8 Hz, 1H), 4.77 (d, J = 6.0 Hz, 2H), 4.53 (d, J = 6.0 Hz, 2H), 4.20 (s, 2H), 1.96 (s, 3H), 1.91 (s, 3H), 1.53 (s, 3H).	498.2
58		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라	^{1}H NMR (400 MHz, MeOD): δ 8.45 (dd, J = 1.2, 4.8 Hz, 1H), 8.15 (d, J = 8.4 Hz, 1H), 7.60 (s, 1H), 7.37 (dd, J = 4.8, 8.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98	427.2

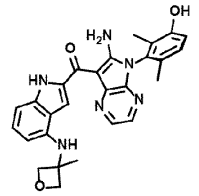
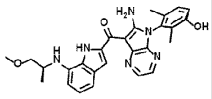
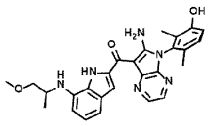
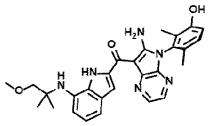
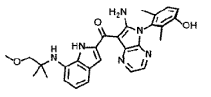
[487]

		진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	(d, J = 8.4 Hz, 1H), 2.79 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.87 (s, 3H).	
59		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (dd, J = 1.2, 4.8 Hz, 1H), 8.16 (d, J = 8.4 Hz, 1H), 7.61 (s, 1H), 7.37 (dd, J = 4.8, 8.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 2.79 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.87 (s, 3H).	427.2
60		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((R)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.51 (s, 1H), 7.17-7.11 (m, 2H), 7.03-6.96 (m, 2H), 6.68 (d, J = 7.2 Hz, 1H), 4.06-3.93 (m, 1H), 3.64 (d, J = 4.4 Hz, 2H), 3.47 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.39 (d, J = 6.4 Hz, 3H).	485.2
61		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((R)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.50 (s, 1H), 7.19-7.11 (m, 2H), 7.02-6.95 (m, 2H), 6.65 (d, J = 7.2 Hz, 1H), 4.03-3.92 (m, 1H), 3.63 (d, J = 4.4 Hz, 2H), 3.47 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.39 (d, J = 6.4 Hz, 3H).	485.2
62		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.67 (d, J = 8.4 Hz, 1H), 7.56 (d, J = 1.6 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.09 (dd, J = 1.6, 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	432.1
63		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.70 (s, 1H), 7.67 (d, J = 8.4 Hz, 1H), 7.56 (s, 1H), 7.12 (d, J = 8.4 Hz, 1H), 7.08 (dd, J = 1.6, 8.4 Hz, 1H), 6.94 (d, J = 8.4 Hz, 1H), 1.90 (s, 3H), 1.86 (s, 3H).	432.1

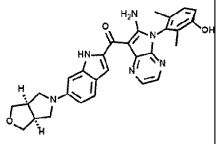
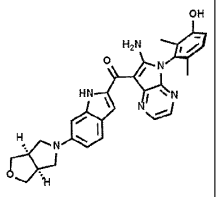
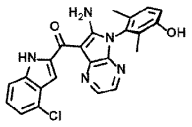
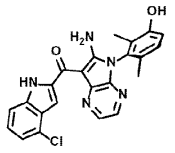
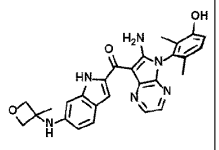
[488]

64		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.57-7.47 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 7.07-7.04 (m, 1H), 7.03 (d, J = 1.6 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.35 (s, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	416.1
65		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.53 (d, J = 3.6 Hz, 1H), 7.52 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.08-7.05 (m, 1H), 7.04-7.02 (m, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	416.1
66		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-플루오로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.96 (s, 1H), 9.69 (s, 1H), 8.42 (d, J = 4.0 Hz, 1H), 8.04-7.94 (m, 2H), 7.53 (d, J = 8.0 Hz, 1H), 7.27 (m, 1H), 7.13 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.76 (dd, J = 8.0, 4.0 Hz, 1H), 1.83 (s, 3H), 1.75 (s, 3H).	416.1
67		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-플루오로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.60 (s, 1H), 7.47 (d, J = 8.0 Hz, 1H), 7.26 (m, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.75 (dd, J = 8.0, 4.0 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	416.1
68		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 2.8 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 7.13-7.07 (m, 1H), 6.97 (dd, J = 4.4, 8.0 Hz, 2H), 5.76 (d, J = 7.6 Hz, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.66 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.77 (s, 3H).	483.2

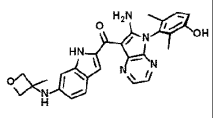
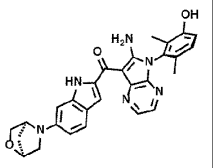
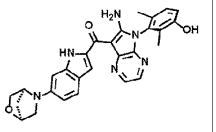
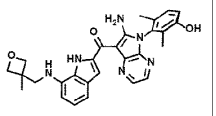
[489]

69		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 2.8 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 7.13-7.07 (m, 1H), 6.97 (dd, J = 4.4, 8.0 Hz, 2H), 5.76 (d, J = 7.6 Hz, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.66 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.77 (s, 3H).	483.2
70		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((S)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.50 (s, 1H), 7.16 (dd, J = 6.4, 8.0 Hz, 2H), 7.02-6.96 (m, 2H), 6.65 (d, J = 7.6 Hz, 1H), 4.02-3.93 (m, 1H), 3.63 (d, J = 4.8 Hz, 2H), 3.47 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.39 (d, J = 6.4 Hz, 3H).	485.2
71		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((S)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.50 (s, 1H), 7.16 (dd, J = 6.4, 8.0 Hz, 2H), 7.02-6.96 (m, 2H), 6.65 (d, J = 7.2 Hz, 1H), 4.04-3.92 (m, 1H), 3.63 (d, J = 4.8 Hz, 2H), 3.47 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.39 (d, J = 6.4 Hz, 3H).	485.2
72		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((1-메톡시-2-메틸프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.51 (s, 1H), 7.35 (d, J = 8.0 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 7.6 Hz, 1H), 7.00-6.93 (m, 2H), 3.44 (s, 2H), 3.42 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.41 (s, 6H)	499.2
73		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((1-메톡시-2-메틸프로판-2-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.51 (s, 1H), 7.36 (d, J = 8.0 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.04-7.00 (m, 1H), 7.00-6.92 (m, 2H), 3.44 (s, 2H), 3.42 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.41 (s, 6H)	499.2

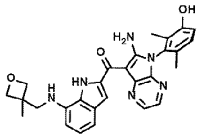
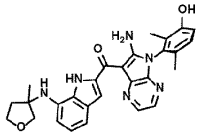
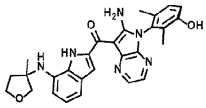
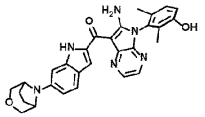
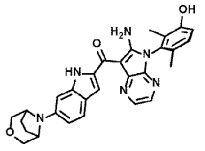
[490]

74		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.53 (d, J = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.79 (s, 1H), 6.78-6.74 (m, 1H), 4.01 (dd, J = 6.8, 8.8 Hz, 2H), 3.72 (dd, J = 3.6, 8.8 Hz, 2H), 3.52 (dd, J = 7.2, 9.6 Hz, 2H), 3.35 (dd, J = 2.8, 9.6 Hz, 2H), 3.15-3.10 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	509.2
75		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.53 (d, J = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.78 (s, 1H), 6.78-6.75 (m, 1H), 4.01 (dd, J = 6.8, 8.8 Hz, 2H), 3.72 (dd, J = 3.6, 8.8 Hz, 2H), 3.52 (dd, J = 7.2, 9.6 Hz, 2H), 3.35 (dd, J = 2.4, 9.6 Hz, 2H), 3.16-3.08 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	509.2
76		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.61 (d, J = 8.4 Hz, 1H), 7.59 (d, J = 0.8 Hz, 1H), 7.26 (t, J = 8.0 Hz, 1H), 7.20-7.11 (m, 2H), 6.98 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	432.1
77		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.61 (d, J = 8.4 Hz, 1H), 7.59 (d, J = 0.8 Hz, 1H), 7.26 (t, J = 8.0 Hz, 1H), 7.20-7.11 (m, 2H), 6.98 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	432.1
78		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)아미	^{1}H NMR (400 MHz, DMSO-d_6): δ 12.85 (s, 1H), 9.66 (s, 1H), 8.38 (d, J = 4.0 Hz, 1H), 7.92 (d, J = 4.0 Hz, 1H), 7.90 (s, 1H), 7.44 (d, J = 8.0 Hz, 1H), 7.12 (d, J = 8.0 Hz, 1H), 6.97 (d, J = 8.0 Hz, 1H), 6.44 - 6.42 (dd, J = 4.0, 8.0 Hz, 1H), 6.29 (s, 1H), 6.20 (s, 1H), 4.70 (d, J = 4.0 Hz,	483.2

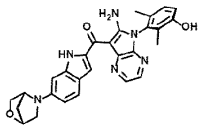
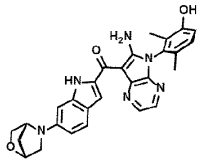
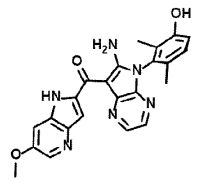
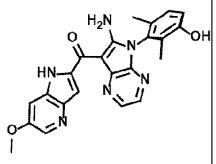
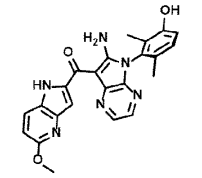
[491]

		노)-1H-인돌-2-일)메탄온	2H), 4.53 (d, *J* = 4.0 Hz, 2H), 1.81 (s, 3H), 1.74 (s, 3H), 1.64 (s, 3H).	
79		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 12.86 (s, 1H), 9.67 (s, 1H), 8.38 (d, *J* = 4.0 Hz, 1H), 7.93 (d, *J* = 4.0 Hz, 1H), 7.90 (s, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.12 (d, *J* = 8.0 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.43 (d, *J* = 8.0 Hz, 1H), 6.30 (s, 1H), 6.20 (s, 1H), 4.70 (d, *J* = 4.0 Hz, 2H), 4.53 (d, *J* = 4.0 Hz, 2H), 1.81 (s, 3H), 1.74 (s, 3H), 1.64 (s, 3H).	483.2
80		(6-((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.54 (d, *J* = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.76 (s, 1H), 6.68 (dd, *J* = 1.6, 8.8 Hz, 1H), 4.67 (d, *J* = 18.4 Hz, 2H), 4.00-3.95 (m, 1H), 3.94-3.88 (m, 1H), 3.69 (d, *J* = 8.8 Hz, 1H), 3.22 (d, *J* = 9.2 Hz, 1H), 2.12-2.06 (m, 1H), 2.03-1.96 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	495.2
81		(6-((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.54 (d, *J* = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.76 (s, 1H), 6.68 (dd, *J* = 1.6, 8.8 Hz, 1H), 4.67 (d, *J* = 18.4 Hz, 2H), 4.00-3.95 (m, 1H), 3.94-3.88 (m, 1H), 3.69 (d, *J* = 8.8 Hz, 1H), 3.22 (d, *J* = 9.2 Hz, 1H), 2.12-2.06 (m, 1H), 2.03-1.96 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	495.2
82		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 7.94 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.22-7.10 (m, 2H), 7.03-6.94 (m, 2H), 6.63 (d, *J* = 7.6 Hz, 1H), 4.81 (d, *J* = 6.0 Hz, 2H), 4.54 (d, *J* = 6.0 Hz, 2H), 3.51 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.56 (s, 3H).	497.2

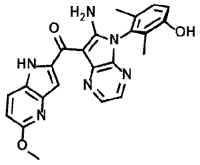
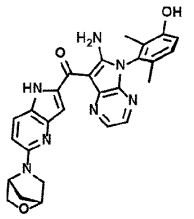
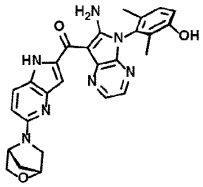
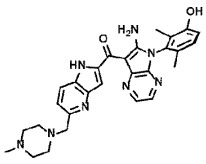
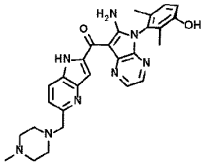
[492]

83		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.58 (s, 1H), 7.15 (dd, J = 8.4, 10.8 Hz, 2H), 7.03-6.94 (m, 2H), 6.63 (d, J = 7.6 Hz, 1H), 4.81 (d, J = 6.0 Hz, 2H), 4.54 (d, J = 6.0 Hz, 2H), 3.51 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.56 (s, 3H).	497.2
84		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.17 (t, J = 7.6 Hz, 2H), 7.01-6.95 (m, 2H), 6.72 (d, J = 7.6 Hz, 1H), 4.18 (d, J = 8.4 Hz, 1H), 4.11 (d, J = 7.2 Hz, 1H), 3.99 (d, J = 6.0 Hz, 1H), 3.81 (d, J = 8.6 Hz, 1H), 2.62-2.52 (m, 1H), 2.15-2.07 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.67 (s, 3H).	497.2
85		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.976 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.14 (t, J = 7.6 Hz, 2H), 7.01-6.95 (m, 2H), 6.72 (d, J = 7.6 Hz, 1H), 4.18 (d, J = 8.4 Hz, 1H), 4.10 (d, J = 7.2 Hz, 1H), 3.99 (d, J = 6.0 Hz, 1H), 3.81 (d, J = 8.6 Hz, 1H), 2.62-2.52 (m, 1H), 2.15-2.07 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.66 (s, 3H).	497.2
86		(6-(3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.57 (d, J = 8.8 Hz, 1H), 7.49 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.04 (s, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.88 (dd, J = 2.0, 8.8 Hz, 1H), 4.25 (s, 2H), 3.99 (d, J = 10.8 Hz, 2H), 3.58 (d, J = 10.8 Hz, 2H), 2.08 (s, 4H), 1.92 (s, 3H), 1.87 (s, 3H).	509.2
87		(6-(3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 2.8 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.57 (d, J = 8.8 Hz, 1H), 7.49 (s, 1H), 7.16 (d, J = 8.8 Hz, 1H), 7.04 (s, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.88 (dd, J = 1.6, 9.2 Hz, 1H), 4.25 (s, 2H), 3.99 (d, J	509.2

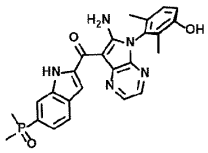
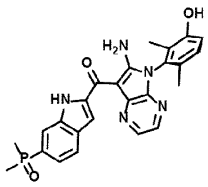
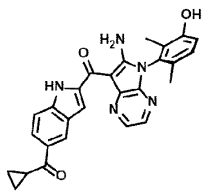
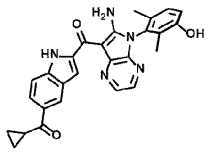
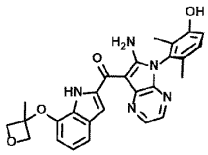
[493]

		닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	= 10.8 Hz, 2H), 3.58 (d, J = 10.8 Hz, 2H), 2.08 (s, 4H), 1.92 (s, 3H), 1.87 (s, 3H).	
88		(6-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.54 (d, J = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.76 (s, 1H), 6.68 (dd, J = 2.0, 8.8 Hz, 1H), 4.68 (d, J = 17.6 Hz, 2H), 4.01-3.88 (m, 2H), 3.72-3.65 (m, 1H), 3.23 (d, J = 9.6 Hz, 1H), 2.12-1.98 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	495.2
89		(6-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 3.2 Hz, 1H), 7.54 (d, J = 8.8 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.76 (s, 1H), 6.68 (dd, J = 2.0, 8.8 Hz, 1H), 4.68 (d, J = 18.0 Hz, 2H), 4.00-3.90 (m, 2H), 3.69 (d, J = 9.6 Hz, 1H), 3.23 (d, J = 9.6 Hz, 1H), 2.11-1.99 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	495.2
90		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 8.19 (d, J = 2.4 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.71 (d, J = 2.4 Hz, 1H), 7.66 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.98 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	429.2
91		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, J = 3.2 Hz, 1H), 8.09 (d, J = 2.4 Hz, 1H), 7.88 (d, J = 3.2 Hz, 1H), 7.61 (d, J = 2.0 Hz, 1H), 7.56 (s, 1H), 7.06 (d, J = 8.4 Hz, 1H), 6.88 (d, J = 8.4 Hz, 1H), 3.88 (s, 3H), 1.83 (s, 3H), 1.78 (s, 3H).	429.2
92		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.6 Hz, 1H), 8.01 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 2.6 Hz, 1H), 7.51 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.80 (d, J = 8.8 Hz, 1H), 3.98 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	429.2

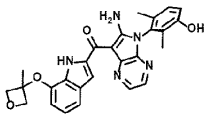
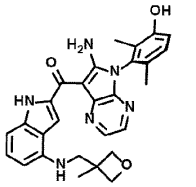
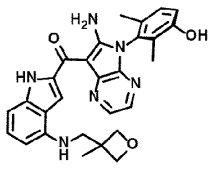
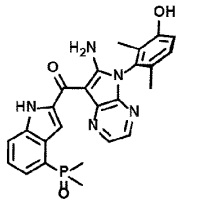
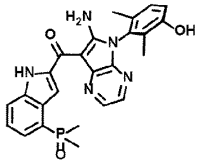
[494]

93		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.6 Hz, 1H), 8.01 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 2.6 Hz, 1H), 7.51 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.80 (d, J = 8.8 Hz, 1H), 3.98 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	429.2
94		(5-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-피롤로[3,2-b]피리딘-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.00 - 7.88 (m, 2H), 7.41 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.74 (d, J = 9.2 Hz, 1H), 4.92 (s, 1H), 4.72 (s, 1H), 3.92 (d, J = 2.4 Hz, 2H), 3.68 (d, J = 9.6 Hz, 1H), 3.44 (d, J = 9.6 Hz, 1H), 2.10-2.05 (m, 1H), 2.03-1.97 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	496.2
95		(5-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-피롤로[3,2-b]피리딘-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.99 - 7.92 (m, 2H), 7.41 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.74 (d, J = 9.2 Hz, 1H), 4.92 (s, 1H), 4.72 (s, 1H), 3.92 (d, J = 2.4 Hz, 2H), 3.68 (d, J = 9.6 Hz, 1H), 3.44 (d, J = 9.6 Hz, 1H), 2.10-2.05 (m, 1H), 2.02-1.98 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	496.2
96		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.14 (d, J = 8.4 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.70 (s, 1H), 7.50 (d, J = 8.4 Hz, 1H), 7.17 (d, J = 8.8 Hz, 1H), 6.99 (d, J = 8.8 Hz, 1H), 3.80 (s, 2H), 2.64-2.53 (m, 8H), 2.29 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	511.2
97		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.15 (d, J = 8.4 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.50 (d, J = 8.4 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.81 (s,	511.2

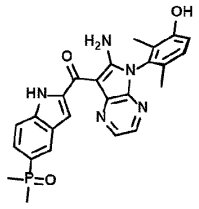
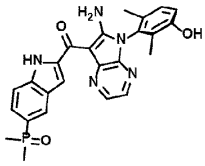
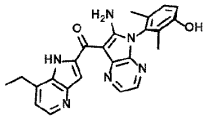
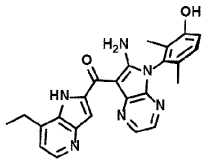
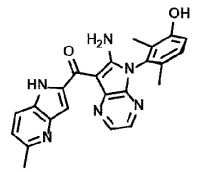
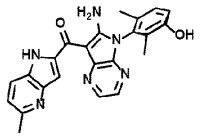
[495]

		틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	2H), 2.71-2.51 (m, 8H), 2.31 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	
98		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 3.2 Hz, 1H), 8.20 (d, J = 13.6 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.90 (dd, J = 2.8, 8.4 Hz, 1H), 7.62 (s, 1H), 7.52-7.42 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.88 (s, 3H), 1.86 (s, 3H)	474.2
99		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 3.2 Hz, 1H), 8.20 (d, J = 13.6 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.90 (dd, J = 2.8, 8.4 Hz, 1H), 7.62 (s, 1H), 7.52-7.42 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.88 (s, 3H), 1.86 (s, 3H)	474.2
100		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로페인카보닐)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.61 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.01 (dd, J = 1.6, 8.8 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.78-7.71 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.09-2.88 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.21-1.14 (m, 2H), 1.14-1.05 (m, 2H).	466.2
101		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로페인카보닐)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.61 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.01 (dd, J = 1.6, 8.8 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.78-7.71 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.09-2.88 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.21-1.14 (m, 2H), 1.14-1.05 (m, 2H).	466.2
102		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.08 (s, 1H), 9.72-9.60 (m, 1H), 8.28 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.36-7.30 (m, 2H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 2H), 6.44 (d, J = 7.6 Hz, 1H), 4.97 (d, J = 6.8 Hz, 2H), 4.75 (d, J = 6.8 Hz, 2H), 1.83 (s, 3H), 1.81 (s, 3H), 1.76 (s, 3H).	484.2

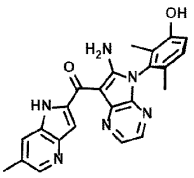
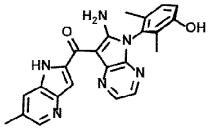
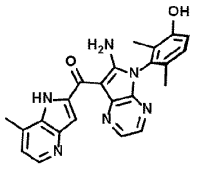
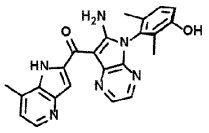
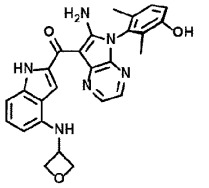
[496]

103		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.08 (s, 1H), 9.68 (d, J = 3.2 Hz, 1H), 8.28 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.37-7.31 (m, 2H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.0 Hz, 2H), 6.44 (d, J = 7.6 Hz, 1H), 4.97 (d, J = 6.8 Hz, 2H), 4.75 (d, J = 6.8 Hz, 2H), 1.83 (s, 3H), 1.81 (s, 3H), 1.76 (s, 3H).	484.2
104		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.68 (s, 1H), 7.20-7.10 (m, 2H), 6.96 (dd, J = 8.4, 16.0 Hz, 2H), 6.23 (d, J = 7.6 Hz, 1H), 4.71 (d, J = 5.6 Hz, 2H), 4.43 (d, J = 5.6 Hz, 2H), 3.49 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H).	497.2
105		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.67 (s, 1H), 7.18-7.12 (m, 2H), 6.96 (dd, J = 8.4, 16.0 Hz, 2H), 6.23 (d, J = 7.6 Hz, 1H), 4.71 (d, J = 5.6 Hz, 2H), 4.43 (d, J = 5.6 Hz, 2H), 3.49 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H).	497.2
106		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.97-7.92 (m, 2H), 7.63 (dd, J = 7.2, 13.6 Hz, 1H), 7.51-7.43 (m, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 1.99 (s, 3H), 1.95 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	474.2
107		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.97-7.91 (m, 2H), 7.63 (dd, J = 7.2, 14.0 Hz, 1H), 7.54-7.43 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 1.99 (s, 3H), 1.96 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	474.2

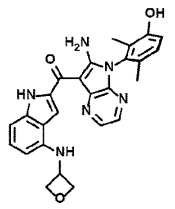
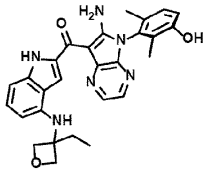
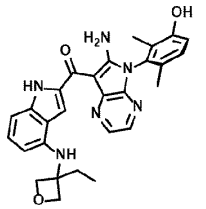
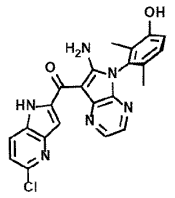
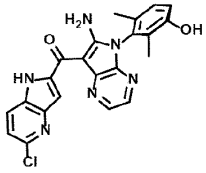
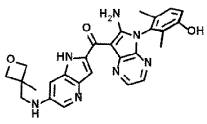
[497]

108		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.96 (s, 1H), 9.69 (s, 1H), 9.04-8.54 (m, 2H), 8.42 (d, J = 2.4 Hz, 1H), 8.20 (d, J = 12.4 Hz, 1H), 8.04 (s, 1H), 7.99 (d, J = 2.4 Hz, 1H), 7.81 (d, J = 8.4 Hz, 1H), 7.65 (t, J = 9.2 Hz, 1H), 7.13 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.70 (s, 3H), 1.67 (s, 3H).	474.2
109		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸포스포릴)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.96 (s, 1H), 9.70 (s, 1H), 9.07-8.50 (m, 2H), 8.42 (d, J = 2.8 Hz, 1H), 8.19 (d, J = 12.4 Hz, 1H), 8.03 (s, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.81 (d, J = 7.6 Hz, 1H), 7.64 (t, J = 9.2 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.70 (s, 3H), 1.67 (s, 3H).	474.2
110		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-에틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.6 Hz, 2H), 8.06 (d, J = 2.8 Hz, 1H), 7.58 (s, 1H), 7.25 (d, J = 4.8 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.03 (d, J = 8.4 Hz, 1H), 3.25 (q, J = 7.6 Hz, 2H), 1.96 (s, 3H), 1.91 (s, 3H), 1.62 (t, J = 7.6 Hz, 3H).	427.2
111		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-에틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.6 Hz, 2H), 8.06 (d, J = 2.8 Hz, 1H), 7.58 (s, 1H), 7.25 (d, J = 4.8 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.03 (d, J = 8.4 Hz, 1H), 3.25 (q, J = 7.6 Hz, 2H), 1.96 (s, 3H), 1.91 (s, 3H), 1.62 (t, J = 7.6 Hz, 3H).	427.2
112		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.07 (d, J = 8.4 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.62 (s, 1H), 7.25 (d, J = 8.4 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.66 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	413.2
113		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.06 (d, J = 8.4 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.62 (s, 1H), 7.25 (d, J = 8.4 Hz, 1H), 7.17 (d, J = 8.4	413.2

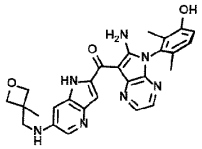
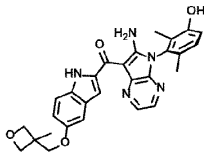
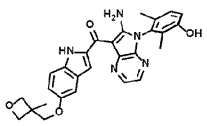
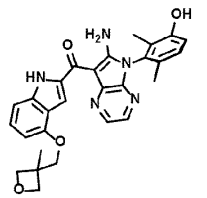
[498]

		1H-피롤로[3,2-b]피리딘-2-일)메탄온	Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 2.65 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	
114		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.34 (d, J = 1.6 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.98 (s, 1H), 7.68 (s, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.56 (s, 3H), 1.94 (s, 3H), 1.90 (s, 3H).	413.2
115		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.34 (d, J = 1.6 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.98 (s, 1H), 7.68 (s, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.56 (s, 3H), 1.94 (s, 3H), 1.90 (s, 3H).	413.2
116		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.34 (d, J = 4.8 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.54 (s, 1H), 7.23 (d, J = 4.8 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.83 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	413.2
117		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.34 (d, J = 4.8 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.54 (s, 1H), 7.23 (d, J = 4.8 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.83 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	413.2
118		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(옥세탄-3-일아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 2.8 Hz, 1H), 7.96 (d, J = 2.8 Hz, 1H), 7.67 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.14-7.09 (m, 1H), 6.99 (t, J = 8.0 Hz, 2H), 5.93 (d, J = 7.6 Hz, 1H), 5.08 (t, J = 6.4 Hz, 2H), 4.80 (d, J = 6.4 Hz, 1H), 4.76 -4.70 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	469.2

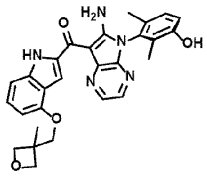
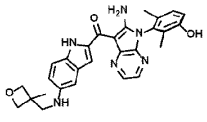
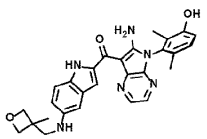
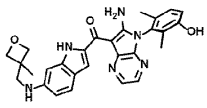
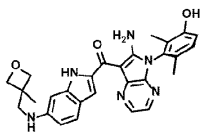
[499]

119		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(옥세탄-3-일아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 2.8 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.67 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.14-7.09 (m, 1H), 6.99 (t, *J* = 8.0 Hz, 2H), 5.93 (d, *J* = 7.6 Hz, 1H), 5.08 (t, *J* = 6.4 Hz, 2H), 4.80 (d, *J* = 6.4 Hz, 1H), 4.76 -4.70 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	469.2
120		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-에틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 3.2 Hz, 1H), 7.65 (d, *J* = 0.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.08 (s, 1H), 7.01-6.93 (m, 2H), 5.71 (d, *J* = 7.6 Hz, 1H), 4.90 (d, *J* = 6.0 Hz, 2H), 4.68 (d, *J* = 6.0 Hz, 2H), 2.24 (q, *J* = 7.2 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 0.93 (t, *J* = 7.2 Hz, 3H).	497.2
121		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-에틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 3.2 Hz, 1H), 7.65 (d, *J* = 0.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.08 (s, 1H), 7.01-6.93 (m, 2H), 5.71 (d, *J* = 7.6 Hz, 1H), 4.90 (d, *J* = 6.0 Hz, 2H), 4.68 (d, *J* = 6.0 Hz, 2H), 2.24 (q, *J* = 7.2 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 0.93 (t, *J* = 7.2 Hz, 3H).	497.2
122		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.17 (d, *J* = 8.8 Hz, 1H), 7.99 (d, *J* = 2.8 Hz, 1H), 7.60 (s, 1H), 7.33 (d, *J* = 8.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	433.1
123		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.16 (d, *J* = 8.8 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.59 (s, 1H), 7.32 (d, *J* = 8.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	433.1
124		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.12 (d, *J* = 1.2 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.62 (s, 1H), 7.24 (d, *J* = 1.2 Hz, 1H), 7.16 (d, *J* = 8.4	498.2

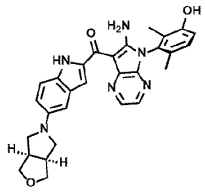
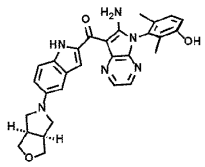
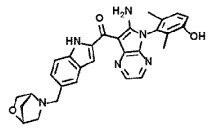
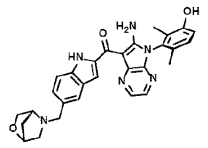
[500]

		b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 4.65 (d, J = 6.0 Hz, 2H), 4.48 (d, J = 6.0 Hz, 2H), 3.45 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.48 (s, 3H).	
125		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.11 (d, J = 2.4 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.23 (d, J = 1.6 Hz, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.65 (d, J = 6.0 Hz, 2H), 4.48 (d, J = 6.0 Hz, 2H), 3.45 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.48 (s, 3H).	498.2
126		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.57 (d, J = 9.2 Hz, 1H), 7.46 (s, 1H), 7.23 (d, J = 2.0 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.05 (dd, J = 2.4, 8.8 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.73 (d, J = 6.0 Hz, 2H), 4.48 (d, J = 6.0 Hz, 2H), 4.09 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H).	498.2
127		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.57 (d, J = 8.8 Hz, 1H), 7.46 (s, 1H), 7.23 (d, J = 2.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.05 (dd, J = 2.4, 8.8 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.73 (d, J = 6.0 Hz, 2H), 4.48 (d, J = 6.0 Hz, 2H), 4.09 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H).	498.2
128		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.65 (s, 1H), 7.28-7.21 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.61 (dd, J = 2.4, 6.0 Hz, 1H), 4.79 (d, J = 6.0 Hz, 2H), 4.53 (d, J = 6.0 Hz, 2H), 4.23 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.55 (s, 3H).	498.2

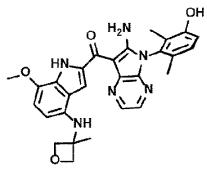
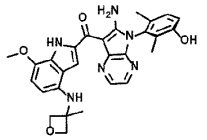
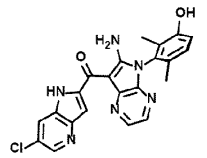
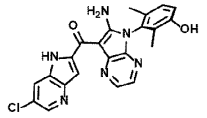
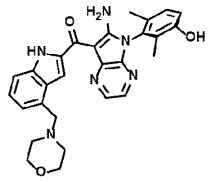
[501]

129		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.65 (s, 1H), 7.29-7.21 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.61 (dd, J = 2.0, 6.0 Hz, 1H), 4.79 (d, J = 6.0 Hz, 2H), 4.52 (d, J = 6.0 Hz, 2H), 4.23 (s, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.55 (s, 3H).	498.2
130		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.46 (d, J = 8.8 Hz, 1H), 7.34 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.95 (dd, J = 2.4, 8.8 Hz, 1H), 6.89 (d, J = 2.4 Hz, 1H), 4.64 (d, J = 6.0 Hz, 2H), 4.43 (d, J = 6.0 Hz, 2H), 3.36 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.46 (s, 3H).	497.2
131		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.46 (d, J = 8.8 Hz, 1H), 7.34 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.95 (dd, J = 2.0, 8.8 Hz, 1H), 6.89 (d, J = 2.0 Hz, 1H), 4.64 (d, J = 6.0 Hz, 2H), 4.43 (d, J = 6.0 Hz, 2H), 3.36 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.46 (s, 3H).	497.2
132		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.93 (d, J = 3.2 Hz, 1H), 7.46 (s, 1H), 7.44 (d, J = 8.8 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.75 (d, J = 2.0 Hz, 1H), 6.68 (dd, J = 2.0, 8.8 Hz, 1H), 4.65 (d, J = 6.0 Hz, 2H), 4.46 (d, J = 6.0 Hz, 2H), 3.43 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.47 (s, 3H).	497.2
133		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.93 (d, J = 3.2 Hz, 1H), 7.59 (s, 1H), 7.43 (d, J = 8.8 Hz, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.75 (d, J = 2.0 Hz, 1H), 6.68	497.2

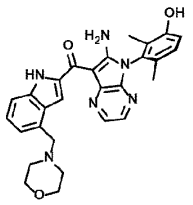
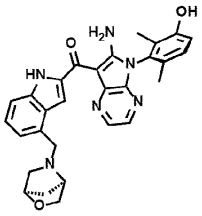
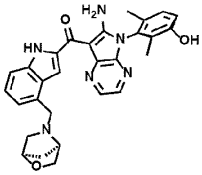
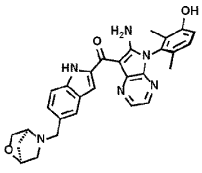
[502]

		아미노)-1H-인돌-2-일)메탄온	(dd, J = 2.0, 8.8 Hz, 1H), 4.65 (d, J = 6.0 Hz, 2H), 4.46 (d, J = 6.0 Hz, 2H), 3.43 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.47 (s, 3H).	
134		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.53 (d, J = 9.2 Hz, 1H), 7.39 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.05 (dd, J = 2.0, 9.2 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.95 (d, J = 2.0 Hz, 1H), 4.00-3.96 (m, 2H), 3.70 (dd, J = 3.2, 9.2 Hz, 2H), 3.42-3.38 (m, 2H), 3.24 (dd, J = 3.2, 9.2 Hz, 2H), 3.09-3.05 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	509.2
135		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.53 (d, J = 8.8 Hz, 1H), 7.39 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.04 (dd, J = 2.0, 8.8 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.95 (d, J = 2.0 Hz, 1H), 4.00-3.96 (m, 2H), 3.70 (dd, J = 3.2, 9.2 Hz, 2H), 3.42-3.78 (m, 2H), 3.24 (dd, J = 3.2, 9.2 Hz, 2H), 3.08-3.04 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H).	509.2
136		(5-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.84 (s, 1H), 9.69 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.80 (s, 1H), 7.68-7.54 (m, 2H), 7.31 (d, J = 9.2 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 4.37 (s, 1H), 3.98 (d, J = 7.6 Hz, 1H), 3.88-3.75 (m, 2H), 3.58-3.52 (m, 1H), 3.49 (s, 1H), 2.78 (d, J = 9.6 Hz, 1H), 2.47 (s, 1H), 1.83 (s, 4H), 1.76 (s, 3H), 1.61 (d, J = 8.8 Hz, 1H).	509.2
137		(5-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.84 (s, 1H), 9.69 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.80 (s, 1H), 7.68-7.54 (m, 2H), 7.31 (d, J = 9.2 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 4.37 (s, 1H), 3.98 (d,	509.2

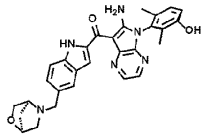
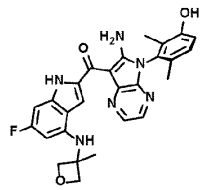
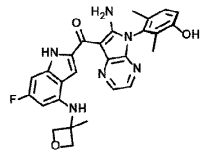
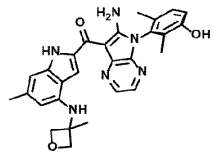
[503]

		-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	J = 7.6 Hz, 1H), 3.88-3.75 (m, 2H), 3.58-3.52 (m, 1H), 3.49 (s, 1H), 2.78 (d, J = 9.6 Hz, 1H), 2.47 (s, 1H), 1.83 (s, 4H), 1.76 (s, 3H), 1.61 (d, J = 8.8 Hz, 1H).	
138		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.65 (d, J = 3.2 Hz, 1H), 8.25 (d, J = 3.2 Hz, 1H), 7.82 (s, 1H), 7.45 (d, J = 8.4 Hz, 1H), 7.27 (d, J = 8.4 Hz, 1H), 6.92 (d, J = 8.0 Hz, 1H), 6.04 (d, J = 8.0 Hz, 1H), 5.22 (d, J = 6.0 Hz, 2H), 4.92 (d, J = 6.0 Hz, 2H), 4.32 (s, 3H), 2.22 (s, 3H), 2.17 (s, 3H), 2.04 (s, 3H).	513.2
139		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.63 (d, J = 2.8 Hz, 1H), 8.24 (d, J = 3.2 Hz, 1H), 7.80 (s, 1H), 7.44 (d, J = 8.4 Hz, 1H), 7.25 (d, J = 8.4 Hz, 1H), 6.90 (d, J = 8.0 Hz, 1H), 6.02 (d, J = 8.0 Hz, 1H), 5.21 (d, J = 6.0 Hz, 2H), 4.90 (d, J = 6.0 Hz, 2H), 4.30 (s, 3H), 2.20 (s, 3H), 2.15 (s, 3H), 2.02 (s, 3H).	513.2
140		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34-8.29 (m, 2H), 8.17 (d, J = 1.2 Hz, 1H), 7.89 (d, J = 2.8 Hz, 1H), 7.62 (s, 1H), 7.07 (d, J = 8.4 Hz, 1H), 6.88 (d, J = 8.4 Hz, 1H), 1.83 (s, 3H), 1.78 (s, 3H).	433.1
141		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45-8.39 (m, 2H), 8.29 (d, J = 1.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.73 (d, J = 0.8 Hz, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	433.1
142		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.79 (d, J = 0.6 Hz, 1H), 7.61 (d, J = 8.4 Hz, 1H), 7.34-7.25 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.11 (d, J = 7.2 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.93 (s, 2H), 3.73 (t,	497.2

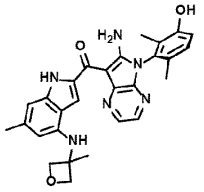
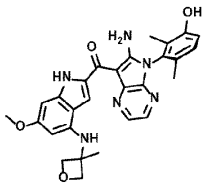
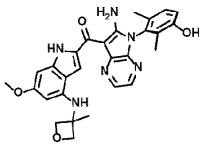
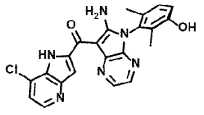
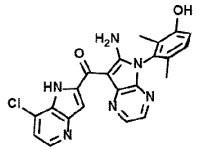
[504]

			J = 4.8 Hz, 4H), 2.63 (s, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	
143		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.78 (s, 1H), 7.59 (d, J = 8.4 Hz, 1H), 7.35-7.23 (m, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.10 (d, J = 7.2 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.87 (s, 2H), 3.71 (t, J = 4.8 Hz, 4H), 2.57 (s, 4H), 1.92 (s, 3H), 1.88 (s, 3H).	497.2
144		(4-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.94 (s, 1H), 9.69 (s, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.03-7.96 (m, 2H), 7.57 (d, J = 8.4 Hz, 1H), 7.23 (t, J = 7.6 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.07 (d, J = 7.2 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.38 (s, 1H), 4.13-3.95 (m, 3H), 3.55 (d, J = 7.2 Hz, 1H), 3.52 (s, 1H), 2.81 (d, J = 9.2 Hz, 1H), 2.53 (d, J = 10.0 Hz, 1H), 1.87 (d, J = 9.2 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.61 (d, J = 9.2 Hz, 1H).	509.2
145		(4-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	1H NMR (400 MHz, DMSO-d_6): δ 13.94 (s, 1H), 9.69 (s, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.03-7.96 (m, 2H), 7.57 (d, J = 8.4 Hz, 1H), 7.23 (t, J = 7.6 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.07 (d, J = 7.2 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.38 (s, 1H), 4.13-3.95 (m, 3H), 3.55 (d, J = 7.2 Hz, 1H), 3.52 (s, 1H), 2.81 (d, J = 9.2 Hz, 1H), 2.53 (d, J = 10.0 Hz, 1H), 1.87 (d, J = 9.2 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.61 (d, J = 9.2 Hz, 1H).	509.2
146		(5-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.70 (s, 1H), 7.64 (d, J = 8.4 Hz, 1H), 7.54 (s, 1H), 7.39 (d, J = 8.4 Hz, 1H), 7.17 (d, J = 8.8 Hz, 1H), 6.98 (d, J = 8.8 Hz, 1H), 4.46 (s, 1H), 4.16 (d, J = 7.2 Hz, 1H), 3.94-3.86 (m, 2H), 3.65 (d, J = 7.2 Hz, 1H), 3.59 (s, 1H), 2.92 (d, J = 10.8	509.2

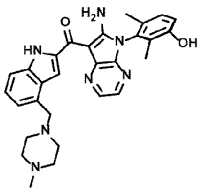
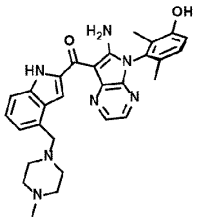
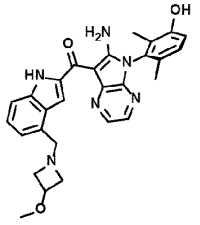
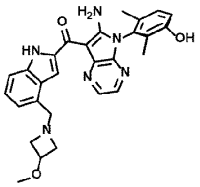
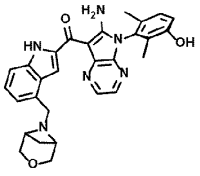
[505]

		5H-피롤로[2,3-b]피라진-7-일)메탄온	Hz, 1H), 2.73 (d, J = 10.8 Hz, 1H), 2.00 (d, J = 11.2 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.76 (d, J = 11.2 Hz, 1H).	
147		(5-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.70 (s, 1H), 7.64 (d, J = 8.8 Hz, 1H), 7.54 (s, 1H), 7.39 (d, J = 8.8 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.46 (s, 1H), 4.16 (d, J = 8.0 Hz, 1H), 3.95-3.86 (m, 2H), 3.65 (d, J = 8.0 Hz, 1H), 3.59 (s, 1H), 2.92 (d, J = 10.4 Hz, 1H), 2.73 (d, J = 10.4 Hz, 1H), 2.00 (d, J = 10.0 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.76 (d, J = 10.0 Hz, 1H).	509.2
148		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 4.0 Hz, 1H), 7.94 (d, J = 4.0 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.64 (d, J = 8.0 Hz, 1H), 5.53 (dd, J = 12.0, 4.0 Hz, 1H), 4.94 (d, J = 8.0 Hz, 2 H), 4.65 (d, J = 8.0 Hz, 2H), 1.92 (s, 3 H), 1.87 (s, 3H), 1.77 (s, 3H).	501.2
149		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 4.0 Hz, 1H), 7.94 (d, J=4.0 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J=8.0 Hz, 1H) 6.64 (d, J = 8.0 Hz, 1H), 5.53 (dd, J = 12.0, 4.0 Hz, 1H), 4.94 (d, J = 8.0 Hz, 2H), 4.65 (d, J = 8.0 Hz, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.77 (s, 3H).	501.2
150		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 2.8 Hz, 1H), 7.94 (d, J = 2.8 Hz, 1H), 7.56 (s, 1H), 7.15 (d, J = 8.4 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.78 (s, 1H), 5.60 (s, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.66 (d, J = 6.0 Hz, 2H), 2.39 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.77 (s, 3H).	497.2

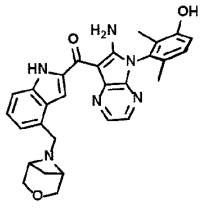
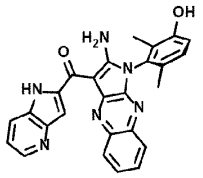
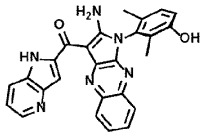
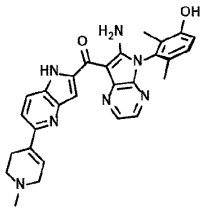
[506]

151		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 2.8 Hz, 1H), 7.94 (d, J = 2.8 Hz, 1H), 7.56 (s, 1H), 7.15 (d, J = 8.4 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.78 (s, 1H), 5.60 (s, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.66 (d, J = 6.0 Hz, 2H), 2.39 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.77 (s, 3H).	497.2
152		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.59 (s, 1H), 7.19 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.4 Hz, 1H), 6.52 (s, 1H), 5.42 (d, J = 1.6 Hz, 1H), 4.96 (d, J = 6.0 Hz, 2H), 4.67 (d, J = 6.0 Hz, 2H), 3.89 (s, 3H), 1.95 (s, 3H), 1.90 (s, 3H), 1.79 (s, 3H).	513.2
153		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.70 (d, J = 2.8 Hz, 1H), 8.23 (d, J = 3.2 Hz, 1H), 7.85 (s, 1H), 7.45 (d, J = 8.4 Hz, 1H), 7.27 (d, J = 8.4 Hz, 1H), 6.78 (s, 1H), 5.67 (s, 1H), 5.22 (d, J = 6.0 Hz, 2H), 4.93 (d, J = 6.0 Hz, 2H), 4.15 (s, 3H), 2.21 (s, 3H), 2.16 (s, 3H), 2.05 (s, 3H).	513.2
154		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 5.2 Hz, 1H), 8.40 (d, J = 3.2 Hz, 1H), 8.05 (d, J = 3.2 Hz, 1H), 7.60 (s, 1H), 7.48 (d, J = 5.2 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.02 (d, J = 8.4 Hz, 1H), 1.97 (s, 3H), 1.92 (s, 3H).	433.1
155		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 5.2 Hz, 1H), 8.40 (d, J = 3.2 Hz, 1H), 8.05 (d, J = 3.2 Hz, 1H), 7.60 (s, 1H), 7.48 (d, J = 5.2 Hz, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.02 (d, J = 8.4 Hz, 1H), 1.97 (s, 3H), 1.92 (s, 3H).	433.1

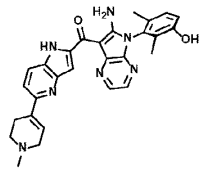
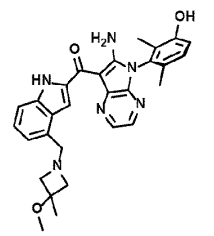
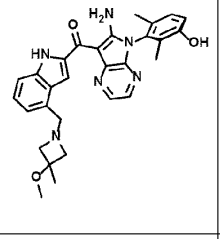
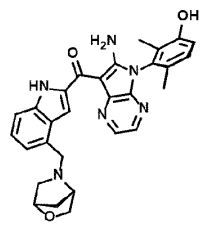
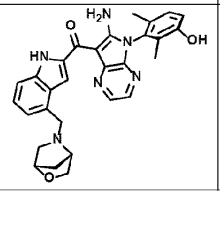
[507]

156		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.78 (d, J = 0.8 Hz, 1H), 7.59 (d, J = 8.4 Hz, 1H), 7.29 (dd, J = 7.2, 8.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.09 (d, J = 6.8 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.90 (s, 2H), 2.79-2.33 (m, 8H), 2.27 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	510.3
157		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.47 (s, 2H), 8.42 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.79 (s, 1H), 7.64 (d, J = 8.4 Hz, 1H), 7.34 - 7.28 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.10 (d, J = 6.8 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.01 (s, 2H), 3.18-3.01 (m, 4H), 2.99-2.73 (m, 4H), 2.71 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	510.3
158		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.59 (d, J = 8.4 Hz, 1H), 7.30 (t, J = 7.6 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.05 (d, J = 7.2 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.06 (t, J = 5.6 Hz, 1H), 4.03 (s, 2H), 3.69-3.63 (m, 2H), 3.25 (s, 3H), 3.19-3.13 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	497.2
159		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.59 (d, J = 8.4 Hz, 1H), 7.30 (t, J = 7.6 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.05 (d, J = 7.2 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.07 (t, J = 5.6 Hz, 1H), 4.03 (s, 2H), 3.69-3.63 (m, 2H), 3.25 (s, 3H), 3.19-3.13 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	497.2
160		(4-((3-옥사-6-아자바이사이클로[3.1.1]헵탄-6-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.80 (s, 1H), 7.63 (d, J = 8.4 Hz, 1H), 7.33 (t, J = 8.0 Hz, 1H), 7.20-7.15 (m, 2H), 6.99 (d, J = 8.4 Hz, 1H), 4.44 (d, J = 11.2 Hz, 4H), 3.95-3.87 (m, 2H), 3.87-	509.2

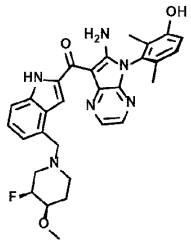
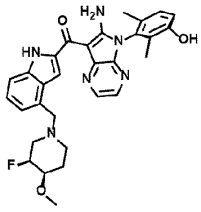
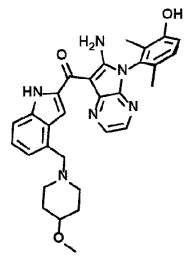
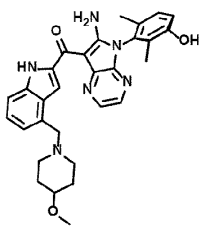
[508]

		틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	3.72 (m, 2H), 2.11-1.89 (m, 5H), 1.88 (s, 3H).	
161		(4-((3-옥사-6-아자바이사이클로[3.1.1]헵탄-6-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.80 (s, 1H), 7.62 (d, *J* = 8.2 Hz, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.17 (dd, *J* = 4.4, 7.6 Hz, 2H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.44 (d, *J* = 11.2 Hz, 4H), 3.88 (d, *J* = 9.2 Hz, 2H), 3.84-3.67 (m, 2H), 2.11-1.90 (m, 5H), 1.88 (s, 3H).	509.2
162		(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]퀴녹살린-3-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (s, 1H), 10.16-9.52 (m, 2H), 9.00-8.42 (m, 2H), 8.30 (d, *J* = 7.2 Hz, 2H), 7.95-7.79 (m, 2H), 7.71 (t, *J* = 7.2 Hz, 1H), 7.63-7.54 (m, 1H), 7.39-7.30 (m, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.03 (d, *J* = 8.4 Hz, 1H), 1.90 (s, 3H), 1.83 (s, 3H)	449.1
163		(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]퀴녹살린-3-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.79 (s, 1H), 9.88 (s, 1H), 9.76 (s, 1H), 8.75-8.65 (m, 1H), 8.51 (d, *J* = 4.0 Hz, 1H), 8.38-8.27 (m, 2H), 7.98-7.82 (m, 2H), 7.73 (t, *J* = 7.2 Hz, 1H), 7.68-7.57 (m, 1H), 7.40-7.28 (m, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 7.05 (d, *J* = 8.4 Hz, 1H), 1.91 (s, 3H), 1.84 (s, 3H)	449.1
164		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.53 (s, 1H), 8.43 (d, *J* = 2.8 Hz, 1H), 8.16 (d, *J* = 8.8 Hz, 1H), 8.01 (d, *J* = 2.8 Hz, 1H), 7.76 (s, 1H), 7.66 (d, *J* = 8.8 Hz, 1H), 7.20 (d, *J* = 8.4 Hz, 1H), 7.02 (d, *J* = 8.4 Hz, 1H), 6.58 (s, 1H), 3.87 (s, 2H), 3.44 (t, *J* = 5.6 Hz, 2H), 3.11 (s, 2H), 2.94 (s, 3H), 1.96 (s, 3H), 1.91 (s, 3H).	494.2

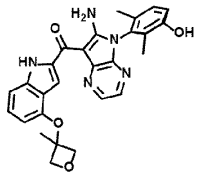
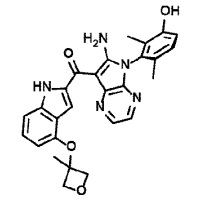
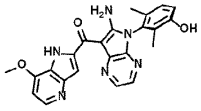
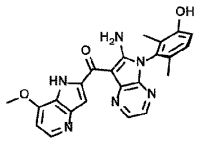
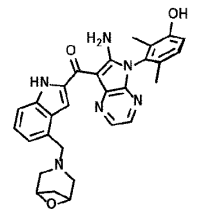
[509]

165		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.82 (d, *J* = 2.8 Hz, 1H), 8.52 (d, *J* = 8.8 Hz, 1H), 8.39 (d, *J* = 3.2 Hz, 1H), 8.14 (s, 1H), 8.02 (d, *J* = 8.8 Hz, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.39 (d, *J* = 8.4 Hz, 1H), 6.97 (s, 1H), 3.88 (s, 2H), 3.43 (d, *J* = 5.2 Hz, 2H), 3.36 (s, 2H), 3.03 (s, 3H), 2.34 (s, 3H), 2.29 (s, 3H).	494.2
166		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시-3-메틸아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.72 (s, 1H), 7.59 (d, *J* = 8.4 Hz, 1H), 7.31 (t, *J* = 8.0 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.07 (d, *J* = 6.8 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.08 (s, 2H), 3.34 (s, 4H), 3.20 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H).	511.2
167		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시-3-메틸아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.1 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.72 (s, 1H), 7.61 (d, *J* = 8.6 Hz, 1H), 7.36 - 7.26 (m, 1H), 7.16 (d, *J* = 8.2 Hz, 1H), 7.09 (d, *J* = 7.1 Hz, 1H), 6.98 (d, *J* = 8.3 Hz, 1H), 4.13 (s, 2H), 3.40 (s, 4H), 3.21 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H).	511.2
168		(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.80 (s, 1H), 7.60 (d, *J* = 8.4 Hz, 1H), 7.31 (t, *J* = 7.2 Hz, 1H), 7.17 (d, *J* = 7.2 Hz, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.48 (s, 1H), 4.23-4.14 (m, 3H), 3.68-3.66 (m, 2H), 2.99 (d, *J* = 10.8 Hz, 1H), 2.83 (d, *J* = 10.8 Hz, 1H), 2.08 (d, *J* = 10.4 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.79 (d, *J* = 10.4 Hz, 1H).	509.2
169		(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.81 (s, 1H), 7.62 (d, *J* = 8.4 Hz, 1H), 7.33 (t, *J* = 7.2 Hz, 1H), 7.19 (d, *J* = 7.2 Hz, 2H), 7.00 (d, *J* = 8.4 Hz, 1H), 4.50 (s,	509.2

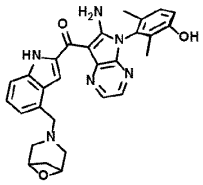
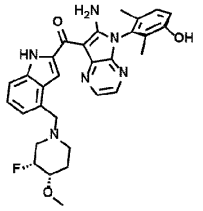
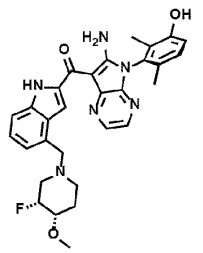
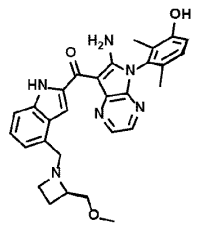
[510]

		시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	1H), 4.25-4.15 (m, 3H), 3.70-3.68 (s, 2H), 3.00 (d, J = 10.4 Hz, 1H), 2.84 (d, J = 10.4 Hz, 1H), 2.09 (d, J = 11.2 Hz, 1H), 1.95 (s, 3H), 1.90 (s, 3H), 1.81 (d, J = 11.2 Hz, 1H).	
170		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3S,4R)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.03 (s, 1H), 8.39 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.95 (s, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.24 (t, J = 7.6 Hz, 1H), 7.11 (d, J = 8.4 Hz, 1H), 7.04-6.97 (m, 2H), 4.88-4.66 (m, 1H), 3.87-3.78 (m, 2H), 3.50-3.28 (m, 3H), 2.94 (s, 1H), 2.67 (s, 1H), 2.54-2.17 (m, 4H), 1.82 (s, 3H), 1.77-1.62 (m, 5H).	543.2
171		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3S,4R)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.03 (s, 1H), 8.39 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.95 (s, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.24 (t, J = 7.6 Hz, 1H), 7.11 (d, J = 8.4 Hz, 1H), 7.04-6.97 (m, 2H), 4.88-4.66 (m, 1H), 3.87-3.78 (m, 2H), 3.50-3.28 (m, 3H), 2.94 (s, 1H), 2.67 (s, 1H), 2.54-2.17 (m, 4H), 1.82 (s, 3H), 1.77-1.62 (m, 5H)	543.2
172		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.77 (s, 1H), 7.61 (d, J = 8.4 Hz, 1H), 7.32 (t, J = 7.6 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.13 (d, J = 7.2 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.93 (s, 2H), 3.33 (s, 3H), 3.30-3.29 (m, 1H), 3.02 - 2.80 (m, 2H), 2.49-2.31 (m, 2H), 1.93 (s, 5H), 1.88 (s, 3H), 1.68-1.58 (m, 2H).	525.3
173		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.77 (s, 1H), 7.64 (d, J = 8.4 Hz, 1H), 7.33 (t, J = 7.6 Hz, 1H), 7.16 (t, J = 7.2 Hz, 2H), 6.98 (d, J = 8.4 Hz, 1H), 4.03 (s, 2H), 3.33 (s, 3H), 3.30-3.30 (m, 1H), 3.10 -2.89 (m, 2H), 2.63-2.42 (m, 2H), 1.93 (s, 5H), 1.88 (s, 3H), 1.73-1.62 (m, 2H).	525.3

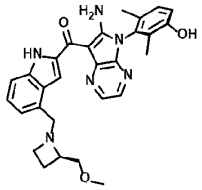
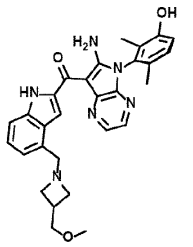
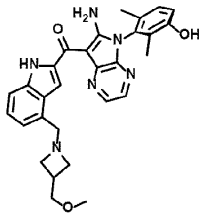
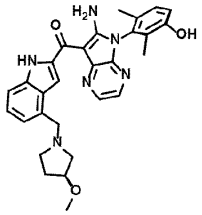
[511]

174		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 2.8 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.59 (s, 1H), 7.32-7.24 (m, 1H), 7.21-7.13 (m, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.08 (d, *J* = 7.6 Hz, 1H), 5.03 (d, *J* = 6.8 Hz, 2H), 4.71 (d, *J* = 6.8 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.85 (s, 3H).	484.2
175		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.59 (s, 1H), 7.31-7.24 (m, 1H), 7.22-7.14 (m, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.08 (d, *J* = 7.6 Hz, 1H), 5.03 (d, *J* = 6.8 Hz, 2H), 4.71 (d, *J* = 6.8 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.85 (s, 3H).	484.2
176		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.58 (d, *J* = 6.4 Hz, 1H), 8.37 (d, *J* = 3.2 Hz, 1H), 8.05 (d, *J* = 3.2 Hz, 1H), 7.57 (s, 1H), 7.35 (d, *J* = 6.4 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 4.42 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	429.2
177		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.47 (d, *J* = 6.4 Hz, 1H), 8.34 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 3.2 Hz, 1H), 7.52 (s, 1H), 7.18 (d, *J* = 6.4 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.32 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	429.2
178		(4-((6-옥사-3-아자바이사이클로[3.1.1]헵탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.84 (s, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.30-7.26 (m, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.11 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.53 (d, *J* = 7.2 Hz, 2H), 4.11 (s, 2H), 3.14 (d, *J* = 11.2 Hz, 2H), 3.01-2.96 (m, 1H), 2.88 (d, *J* = 11.2 Hz, 2H), 2.50 (d, *J* = 7.2 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	509.2

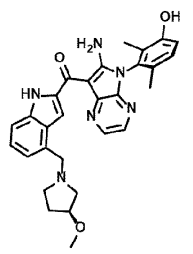
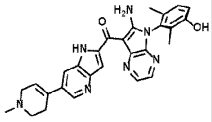
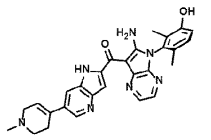
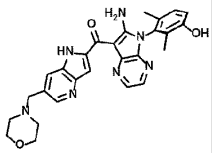
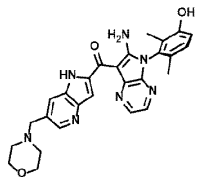
[512]

179		(4-((6-옥사-3-아자바이사이클로[3.1.1]헵탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.84 (s, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.30-7.26 (m, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.11 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.52 (d, *J* = 7.2 Hz, 2H), 4.12 (s, 2H), 3.15 (d, *J* = 12.0 Hz, 2H), 3.01-2.96 (m, 1H), 2.89 (d, *J* = 12.0 Hz, 2H), 2.49 (d, *J* = 7.2 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	509.2
180		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3R,4S)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.77-7.66 (m, 2H), 7.37 (d, *J* = 8.4 Hz, 1H), 7.17 (d, *J* = 8.0 Hz, 2H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.91-4.89 (m, 1H), 4.78 (d, *J* = 4.0 Hz, 1H), 4.14 (s, 2H), 3.53-3.43 (m, 1H), 3.40 (s, 3H), 3.26-3.13 (m, 1H), 3.00 (d, *J* = 2.0 Hz, 1H), 2.88-2.71 (m, 1H), 2.70-2.56 (m, 1H), 2.04-1.95 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	543.2
181		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3R,4S)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOH): δ 8.43 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.84-7.74 (m, 2H), 7.42 (d, *J* = 8.4 Hz, 1H), 7.29 (d, *J* = 7.2 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.01 (d, *J* = 8.4 Hz, 1H), 4.93 (d, *J* = 2.0 Hz, 1H), 4.49 (s, 2H), 3.65-3.47 (m, 2H), 3.43 (s, 3H), 3.37 (s, 1H), 3.25-3.11 (m, 1H), 3.09-2.95 (m, 1H), 2.18-1.97 (m, 2H), 1.95 (s, 3H), 1.90 (s, 3H).	543.2
182		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 3.2 Hz, 1H), 7.73 (s, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.28 (t, *J* = 7.6 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.06 (d, *J* = 7.2 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 4.16 (d, *J* = 12.8 Hz, 1H), 3.90 (d, *J* = 12.8 Hz, 1H), 3.66-3.55 (m, 1H), 3.39-3.32 (m, 2H), 3.31 (s, 4H), 3.18-3.02 (m, 1H), 2.09-1.91 (m, 5H), 1.88 (s, 3H).	511.2

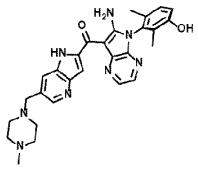
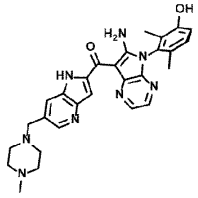
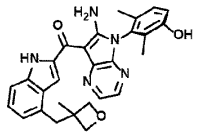
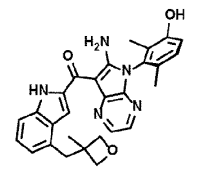
[513]

183		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 3.2 Hz, 1H), 7.73 (s, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.28 (t, *J* = 7.6 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.06 (d, *J* = 7.2 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 4.16 (d, *J* = 12.8 Hz, 1H), 3.90 (d, *J* = 12.8 Hz, 1H), 3.66-3.55 (m, 1H), 3.39-3.32 (m, 2H), 3.31 (s, 4H), 3.18-3.02 (m, 1H), 2.09-1.91 (m, 5H), 1.88 (s, 3H).	511.2
184		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 2.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.71 (s, 1H), 7.61 (d, *J* = 8.4 Hz, 1H), 7.31 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.07 (d, *J* = 7.2 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.10 (s, 2H), 3.60 (t, *J* = 8.0 Hz, 2H), 3.52 (d, *J* = 6.0 Hz, 2H), 3.37 (s, 3H), 3.30-3.27 (m, 2H), 2.85-2.74 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	511.2
185		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.72 (s, 1H), 7.66 (d, *J* = 8.4 Hz, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.11 (d, *J* = 7.2 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.24 (s, 2H), 3.82-3.66 (m, 2H), 3.55-3.45 (m, 4H), 3.40 (s, 3H), 3.30-3.28 (m, 2H), 2.93-2.82 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	511.2
186		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.75 (d, *J* = 0.8 Hz, 1H), 7.60 (d, *J* = 8.4 Hz, 1H), 7.31 (dd, *J* = 7.2, 8.4 Hz, 1H), 7.15 (dd, *J* = 7.6, 13.0 Hz, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.12-4.00 (m, 2H), 3.99-3.93 (m, 1H), 3.26 (s, 3H), 2.99-2.76 (m, 2H), 2.74-2.63 (m, 2H), 2.17-2.04 (m, 1H), 1.93 (s, 3H), 1.90-1.80 (m, 4H).	511.2

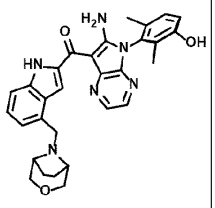
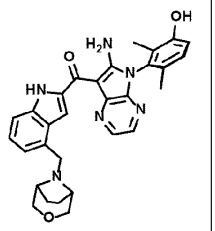
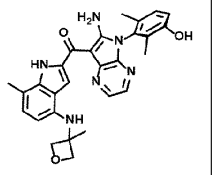
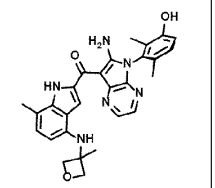
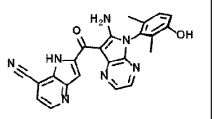
[514]

187		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.31 (d, J = 3.2 Hz, 1H), 7.87 (d, J = 3.2 Hz, 1H), 7.65 (d, J = 0.8 Hz, 1H), 7.51 (d, J = 8.4 Hz, 1H), 7.26-7.17 (m, 1H), 7.05 (t, J = 8.4 Hz, 2H), 6.88 (d, J = 8.4 Hz, 1H), 4.03-3.92 (m, 2H), 3.89 (dd, J = 3.2, 6.4 Hz, 1H), 3.24 (s, 3H), 2.90-2.71 (m, 2H), 2.68-2.58 (m, 2H), 2.07-1.96 (m, 1H), 1.83 (s, 3H), 1.80-1.72 (m, 4H).	511.2
188		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.62 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.20 (s, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.69 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.34 (s, 1H), 3.48 (s, 2H), 3.07 (t, J = 5.6 Hz, 2H), 2.87 (s, 2H), 2.64 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	494.2
189		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.62 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.20 (s, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.69 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.34 (s, 1H), 3.48 (s, 2H), 3.07 (t, J = 5.6 Hz, 2H), 2.87 (s, 2H), 2.64 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	494.2
190		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (s, 1H), 8.42 (d, J = 4.0 Hz, 1H), 8.15 (s, 1H), 7.99 (d, J = 4.0 Hz, 1H), 7.69 (s, 1H), 7.12 (d, J = 8.0 Hz, 1H), 6.95 (d, J = 8.0 Hz, 1H), 3.76-3.71 (m, 6H), 2.56 (m, 4H), 1.91 (s, 3H), 1.87 (s, 3H).	498.2
191		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 4.0 Hz, 1H), 8.22 (s, 1H), 8.00 (d, J = 4.0 Hz, 1H), 7.72 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 3.88 (s, 2H), 3.79-3.73 (m, 4H), 2.69 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	498.2

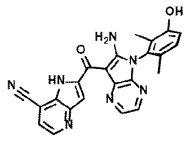
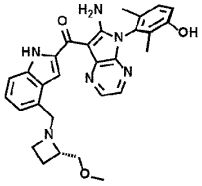
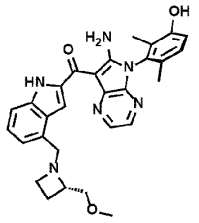
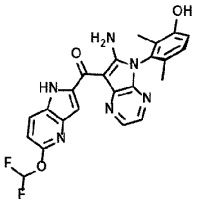
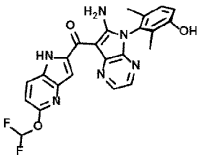
[515]

		[3,2-b]피리딘-2-일)메탄온		
192		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (s, 1H), 8.41 (d, *J* = 4.0 Hz, 1H), 8.14 (s, 1H), 7.99 (d, *J* = 4.0 Hz, 1H), 7.69 (s, 1H), 7.14 (d, *J* = 8.0 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 3.76 (s, 2H), 2.80-2.36 (m, 8H), 2.29 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	511.2
193		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (s, 1H), 8.42 (d, *J* = 4.0 Hz, 1H), 8.14 (s, 1H), 7.99 (d, *J* = 4.0 Hz, 1H), 7.69 (s, 1H), 7.14 (d, *J* = 8.0 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 3.76 (s, 2H), 2.95-2.36 (m, 8H), 2.30 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	511.2
194		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.68 (s, 1H), 7.54 (d, *J* = 8.4 Hz, 1H), 7.27 (t, *J* = 7.6 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.93 (d, *J* = 7.2 Hz, 1H), 4.81 (d, *J* = 5.6 Hz, 2H), 4.35 (d, *J* = 5.6 Hz, 2H), 3.28 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.40 (s, 3H).	482.2
195		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.68 (s, 1H), 7.54 (d, *J* = 8.4 Hz, 1H), 7.27 (t, *J* = 7.6 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.93 (d, *J* = 7.2 Hz, 1H), 4.81 (d, *J* = 5.6 Hz, 2H), 4.35 (d, *J* = 5.6 Hz, 2H), 3.28 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.40 (s, 3H).	482.2

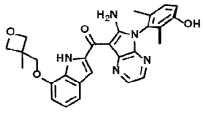
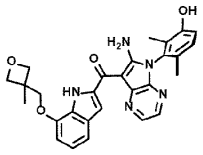
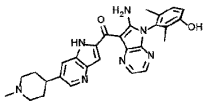
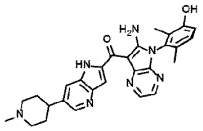
[516]

196		(4-((3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.85 (s, 1H), 7.58 (d, J = 8.4 Hz, 1H), 7.30 (t, J = 7.6 Hz, 1H), 7.17 (d, J = 8.4 Hz, 2H), 6.98 (d, J = 8.4 Hz, 1H), 3.88 (d, J = 2.0 Hz, 2H), 3.78 (d, J = 10.4 Hz, 2H), 3.51 (d, J = 9.6 Hz, 2H), 3.19 (s, 2H), 2.27-2.20 (m, 2H), 1.97-1.92 (m, 5H), 1.88 (s, 3H).	523.2
197		(4-((3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.85 (s, 1H), 7.58 (d, J = 8.4 Hz, 1H), 7.33-7.26 (m, 1H), 7.20-7.13 (m, 2H), 6.98 (d, J = 8.4 Hz, 1H), 3.88 (s, 2H), 3.78 (d, J = 10.4 Hz, 2H), 3.50 (d, J = 10.8 Hz, 2H), 3.19 (s, 2H), 2.26-2.20 (m, 2H), 1.96-1.92 (m, 5H), 1.88 (s, 3H).	523.2
198		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.55 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.90 (d, J = 8.0 Hz, 1H), 5.73 (d, J = 8.0 Hz, 1H), 4.94 (d, J = 4.0 Hz, 2H), 4.64 (d, J = 4.0 Hz, 2H), 2.62 (s, 3H).	497.2
199		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.55 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.90 (d, J = 8.0 Hz, 1H), 5.73 (d, J = 8.0 Hz, 1H), 4.94 (d, J = 4.0 Hz, 2H), 4.64 (d, J = 4.0 Hz, 2H), 2.61 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.76 (s, 3H).	497.2
200		(R)-2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-피롤로[3,2-b]	^{1}H NMR (400 MHz, MeOD): δ 8.63 (d, J = 4.8 Hz, 1H), 8.36 (d, J = 3.2 Hz, 1H), 8.05 (d, J = 3.2 Hz, 1H), 7.69 (d, J = 4.8 Hz, 1H), 7.63 (s, 1H), 7.18 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.94 (s, 3H), 1.90 (s, 3H).	424.1

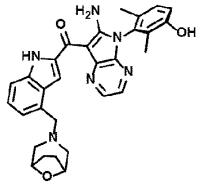
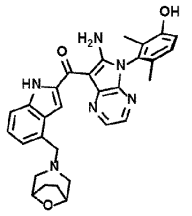
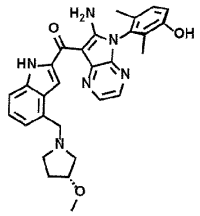
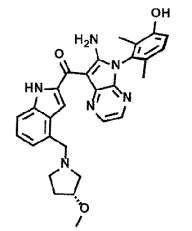
[517]

		피리딘-7-카보나이트릴		
201		(S)-2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-피롤로[3,2-b]피리딘-7-카보나이트릴	^{1}H NMR (400 MHz, MeOD): δ 8.61 (d, *J* = 4.8 Hz, 1H), 8.33 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 3.2 Hz, 1H), 7.66 (d, *J* = 4.8 Hz, 1H), 7.57 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 1.95 (s, 3H), 1.90 (s, 3H).	424.1
202		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 2.8 Hz, 1H), 7.85 (d, *J* = 8.8 Hz, 1H), 7.80 (s, 1H), 7.44 (t, *J* = 7.6 Hz, 1H), 7.30 (d, *J* = 6.8 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.01 (d, *J* = 8.4 Hz, 1H), 4.79-4.66 (m, 3H), 4.28-4.12 (m, 1H), 4.07-3.92 (m, 1H), 3.61-3.41 (m, 2H), 3.36 (s, 3H), 2.56-2.40 (m, 2H), 1.95 (s, 3H), 1.90 (s, 3H).	511.2
203		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 3.2 Hz, 1H), 7.88 (d, *J* = 3.2 Hz, 1H), 7.72-7.57 (m, 2H), 7.26 (t, *J* = 7.6 Hz, 1H), 7.14-7.01 (m, 2H), 6.89 (d, *J* = 8.4 Hz, 1H), 4.46-4.33 (m, 1H), 4.31-4.02 (m, 2H), 3.68-3.49 (m, 2H), 3.43-3.28 (m, 2H), 3.16 (s, 3H), 2.22-2.09 (m, 2H), 1.83 (s, 3H), 1.78 (s, 3H).	511.2
204		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이플루오로메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.19 (d, *J* = 8.8 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.62 (t, *J* = 73.6 Hz, 1H), 7.55 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.93 (d, *J* = 8.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	465.1
205		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이플루오로메톡시)-1H-	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.19 (d, *J* = 8.8 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.62 (t, *J* = 73.6 Hz, 1H), 7.55 (s, 1H), 7.17 (d, *J* = 8.4 Hz,	465.1

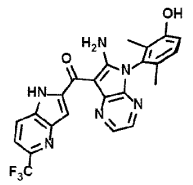
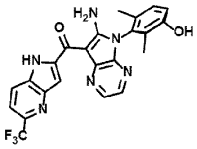
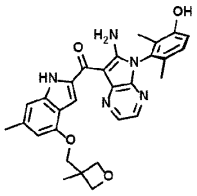
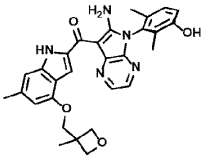
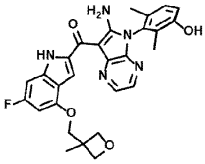
[518]

		피롤로[3,2-b]피리딘-2-일)메탄온	1H), 6.98 (d, J = 8.4 Hz, 1H), 6.94 (d, J = 8.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	
206		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.49 (d, J = 2.8 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.45 (s, 1H), 7.31 (d, J = 8.0 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.04 (t, J = 8.0 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.86 (d, J = 7.6 Hz, 1H), 5.01 (d, J = 5.6 Hz, 2H), 4.58 (d, J = 5.6 Hz, 2H), 4.24 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.64 (s, 3H).	498.2
207		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.49 (d, J = 2.8 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.45 (s, 1H), 7.31 (d, J = 8.0 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.04 (t, J = 8.0 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.86 (d, J = 7.6 Hz, 1H), 5.01 (d, J = 5.6 Hz, 2H), 4.58 (d, J = 5.6 Hz, 2H), 4.24 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.64 (s, 3H).	498.2
208		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (br d, J = 3.2 Hz, 1H), 8.30 (s, 1H), 7.98 (s, 1H), 7.89 (d, J = 3.2 Hz, 1H), 7.58 (s, 1H), 7.07 (d, J = 8.4 Hz, 1H), 6.89 (d, J = 8.4 Hz, 1H), 3.18-3.12 (m, 2H), 2.81 (dt, J = 2.0, 10.0 Hz, 1H), 2.44 (br s, 5H), 2.00-1.87 (m, 4H), 1.83 (s, 3H), 1.78 (s, 3H).	496.2
209		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (br d, J = 3.2 Hz, 1H), 8.30 (s, 1H), 7.98 (s, 1H), 7.89 (d, J = 3.2 Hz, 1H), 7.58 (s, 1H), 7.07 (d, J = 8.4 Hz, 1H), 6.89 (d, J = 8.4 Hz, 1H), 3.18-3.12 (m, 2H), 2.81 (dt, J = 2.0, 10.0 Hz, 1H), 2.44 (br s, 5H), 2.00-1.87 (m, 4H), 1.83 (s, 3H), 1.78 (s, 3H).	496.2

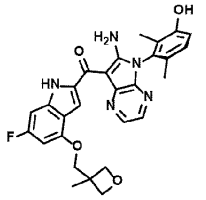
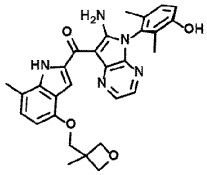
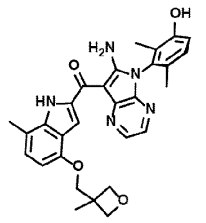
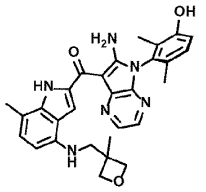
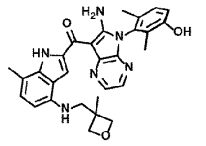
[519]

210		(4-(((1R,5S)-8-옥사-3-아자바이사이클로[3.2.1]옥탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.84 (s, 1H), 7.56 (d, J = 8.0 Hz, 1H), 7.25 (m, 1H), 7.17 (d, J = 8.0 Hz, 1H), 7.03 (d, J = 4.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 4.28-4.23 (m, 2H), 2.64 (d, J = 8.0 Hz, 2H), 2.37 (d, J = 8.0 Hz, 2H), 2.22 (s, 2H), 2.04 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.83-1.76 (m, 2H)	523.2
211		(4-(((1R,5S)-8-옥사-3-아자바이사이클로[3.2.1]옥탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 4.0 Hz, 1H), 7.96 (d, J = 4.0 Hz, 1H), 7.84 (s, 1H), 7.56 (d, J = 8.0 Hz, 1H), 7.29-7.22 (m, 1H), 7.17 (d, J = 8.0 Hz, 1H), 7.03 (d, J = 4.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 4.26 (m, 2H), 2.64 (d, J = 8.0 Hz, 2H), 2.37 (d, J = 8.0 Hz, 2H), 2.22 (s, 2H), 2.06 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84-1.77 (m, 2H).	523.2
212		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.75 (s, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.31 (t, J = 8.0 Hz, 1H), 7.15 (dd, J = 4.0, 8.0 Hz, 2H), 6.98 (d, J = 8.0 Hz, 1H), 4.04 (m, 2H), 4.00-3.95 (m, 1H), 3.26 (s, 3H), 2.92 (m, 2H), 2.75-2.65 (m, 2H), 2.11 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.78 (m, 1H).	511.2
213		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.75 (s, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.34-7.28 (m, 1H), 7.15 (dd, J = 4.0, 8.0 Hz, 2H), 6.98 (d, J = 8.0 Hz, 1H), 4.04 (m, 2H), 3.94 (m, 1H), 3.26 (s, 3H), 2.96-2.77 (m, 2H), 2.71 (m, 2H), 2.15-2.07 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.79 (m, 1H).	511.2

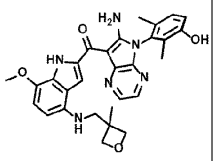
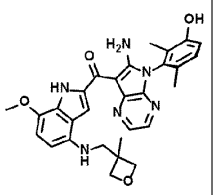
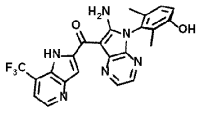
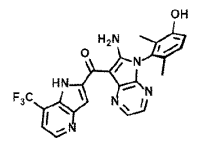
[520]

214		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.00 (s, 1H), 9.68 (s, 1H), 8.44 (d, J = 3.2 Hz, 1H), 8.33-8.31 (m, 2H), 8.01 (d, J = 3.2 Hz, 1H), 7.75 (d, J = 8.8 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.84 (s, 3H), 1.77 (s, 3H).	467.1
215		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.00 (s, 1H), 9.67 (s, 1H), 8.44 (d, J = 3.2 Hz, 1H), 8.33-8.31 (m, 2H), 8.01 (d, J = 3.2 Hz, 1H), 7.75 (d, J = 8.8 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.84 (s, 3H), 1.77 (s, 3H).	467.1
216		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.8 Hz, 1H), 7.95 (d, J = 2.8 Hz, 1H), 7.60 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.07 (s, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.46 (s, 1H), 4.78 (d, J = 6.0 Hz, 2H), 4.52 (d, J = 6.0 Hz, 2H), 4.22 (s, 2H), 2.49 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.54 (s, 3H).	512.2
217		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.8 Hz, 1H), 7.95 (d, J = 2.8 Hz, 1H), 7.60 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.06 (s, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.46 (s, 1H), 4.78 (d, J = 6.0 Hz, 2H), 4.52 (d, J = 6.0 Hz, 2H), 4.22 (s, 2H), 2.49 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.54 (s, 3H).	512.2
218		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.65 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 7.06-6.91 (m, 2H), 6.62 - 6.30 (m, 1H), 4.78 (d, J = 6.0 Hz, 2H), 4.53 (d, J = 6.0 Hz, 2H), 4.23 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.54 (s, 3H).	516.2

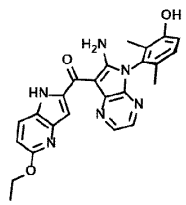
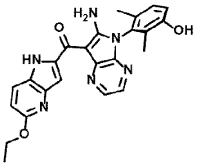
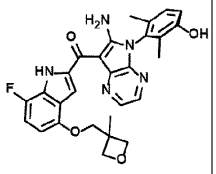
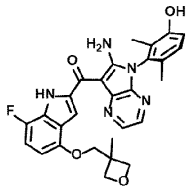
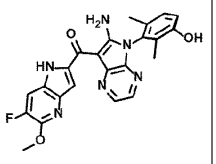
[521]

219		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 7.95 (d, J = 3.2 Hz, 1H), 7.66 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.99 (t, J = 7.6 Hz, 2H), 6.49 (d, J = 11.6 Hz, 1H), 4.78 (d, J = 6.0 Hz, 2H), 4.53 (d, J = 6.0 Hz, 2H), 4.23 (s, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.55 (s, 3H).	516.2
220		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.90 (s, 1H), 9.68 (s, 1H), 8.36 (d, J = 2.8 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.42 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.8 Hz, 1H), 7.00 (dd, J = 8.0, 12.8 Hz, 2H), 6.54 (d, J = 8.0 Hz, 1H), 4.59 (d, J = 6.0 Hz, 2H), 4.37 (d, J = 6.0 Hz, 2H), 4.17 (s, 2H), 2.62 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.45 (s, 3H).	512.2
221		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (s, 1H), 10.21 - 9.87 (m, 1H), 8.54 (s, 2H), 8.35 (d, J = 2.8 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.42 (d, J = 2.0 Hz, 1H), 7.12 (d, J = 8.4 Hz, 1H), 7.04-6.99 (m, 2H), 6.54 (d, J = 8.0 Hz, 1H), 4.59 (d, J = 6.0 Hz, 2H), 4.37 (d, J = 6.0 Hz, 2H), 4.17 (s, 2H), 2.62 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H), 1.45 (s, 3H).	512.2
222		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 4.0 Hz, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.61 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 4.0 Hz, 1H), 6.93 (d, J = 4.0 Hz, 1H), 6.17 (d, J = 8.0 Hz, 1H), 4.70 (d, J = 8.0 Hz, 2H), 4.43 (d, J = 8.0 Hz, 2H), 3.46 (s, 2H), 2.61 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H)	511.2
223		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((3-메틸옥세탄-3-	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.79 (s, 1H), 9.68 (s, 1H), 8.34 (d, J = 4.0 Hz, 1H), 8.00 (d, J = 4.0 Hz, 1H), 7.74 (d, J = 4.0 Hz, 1H), 7.14 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 6.87 (d, J = 8.0 Hz, 1H), 6.04 (d, J = 8.0 Hz, 1H), 5.94-	511.2

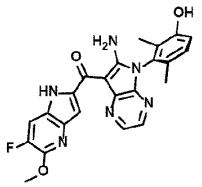
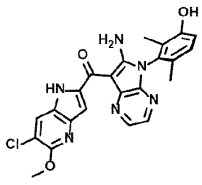
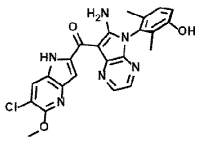
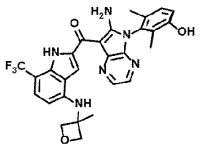
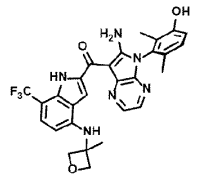
[522]

		일)메틸)아미노)-1H-인돌-2-일)메탄온	5.87 (m, 1H), 4.51 (d, J = 8.0 Hz, 2H), 4.27 (d, J = 8.0 Hz, 2H), 3.35 (d, J = 8.0 Hz, 2H), 2.54 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.38 (s, 3H)	
224		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 14.93 (s, 1H), 8.36 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.59 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.67 (d, J = 8.0 Hz, 1H), 6.14 (d, J = 8.0 Hz, 1H), 4.69 (d, J = 5.6 Hz, 2H), 4.43 (d, J = 5.6 Hz, 2H), 4.03 (s, 3H), 3.43 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H)	527.2
225		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 14.93 (s, 1H), 8.36 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.59 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.67 (d, J = 8.0 Hz, 1H), 6.14 (d, J = 8.0 Hz, 1H), 4.69 (d, J = 5.6 Hz, 2H), 4.43 (d, J = 5.6 Hz, 2H), 4.03 (s, 3H), 3.43 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H)	527.2
226		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.56 (d, J = 4.0 Hz, 1H), 8.20 (s, 1H), 7.93 (s, 1H), 7.54 (s, 2H), 7.07 (d, J = 8.0 Hz, 1H), 6.89 (d, J = 8.0 Hz, 1H), 1.84 (s, 3H), 1.79 (s, 3H).	467.1
227		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.56 (d, J = 4.0 Hz, 1H), 8.20 (s, 1H), 7.93 (s, 1H), 7.54 (s, 2H), 7.07 (d, J = 8.0 Hz, 1H), 6.89 (d, J = 8.0 Hz, 1H), 1.84 (s, 3H), 1.79 (s, 3H).	467.1

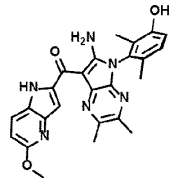
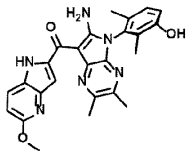
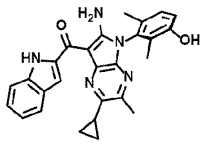
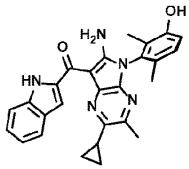
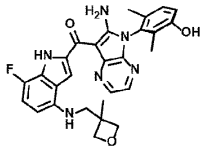
[523]

228		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 9.6 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.52 (s, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 4.41 (q, *J* = 7.2 Hz, 2H), 1.94 (s, 3H), 1.90 (s, 3H), 1.45 (t, *J* = 7.2 Hz, 3H).	443.2
229		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, *J* = 3.2 Hz, 1H), 7.92 (dd, *J* = 0.8, 8.8 Hz, 1H), 7.87 (d, *J* = 3.2 Hz, 1H), 7.40 (d, *J* = 0.8 Hz, 1H), 7.06 (d, *J* = 8.4 Hz, 1H), 6.88 (d, *J* = 8.4 Hz, 1H), 6.70 (d, *J* = 8.8 Hz, 1H), 4.29 (q, *J* = 7.2 Hz, 2H), 1.82 (s, 3H), 1.78 (s, 3H), 1.33 (t, *J* = 7.2 Hz, 3H).	443.2
230		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.23 (d, *J* = 3.2 Hz, 1H), 7.87 (d, *J* = 3.2 Hz, 1H), 7.50 (d, *J* = 3.2 Hz, 1H), 7.06 (d, *J* = 8.4 Hz, 1H), 6.88 (d, *J* = 8.4 Hz, 1H), 6.86-6.81 (m, 1H), 6.39 (dd, *J* = 2.8, 8.4 Hz, 1H), 4.67 (d, *J* = 6.0 Hz, 2H), 4.42 (d, *J* = 6.0 Hz, 2H), 4.10 (s, 2H), 1.83 (s, 3H), 1.78 (s, 3H), 1.44 (s, 3H).	516.2
231		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.62 (d, *J* = 3.2 Hz, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 6.99-6.93 (m, 1H), 6.52 (dd, *J* = 2.8, 8.4 Hz, 1H), 4.79 (d, *J* = 6.0 Hz, 2H), 4.54 (d, *J* = 6.0 Hz, 2H), 4.22 (s, 2H), 1.95 (s, 3H), 1.90 (s, 3H), 1.56 (s, 3H).	516.2
232		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.89 (d, *J* = 10.8 Hz, 1H), 7.53 (d, *J* = 0.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.08 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H).	447.2

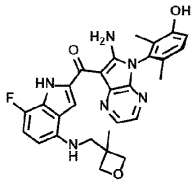
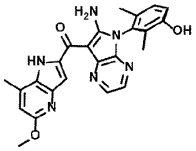
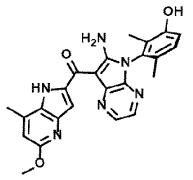
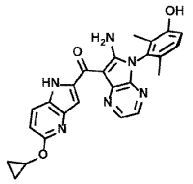
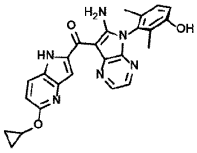
[524]

233		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.90 (d, J = 10.8 Hz, 1H), 7.53 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.08 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H).	447.2
234		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 4.0 Hz, 1H), 8.18 (s, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.51 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 4.06 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	463.1
235		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 4.0 Hz, 1H), 8.18 (s, 1H), 7.97 (d, J = 4.0 Hz, 1H), 7.51 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 4.06 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	463.1
236		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, J = 2.8 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.66 (s, 1H), 7.39 (d, J = 8.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.78 (d, J = 8.4 Hz, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.67 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.79 (s, 3H).	551.2
237		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-7-(트라이플루오로	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, J = 2.8 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.66 (s, 1H), 7.39 (d, J = 8.4 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.78 (d, J = 8.4 Hz, 1H), 4.95 (d, J = 6.0 Hz, 2H), 4.67 (d, J = 6.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.80 (s, 3H).	551.2

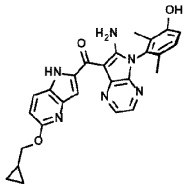
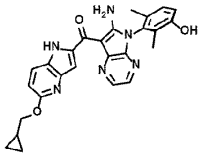
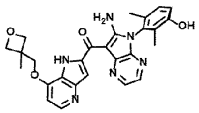
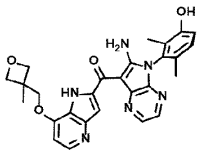
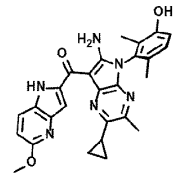
[525]

		메틸)-1H-인돌-2-일)메탄온		
238		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.00 (d, *J* = 9.2 Hz, 1H), 7.42 (s, 1H), 7.16 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.00 (s, 3H), 2.78 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	457.2
239		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.00 (d, *J* = 9.2 Hz, 1H), 7.42 (s, 1H), 7.16 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.00 (s, 3H), 2.78 (s, 3H), 2.50 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	457.2
240		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.76 (d, *J* = 8.4 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 1H), 7.46 (s, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.18-7.09 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 2.63 (s, 3H), 2.50-2.41 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.39-1.32 (m, 4H).	452.2
241		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ7.76 (d, *J* = 8.4 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 1H), 7.46 (s, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.18-7.09 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 2.63 (s, 3H), 2.49-2.41 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.38-1.32 (m, 4H).	452.2
242		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-(((3-메틸옥세탄	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.66 (d, *J* = 3.2 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.89-6.84 (m, 1H), 6.08 (dd, *J* = 3.2, 8.4 Hz, 1H), 4.69 (d, *J* = 6.0 Hz, 2H), 4.44 (d, *J*	515.2

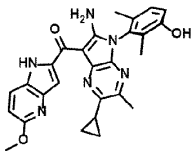
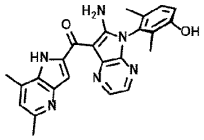
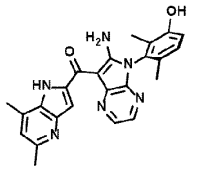
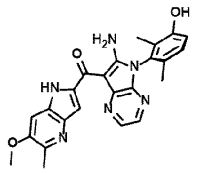
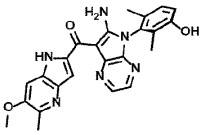
[526]

		-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	= 6.0 Hz, 2H), 3.45 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.47 (s, 3H).	
243		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.67 (d, J = 3.2 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.90-6.86 (m, 1H), 6.15 (dd, J = 3.2, 8.4 Hz, 1H), 4.68 (d, J = 6.0 Hz, 2H), 4.44 (d, J = 6.0 Hz, 2H), 3.48 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.48 (s, 3H).	515.2
244		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.40 (s, 1H), 7.16 (s, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.66 (s, 1H), 3.96 (s, 3H), 2.73 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	443.2
245		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.41 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.66 (s, 1H), 3.96 (s, 3H), 2.73 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	443.2
246		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로폭시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.05 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.86 (d, J = 8.8 Hz, 1H), 4.24 (tt, J = 3.2, 6.0 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 0.89-0.82 (m, 2H), 0.82-0.73 (m, 2H).	455.2
247		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로폭시-1H-피롤	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.09 - 8.05 (m, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.55 (d, J = 0.8 Hz, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.87 (d, J = 8.8 Hz, 1H), 4.29-4.20 (m, 1H), 1.93 (s, 3H), 1.88 (s,	455.2

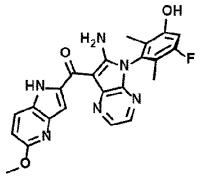
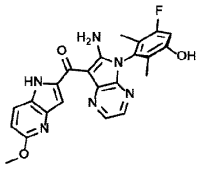
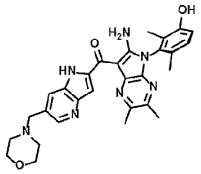
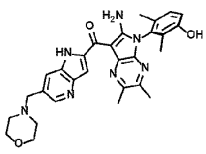
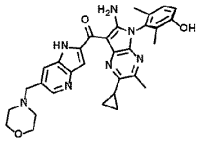
[527]

		로[3,2-b]피리딘-2-일)메탄온	3H), 0.89-0.83 (m, 2H), 0.81-0.74 (m, 2H).	
248		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로필메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.81 (d, J = 8.8 Hz, 1H), 4.18 (d, J = 7.2 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.37-1.27 (m, 1H), 0.69-0.63 (m, 2H), 0.39 (d, J = 5.2 Hz, 2H)	469.2
249		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로필메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.10 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.86 (d, J = 8.8 Hz, 1H), 4.20 (d, J = 7.2 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.38-1.30 (m, 1H), 0.69-0.60 (m, 2H), 0.40 (d, J = 5.2 Hz, 2H)	469.2
250		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.48 (d, J = 3.2 Hz, 1H), 8.33 (d, J = 5.6 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.51 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.01-6.95 (m, 2H), 5.02 (d, J = 5.6 Hz, 2H), 4.59 (d, J = 5.6 Hz, 2H), 4.34 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.63 (s, 3H)	499.2
251		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.48 (d, J = 3.2 Hz, 1H), 8.34 (d, J = 5.6 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.52 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.01-6.95 (m, 2H), 5.02 (d, J = 5.6 Hz, 2H), 4.59 (d, J = 5.6 Hz, 2H), 4.34 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.63 (s, 3H)	499.2
252		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.66 (s, 1H), 9.66 (s, 1H), 7.96 (d, J = 8.8 Hz, 1H), 7.34 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.86 (d, J = 8.8 Hz, 1H), 3.92 (s, 3H), 2.56 (s, 3H), 2.42 (d, J = 4.8 Hz, 1H), 1.83 (s, 3H),	483.2

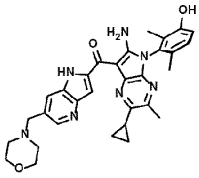
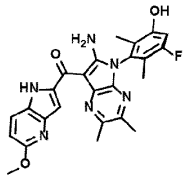
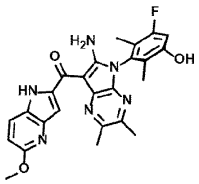
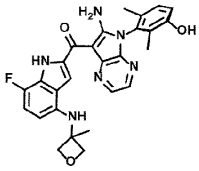
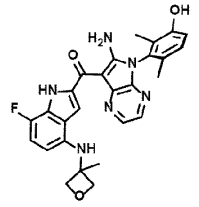
[528]

		메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	1.75 (s, 3H), 1.32-1.28 (m, 2H), 1.21-1.18 (m, 2H).	
253		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.07-14.62 (m, 1H), 7.94 (d, J = 8.8 Hz, 1H), 7.27 (s, 1H), 7.08 (d, J = 8.0 Hz, 1H), 6.94 (d, J = 8.0 Hz, 1H), 6.83 (d, J = 8.8 Hz, 1H), 3.91 (s, 3H), 2.57-2.53 (m, 3H), 2.40-2.36 (m, 1H), 1.82 (s, 3H), 1.74 (s, 3H), 1.28-1.23 (m, 4H).	483.2
254		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5,7-다이메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.15 (d, J = 2.4 Hz, 1H), 7.81 (d, J = 2.4 Hz, 1H), 7.25 (s, 1H), 7.10 (s, 1H), 6.95 (d, J = 8.4 Hz, 1H), 6.77 (d, J = 8.4 Hz, 1H), 2.66 (s, 3H), 2.52 (s, 3H), 1.71 (s, 3H), 1.66 (s, 3H).	427.2
255		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5,7-다이메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.15 (d, J = 2.4 Hz, 1H), 7.81 (d, J = 2.4 Hz, 1H), 7.25 (s, 1H), 7.10 (s, 1H), 6.95 (d, J = 8.4 Hz, 1H), 6.77 (d, J = 8.4 Hz, 1H), 2.66 (s, 3H), 2.52 (s, 3H), 1.71 (s, 3H), 1.66 (s, 3H).	427.2
256		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.64 (s, 1H), 7.60 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.01 (s, 3H), 2.53 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	443.2
257		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.65 (s, 1H), 7.60 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.01 (s, 3H), 2.53 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	443.2

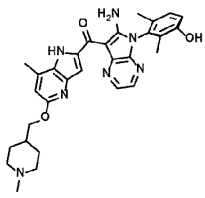
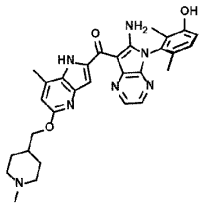
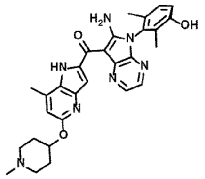
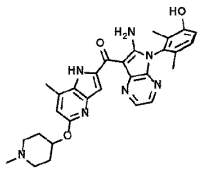
[529]

258		(R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.53 (s, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 6.76 (d, *J* = 11.2 Hz, 1H), 3.99 (s, 3H), 1.82 (s, 6H).	447.2
259		(S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, H), 8.04 (d, *J* = 8.8 Hz, H), 7.99 (d, *J* = 3.2 Hz, H), 7.53 (d, *J* = 0.8 Hz, H), 6.83 (d, *J* = 2.4 Hz, H), 6.81 (d, *J* = 4.4 Hz, H), 4.00 (s, 3H), 1.85 - 1.82 (m, 6H).	447.2
260		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (s, 1H), 8.09 (s, 1H), 7.57 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.77-3.65 (m, 6H), 2.79 (s, 3H), 2.61-2.53 (m, 4H), 2.49 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H).	526.2
261		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (s, 1H), 8.08 (m, 1H), 7.56 (s, 1H), 7.11 (d, J = 8.0 Hz, 1H), 6.94 (d, J = 8.0 Hz, 1H), 3.75-3.67 (m, 6H), 2.78 (s, 3H), 2.60-2.52 (m, 4H), 2.49 (s, 3H), 1.90 (s, 3H), 1.87 (s, 3H).	526.2
262		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (s, 1H), 8.18 (s, 1H), 7.52 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.79-3.69 (m, 6H), 2.63 (s, 3H), 2.57 (s, 4H), 2.51-2.42 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.39 (dd, *J* = 2.4, 8.0 Hz, 2H), 1.31-1.26 (m, 2H).	552.3

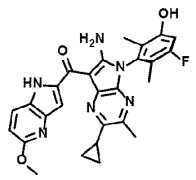
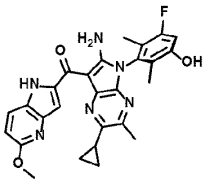
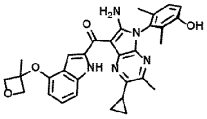
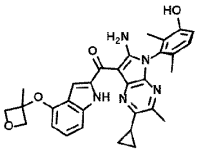
[530]

263		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (s, 1H), 8.18 (s, 1H), 7.52 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.79-3.70 (m, 6H), 2.63 (s, 3H), 2.57 (s, 4H), 2.50-2.43 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.39 (dd, *J* = 2.4, 8.0 Hz, 2H), 1.31-1.25 (m, 2H).	552.3
264		(R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.99 (d, *J* = 9.2 Hz, 1H), 7.40 (s, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 6.60 (d, *J* = 12.4 Hz, 1H), 3.99 (s, 3H), 2.77 (s, 3H), 2.49 (s, 3H), 1.78 (s, 3H), 1.76 (d, *J* = 1.2 Hz, 3H).	475.2
265		(S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.99 (d, *J* = 8.8 Hz, 1H), 7.40 (s, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 6.58 (d, *J* = 12.8 Hz, 1H), 3.99 (s, 3H), 2.77 (s, 3H), 2.49 (s, 3H), 1.77 (s, 3H), 1.75 (s, 3H).	475.2
266		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.59 (d, *J* = 3.2 Hz, 1H), 7.09 (d, *J* = 8.4 Hz, 1H), 6.92 (d, *J* = 8.4 Hz, 1H), 6.85-6.80 (m, 1H), 5.63 (dd, *J* = 3.2, 8.4 Hz, 1H), 4.93 (d, *J* = 6.0 Hz, 2H), 4.64 (d, *J* = 6.0 Hz, 2H), 1.89 (s, 3H), 1.86 (s, 3H), 1.75 (s, 3H).	501.1
267		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.60 (d, *J* = 3.2 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.85-6.80 (m, 1H), 5.63 (dd, *J* = 3.2, 8.4 Hz, 1H), 4.93 (d, *J* = 6.0 Hz, 2H), 4.64 (d, *J* = 6.0 Hz, 2H), 1.92 (s, 3H), 1.88 (s, 3H), 1.75 (s, 3H).	501.2

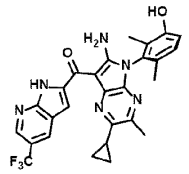
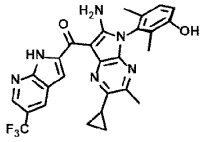
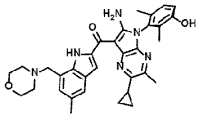
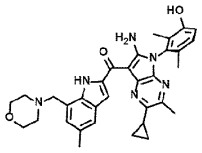
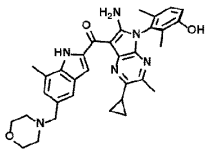
[531]

268		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.92 (s, 1H), 9.69 (s, 1H), 8.38 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.34 (d, J = 1.6 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.64 (s, 1H), 4.14 (d, J = 6.0 Hz, 2H), 2.78 (d, J = 11.2 Hz, 2H), 2.65 (s, 3H), 2.15 (s, 3H), 1.92-1.84 (m, 2H), 1.83 (s, 3H), 1.75 (s, 3H), 1.73 (s, 2H), 1.32 (d, J = 11.2 Hz, 2H).	540.2
269		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (s, 1H), 9.68 (s, 1H), 8.38 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.34 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.63 (s, 1H), 4.14 (d, J = 6.0 Hz, 2H), 2.79 (d, J = 11.2 Hz, 2H), 2.65 (s, 3H), 2.16 (s, 3H), 1.91-1.84 (m, 2H), 1.83 (s, 3H), 1.75 (s, 3H), 1.75-1.68 (m, 2H), 1.40-1.23 (m, 2H).	540.3
270		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.8 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 3.39-3.35 (m, 1H), 3.03-2.93 (m, 2H), 2.74 (s, 3H), 2.71-2.63 (m, 2H), 2.50 (s, 3H), 2.21-2.11 (m, 2H), 2.00-1.94 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	526.2
271		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.41 (s, 1H), 7.20 (d, J = 8.8 Hz, 1H), 7.02 (d, J = 8.4 Hz, 1H), 6.69 (s, 1H), 3.32-3.26 (m, 1H), 3.06-2.96 (m, 2H), 2.77 (s, 3H), 2.74-2.63 (m, 2H), 2.52 (s, 3H), 2.23-2.14 (m, 2H), 2.04-1.97 (m, 2H), 1.96 (s, 3H), 1.91 (s, 3H).	526.2

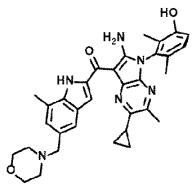
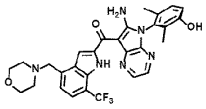
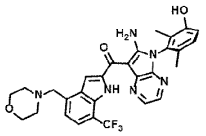
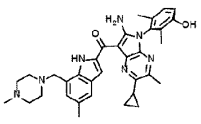
[532]

272		(R)-(6-아미노-2-사이클로프로필-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.60 (s, 1H), 10.20 (s, 1H), 7.94 (d, J = 8.8 Hz, 1H), 7.34 (s, 1H), 6.91-6.81 (m, 2H), 3.91 (s, 3H), 2.56 (s, 3H), 2.41 (dt, J = 4.0, 8.0 Hz, 1H), 1.74 (d, J = 1.2 Hz, 3H), 1.70 (s, 3H), 1.33-1.25 (m, 2H), 1.23-1.14 (m, 2H).	501.2
273		(S)-(6-아미노-2-사이클로프로필-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.61 (s, 1H), 10.18 (s, 1H), 7.95 (d, J = 8.8 Hz, 1H), 7.34 (s, 1H), 6.97-6.78 (m, 2H), 3.91 (s, 3H), 2.56 (s, 3H), 2.46-2.36 (m, 1H), 1.74 (s, 3H), 1.70 (s, 3H), 1.29 (dd, J = 2.4, 8.0 Hz, 2H), 1.22-1.13 (m, 2H).	501.2
274		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.60 (s, 1H), 7.37 (d, J = 8.4 Hz, 1H), 7.20 (t, J = 8.4 Hz, 1H), 7.15 (d, J = 8.4 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.09 (d, J = 7.6 Hz, 1H), 5.04 (d, J = 6.8 Hz, 2H), 4.72 (d, J = 6.8 Hz, 2H), 2.63 (s, 3H), 2.44 (s, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.86 (s, 3H), 1.35-1.31 (m, 4H).	538.2
275		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.60 (s, 1H), 7.37 (d, J = 8.4 Hz, 1H), 7.20 (t, J = 8.4 Hz, 1H), 7.15 (d, J = 8.4 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.09 (d, J = 7.6 Hz, 1H), 5.04 (d, J = 6.8 Hz, 2H), 4.72 (d, J = 6.8 Hz, 2H), 2.63 (s, 3H), 2.44 (s, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.86 (s, 3H), 1.35-1.31 (m, 4H).	538.2

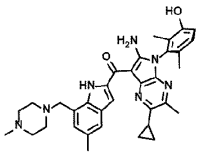
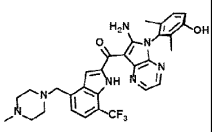
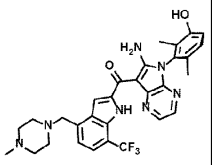
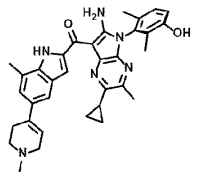
[533]

276		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.22 (s, 1H), 9.65 (s, 1H), 8.81 (d, J = 1.6 Hz, 1H), 8.60 (d, J = 1.6 Hz, 1H), 7.59 (s, 1H), 7.12 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 2.55 (s, 3H), 2.37-2.32 (m, 1H), 1.83 (s, 3H), 1.75 (s, 3H), 1.43 (d, J = 3.2 Hz, 2H), 1.20 (dd, J = 2.4, 8.0 Hz, 2H).	521.1
277		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.22 (s, 1H), 9.66 (s, 1H), 8.82 (d, J = 1.6 Hz, 1H), 8.61 (d, J = 1.6 Hz, 1H), 7.59 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 2.56 (s, 3H), 2.37-2.32 (m, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.38 (d, J = 3.2 Hz, 2H), 1.21 (dd, J = 2.4, 8.0 Hz, 2H).	521.2
278		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.51 (s, 1H), 7.43 (s, 1H), 7.15 (d, J = 8.4 Hz, 1H), 7.06 (s, 1H), 6.96 (d, J = 8.4 Hz, 1H), 3.94 (s, 2H), 3.69 (t, J = 4.4 Hz, 4H), 2.59 (s, 3H), 2.53 (s, 4H), 2.45 (s, 3H), 2.35-2.27 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.23-1.17 (m, 2H), 1.16-1.08 (m, 2H).	565.3
279		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.54 (s, 1H), 7.46 (s, 1H), 7.15 (d, J = 8.4 Hz, 1H), 7.09 (s, 1H), 6.96 (d, J = 8.4 Hz, 1H), 4.19-3.88 (m, 2H), 3.71 (s, 4H), 2.82-2.60 (m, 3H), 2.59 (s, 4H), 2.46 (s, 3H), 2.34-2.27 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H), 1.25-1.16 (m, 2H), 1.16-1.09 (m, 2H).	565.3
280		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로	^{1}H NMR (400 MHz, MeOD): δ 8.04 (s, 1H), 7.51 (s, 1H), 7.18-7.11 (m, 2H), 6.97 (d, J = 8.4 Hz, 1H), 3.72 (t, J = 4.0 Hz, 4H), 3.67 (s, 2H), 2.72 (s, 3H), 2.62-2.55 (m, 7H), 2.37-2.28 (m, 1H), 1.91 (s, 3H),	565.4

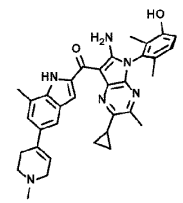
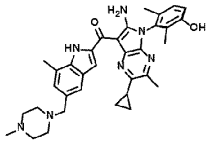
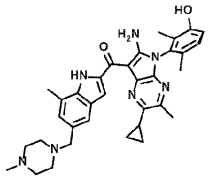
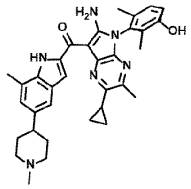
[534]

		[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-인돌-2-일)메탄온	1.86 (s, 3H), 1.17-1.10 (m, 2H), 1.14-1.06 (m, 2H).	
281		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.04 (s, 1H), 7.51 (s, 1H), 7.20-7.11 (m, 2H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.72 (t, *J* = 4.4 Hz, 4H), 3.67 (s, 2H), 2.72 (s, 3H), 2.62-2.54 (m, 7H), 2.37-2.29 (m, 1H), 1.91 (s, 3H), 1.86 (s, 3H), 1.17-1.10 (m, 2H), 1.09-1.03 (m, 2H)	565.4
282		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.78 (s, 1H), 7.60 (d, *J* = 7.2 Hz, 1H), 7.26 (d, *J* = 7.2 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.93 (s, 2H), 3.74-3.72 (m, 4H), 2.58-2.56 (m, 4H), 1.94 (s, 3H), 1.89 (s, 3H).	565.4
283		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.78 (s, 1H), 7.60 (d, *J* = 7.2 Hz, 1H), 7.26 (d, *J* = 7.2 Hz, 1H), 7.17 (d, *J* = 8.0 Hz, 1H), 6.99 (d, *J* = 8.0 Hz, 1H), 3.93 (s, 2H), 3.74-3.72 (m, 4H), 2.58-2.56 (m, 4H), 1.94 (s, 3H), 1.89 (s, 3H).	565.3
284		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (s, 1H), 7.43 (s, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 7.05 (s, 1H), 6.96 (d, *J* = 8.4 Hz, 1H), 3.95 (s, 2H), 3.00-2.63 (m, 3H), 2.59 (s, 3H), 2.55 (s, 3H), 2.44 (s, 3H), 2.40 (d, *J* = 4.4 Hz, 1H), 2.24 (s, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.18-1.16 (m, 2H), 1.15-1.11 (m, 2H).	578.4

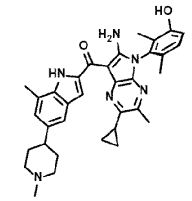
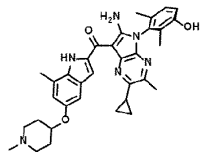
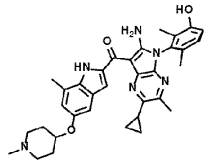
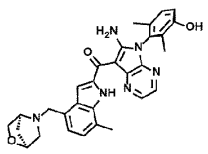
[535]

285		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.46 (s, 1H), 7.43 (s, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 7.05 (s, 1H), 6.96 (d, *J* = 8.4 Hz, 1H), 3.96 (s, 2H), 2.74-2.62 (m, 4H), 2.59 (s, 3H), 2.55-2.47 (m, 3H), 2.44 (s, 3H), 2.40 (s, 1H), 2.33 (s, 3H), 2.30-2.28 (m, 1H), 1.91 (s, 3H), 1.87 (s, 3H), 1.18-1.16 (m, 2H), 1.14-1.11 (m, 2H).	578.4
286		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 2.8 Hz, 1H), 8.01 (d, *J* = 2.8 Hz, 1H), 7.77 (s, 1H), 7.60 (d, *J* = 7.2 Hz, 1H), 7.24 (d, *J* = 7.2 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.95 (s, 2H), 2.75-2.48 (m, 8H), 2.31 (s, 3H), 1.94 (s, 3H), 1.89 (s, 3H).	578.4
287		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 3.2 Hz, 1H), 7.79 (s, 1H), 7.62 (d, *J* = 7.6 Hz, 1H), 7.27 (d, *J* = 7.6 Hz, 1H), 7.19 (d, *J* = 8.8 Hz, 1H), 7.01 (d, *J* = 8.8 Hz, 1H), 3.98 (s, 2H), 2.77-2.45 (m, 8H), 2.34 (s, 3H), 1.96 (s, 3H), 1.91 (s, 3H).	578.4
288		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.99 (s, 1H), 7.57 (s, 1H), 7.28 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.12 (s, 1H), 3.23-3.22 (m, 2H), 2.84-2.81 (m, 2H), 2.78-2.74 (m, 2H), 2.73 (s, 3H), 2.60 (s, 3H), 2.46 (s, 3H), 2.35-2.31 (m, 1H), 1.91 (s, 3H), 1.87 (s, 3H), 1.29 (s, 3H), 1.16-1.11 (m, 2H), 1.07-1.04 (m, 2H).	561.5

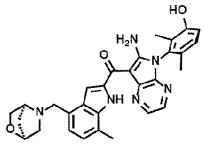
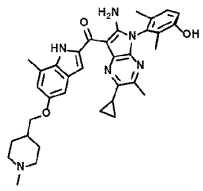
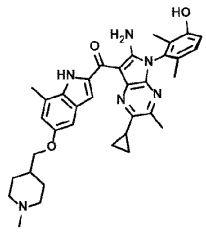
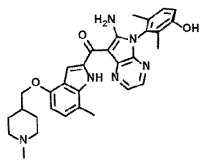
[536]

289		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.99 (s, 1H), 7.56 (s, 1H), 7.28 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.11 (s, 1H), 3.23-3.22 (m, 2H), 2.84-2.81 (m, 2H), 2.77-2.74 (m, 2H), 2.72 (s, 3H), 2.60 (s, 3H), 2.46 (s, 3H), 2.36-2.28 (m, 1H), 1.91 (s, 3H), 1.86 (s, 3H), 1.16-1.11 (m, 2H), 1.07-1.04 (m, 2H).	561.5
290		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.03 (s, 1H), 7.49 (s, 1H), 7.17-7.09 (m, 2H), 6.96 (d, *J* = 8.4 Hz, 1H), 3.63 (s, 2H), 2.71 (s, 3H), 2.71-2.35 (m, 11H), 2.32 (t, *J* = 5.2 Hz, 1H), 2.28 (s, 3H), 1.91 (s, 3H), 1.86 (s, 3H), 1.18-1.10 (m, 2H), 1.06 (d, *J* = 3.2 Hz, 2H).	578.4
291		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.03 (s, 1H), 7.49 (s, 1H), 7.17-7.09 (m, 2H), 6.96 (d, *J* = 8.4 Hz, 1H), 3.63 (s, 2H), 2.71 (s, 3H), 2.71-2.35 (m, 11H), 2.32 (t, *J* = 5.2 Hz, 1H), 2.28 (s, 3H), 1.91 (s, 3H), 1.86 (s, 3H), 1.18-1.10 (m, 2H), 1.06 (d, *J* = 3.2 Hz, 2H).	578.4
292		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸피페리딘-4-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.97 (s, 1H), 7.42 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.04 (s, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.39-3.36 (m, 1H), 2.85-2.78 (m, 2H), 2.72 (s, 3H), 2.70 (s, 3H), 2.60 (s, 3H), 2.36-2.29 (m, 1H), 2.09-1.95 (m, 5H), 1.91 (s, 3H), 1.86 (s, 3H), 1.15-1.11 (m, 2H), 1.07-1.03 (m, 2H).	563.3

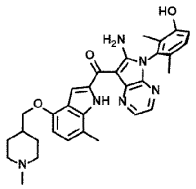
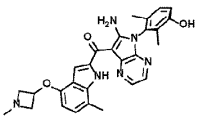
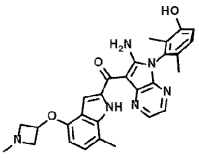
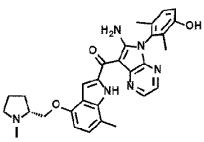
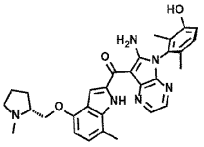
[537]

293		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸피페리딘-4-일)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.97 (s, 1H), 7.42 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.04 (s, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 3.38-3.35 (m, 2H), 2.82-2.77 (m, 2H), 2.72 (s, 3H), 2.69 (s, 3H), 2.60 (s, 3H), 2.36-2.30 (m, 1H), 2.10-1.96 (m, 5H), 1.91 (s, 3H), 1.86 (s, 3H), 1.15-1.11 (m, 2H), 1.07-1.05 (m, 2H).	563.3
294		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.80 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.05 (d, *J* = 2.0 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 1.2 Hz, 1H), 4.40 (d, *J* = 8.0 Hz, 1H), 2.87-2.74 (m, 2H), 2.70 (s, 3H), 2.60 (s, 3H), 2.51-2.39 (m, 2H), 2.35 (s, 3H), 2.33-2.27 (m, 1H), 2.11-2.01 (m, 2H), 1.92-1.84 (m, 7H), 1.17-1.09 (m, 2H), 1.06-0.99 (m, 2H).	579.4
295		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.80 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.05 (d, *J* = 2.0 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 1.2 Hz, 1H), 4.42 (d, *J* = 2.0 Hz, 1H), 2.89-2.78 (m, 2H), 2.70 (s, 3H), 2.60 (s, 3H), 2.53-2.42 (m, 2H), 2.40-2.36 (m, 3H), 2.34-2.29 (m, 1H), 2.06 (d, *J* = 7.2 Hz, 2H), 1.92-1.85 (m, 8H), 1.16-1.09 (m, 2H), 1.05-0.99 (m, 2H).	579.4
296		(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-7-메틸-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, *J* = 2.4 Hz, 1H), 7.99 (d, *J* = 2.8 Hz, 1H), 7.68 (s, 1H), 7.19-7.16 (m, 1H), 7.15-7.09 (m, 2H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.54 (s, 1H), 4.39-4.21 (m, 2H), 4.16 (d, *J* = 8.8 Hz, 1H), 3.86 (s, 1H), 3.70 (d, *J* = 8.8 Hz, 1H), 3.15-3.07 (m, 1H), 3.04-2.93 (m, 1H), 2.76 (s, 3H), 2.20-2.15 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	523.2

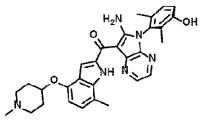
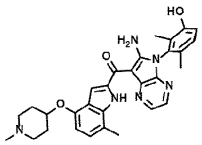
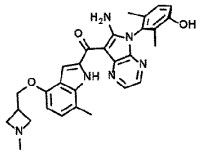
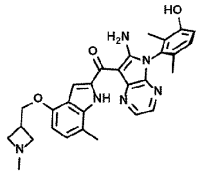
[538]

297		(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-7-메틸-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 2.4 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.68 (s, 1H), 7.18 (s, 1H), 7.16 (s, 2H), 6.99 (d, J = 8.4 Hz, 1H), 4.60-4.55 (m, 1H), 4.47-4.25 (m, 2H), 4.16 (d, J = 8.8 Hz, 1H), 3.94 (s, 1H), 3.72 (d, J = 8.0 Hz, 1H), 3.20-3.12 (m, 1H), 3.10-3.01 (m, 1H), 2.77 (s, 3H), 2.27-2.16 (m, 1H), 1.95 (br s, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	523.2
298		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.54 (s, 1H), 7.81 (s, 1H), 7.15 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 2.0 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.80 (d, J = 0.8 Hz, 1H), 3.92 (d, J = 6.0 Hz, 2H), 3.21 (d, J = 11.2 Hz, 2H), 2.69 (s, 3H), 2.60 (s, 3H), 2.56 (s, 3H), 2.53-2.44 (m, 2H), 2.34-2.29 (m, 1H), 2.07-1.95 (m, 3H), 1.91 (s, 3H), 1.86 (s, 3H), 1.66-1.52 (m, 2H), 1.18-1.09 (m, 2H), 1.06-0.99 (m, 1H), 1.07-0.99 (m, 1H).	593.4
299		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.53 (s, 1H), 7.81 (s, 1H), 7.19-7.11 (m, 1H), 6.99 (d, J = 2.0 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.81 (s, 1H), 3.92 (d, J = 6.0 Hz, 2H), 3.26-3.17 (m, 2H), 2.69 (s, 3H), 2.60 (s, 3H), 2.56 (s, 3H), 2.54-2.45 (m, 2H), 2.37-2.28 (m, 1H), 2.07-1.95 (m, 3H), 1.86 (s, 3H), 1.67-1.49 (m, 2H), 1.17-1.09 (m, 2H), 1.07-0.99 (m, 2H).	593.4
300		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.8 Hz, 1H), 7.53 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.05-6.92 (m, 2H), 6.44 (d, J = 7.6 Hz, 1H), 3.99 (d, J = 6.0 Hz, 2H), 3.05-2.92 (m, 2H), 2.66 (s, 3H), 2.33 (s, 3H), 2.19-2.13 (m, 2H), 2.04-1.95 (m, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.60-1.47 (m, 2H).	539.4

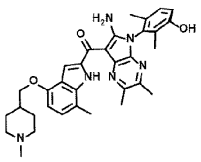
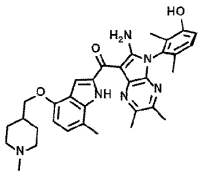
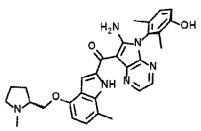
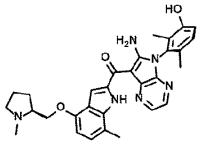
[539]

301		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 2.8 Hz, 1H), 7.97 (d, *J* = 2.8 Hz, 1H), 7.53 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.05-6.94 (m, 2H), 6.44 (d, *J* = 7.6 Hz, 1H), 3.99 (d, *J* = 6.0 Hz, 2H), 3.05-2.92 (m, 2H), 2.66 (s, 3H), 2.34 (s, 3H), 2.19-2.13 (m, 2H), 2.03-1.95 (m, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.60-1.47 (m, 2H).	539.4
302		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.57 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.06-6.96 (m, 2H), 6.24 (d, *J* = 8.0 Hz, 1H), 5.28-5.26 (m, 1H), 4.77-4.64 (m, 2H), 4.44-4.31 (m, 2H), 3.07 (s, 3H), 2.69 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	497.2
303		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.57 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.06-6.97 (m, 2H), 6.24 (d, *J* = 7.6 Hz, 1H), 5.28-5.26 (m, 1H), 4.77-4.64 (m, 2H), 4.45-4.32 (m, 2H), 3.07 (s, 3H), 2.69 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	497.2
304		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.57 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.05-6.98 (m, 2H), 6.54 (d, *J* = 7.6 Hz, 1H), 4.52 (dd, *J* = 3.2, 10.8 Hz, 1H), 4.31 (dd, *J* = 7.6, 10.8 Hz, 1H), 3.88 (d, *J* = 5.6 Hz, 1H), 3.70-3.65 (m, 1H), 3.22-3.17 (m, 1H), 3.12 (s, 3H), 2.67 (s, 3H), 2.45-2.38 (m, 1H), 2.23-2.07 (m, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	525.2
305		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-1-메틸피롤리딘	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.57 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.05-6.98 (m, 2H), 6.54 (d, *J* = 7.6 Hz, 1H), 4.54 (dd, *J* = 3.2, 10.8 Hz, 1H), 4.31 (dd, *J* = 7.6, 10.8 Hz, 1H), 3.92 (d, *J* = 5.6 Hz, 1H), 3.72-3.67 (m, 1H), 3.25-3.20	525.2

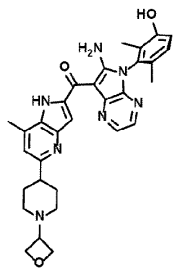
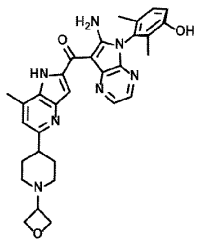
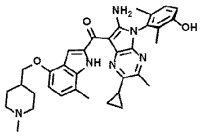
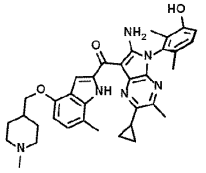
[540]

		-2-일)메톡시)-1H-인돌-2-일)메탄온	(m, 1H), 3.14 (s, 3H), 2.67 (s, 3H), 2.46-2.39 (m, 1H), 2.25-2.07 (m, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	
306		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.8 Hz, 1H), 7.53 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 7.01 (t, J = 7.2 Hz, 2H), 6.50 (d, J = 7.6 Hz, 1H), 4.61 (s, 1H), 2.82 (s, 2H), 2.66 (s, 3H), 2.56-2.45 (m, 2H), 2.37 (s, 3H), 2.08 (s, 2H), 1.99 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	525.4
307		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.8 Hz, 1H), 7.53 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.99 (t, J = 7.2 Hz, 2H), 6.51 (d, J = 7.6 Hz, 1H), 4.66 (s, 1H), 2.93 (s, 2H), 2.72 (s, 3H), 2.56-2.45 (m, 2H), 2.37 (s, 3H), 2.08 (s, 2H), 2.08 (s, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	525.3
308		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.54 (s, 1H), 7.11 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 6.94 (d, J = 8.4 Hz, 1H), 6.46 (d, J = 7.6 Hz, 1H), 4.21 (d, J = 6.0 Hz, 2H), 3.56 (t, J = 8.0 Hz, 2H), 3.30-3.25 (m, 2H), 3.08-2.97 (m, 1H), 2.66 (s, 3H), 2.41 (s, 3H), 1.91 (s, 3H), 1.87 (s, 6H).	511.1
309		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.55 (s, 1H), 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.60 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.04 (d, J = 7.6 Hz, 1H), 6.99 (d, J = 8.8 Hz, 1H), 6.53 (d, J = 7.6 Hz, 1H), 4.25 (d, J = 4.8 Hz, 2H), 4.12-4.04 (m, 2H), 3.99-3.90 (m, 2H), 3.34-3.33 (m, 1H), 2.83 (s, 3H), 2.68 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H)	511.1

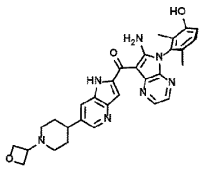
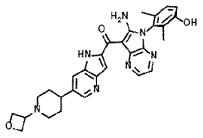
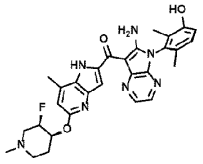
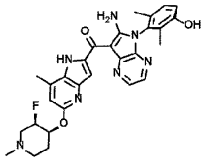
[541]

310		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.56 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.03 - 6.92 (m, 2H), 6.43 (d, *J* = 7.6 Hz, 1H), 3.98 (d, *J* = 6.0 Hz, 2H), 3.02-2.91 (m, 2H), 2.76 (s, 3H), 2.70 (s, 3H), 2.49 (s, 3H), 2.31 (s, 3H), 2.15-2.10 (m, 2H), 2.03-1.96 (m, 3H), 1.92 (s, 3H), 1.87 (s, 3H), 1.57-1.50 (m, 2H).	567.4
311		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 7.55 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.04 - 6.91 (m, 2H), 6.45 (d, *J* = 7.6 Hz, 1H), 4.02 (d, *J* = 6.0 Hz, 2H), 3.19-3.16 (m, 2H), 2.76 (s, 3H), 2.71 (s, 3H), 2.51 (s, 3H), 2.49 (s, 3H), 2.46-2.42 (m, 1H), 2.10-2.00 (m, 4H), 1.92 (s, 3H), 1.87 (s, 3H), 1.67-1.60 (m, 2H).	567.4
312		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.56 (s, 1H), 7.17 (d, *J* = 8.0 Hz, 1H), 7.04-6.96 (m, 2H), 6.47 (d, *J* = 7.6 Hz, 1H), 4.21-4.09 (m, 2H), 3.17-3.11 (m, 1H), 2.98-2.89 (m, 1H), 2.66 (s, 3H), 2.65 (s, 3H), 2.44 (q, *J* = 8.8 Hz, 1H), 2.24-2.12 (m, 1H), 1.93 (s, 3H), 1.91-1.84 (m, 5H), 1.83-1.73 (m, 1H).	525.5
313		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.56 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.05-6.95 (m, 2H), 6.47 (d, *J* = 7.6 Hz, 1H), 4.23-4.09 (m, 2H), 3.19-3.13 (m, 1H), 3.01-2.91 (m, 1H), 2.67 (s, 6H), 2.47 (q, *J* = 8.8 Hz, 1H), 2.22-2.11 (m, 1H), 1.93 (s, 3H), 1.92-1.85 (m, 5H), 1.84-1.74 (m, 1H).	525.4

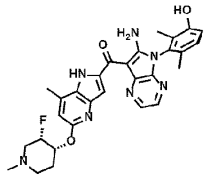
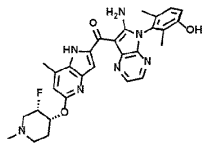
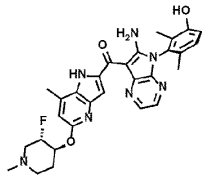
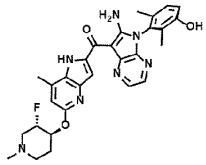
[542]

314		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.52 (s, 1H), 7.19-7.14 (m, 2H), 6.99 (d, J = 8.4 Hz, 1H), 4.75-4.72 (m, 2H), 4.69-4.65 (m, 2H), 3.58 (t, J = 6.8 Hz, 1H), 2.97 (d, J = 10.8 Hz, 2H), 2.88-2.83 (m, 1H), 2.80 (s, 3H), 2.10-2.06 (m, 2H), 2.02-1.96 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	552.3
315		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 2.8 Hz, 1H), 7.53 (s, 1H), 7.33 (s, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 4.85-4.83 (m, 2H), 4.79-4.75 (m, 2H), 4.05-4.12 (m, 1H), 3.33 (s, 2H), 3.14-3.08 (m, 1H), 2.87 (s, 3H), 2.61-2.55 (m, 2H), 2.19-2.10 (m, 4H), 1.94 (s, 3H), 1.89 (s, 3H).	552.3
316		(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.24 (s, 1H), 7.14 (d, J = 8.4 Hz, 1H), 7.03 - 6.86 (m, 2H), 6.43 (d, J = 7.6 Hz, 1H), 3.98 (d, J = 6.0 Hz, 2H), 3.05-2.91 (m, 2H), 2.59 (s, 6H), 2.32 (s, 3H), 2.30-2.26 (m, 1H), 2.17-2.12 (m, 2H), 2.07-1.98 (m, 3H), 1.91 (s, 3H), 1.86 (s, 3H), 1.55-.42 (m, 2H), 1.18-1.06 (m, 4H).	593.4
317		(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.24 (s, 1H), 7.14 (d, J = 8.4 Hz, 1H), 7.02-6.90 (m, 2H), 6.43 (d, J = 7.6 Hz, 1H), 3.98 (d, J = 6.0 Hz, 2H), 3.05-2.92 (m, 2H), 2.59 (s, 6H), 2.33 (s, 3H), 2.31-2.26 (m, 1H), 2.19-2.13 (m, 2H), 2.08-1.96 (m, 3H), 1.91 (s, 3H), 1.86 (s, 3H), 1.55-1.45 (m, 2H), 1.18-1.06 (m, 4H).	593.4

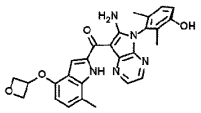
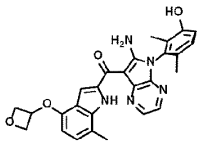
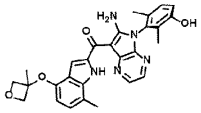
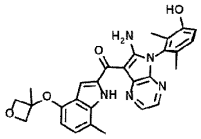
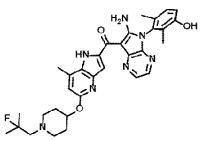
[543]

318		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 3.2 Hz, 1H), 8.40 (s, 1H), 8.08 (s, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.68 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.77-4.74 (m, 2H), 4.70-4.66 (m, 2H), 3.61-3.57 (m, 1H), 3.02-2.97 (m, 2H), 2.85 (s, 1H), 2.08 (m, 2H), 2.04-1.96 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	538.2
319		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.45 (d, J = 3.2 Hz, 1H), 8.40 (d, J = 1.6 Hz, 1H), 8.08 (s, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.69 (s, 1H), 7.17 (d, J = 8.8 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.76 (s, 2H), 4.70-4.66 (m, 2H), 3.60 (m, 1H), 3.00 (m, 2H), 2.91-2.81 (m, 1H), 2.13-2.07 (m, 2H), 2.04-1.96 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	538.2
320		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.69 (d, J = 0.8 Hz, 1H), 5.35-5.03 (m, 1H), 4.91 (s, 1H), 3.26-3.14 (m, 1H), 2.93-2.82 (m, 1H), 2.74 (s, 3H), 2.63-2.50 (m, 1H), 2.40 (s, 1H), 2.35 (s, 3H), 2.23-2.16 (m, 1H), 2.04-1.98 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H).	544.2
321		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.69 (d, J = 0.8 Hz, 1H), 5.25-5.04(m, 1H), 4.95 (s, 1H), 3.21-3.14 (m, 1H), 2.94-2.81 (m, 1H), 2.74 (s, 3H), 2.62-2.49 (m, 1H), 2.41 (s, 1H), 2.36 (s, 3H), 2.22-2.14 (m, 1H), 2.01-1.98 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	544.2

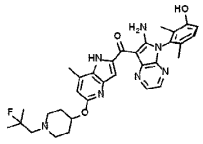
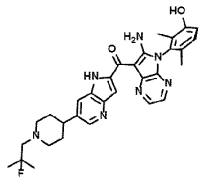
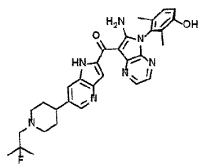
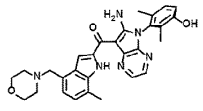
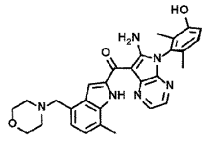
[544]

322		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.39 (s, 1H), 7.20 (d, J = 8.4 Hz, 1H), 7.02 (d, J = 8.4 Hz, 1H), 6.72 (s, 1H), 5.39-5.26 (m, 1H), 5.18-5.02 (m, 1H), 3.31-2.99 (m, 2H), 2.92-2.80 (m, 1H), 2.77 (s, 3H), 2.70-2.60 (m, 1H), 2.52 (s, 3H), 2.30-2.21 (m, 1H), 2.15-2.08 (m, 1H), 1.96 (s, 3H), 1.92 (s, 3H).	544.2
323		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.35 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.34-5.16 (m, 1H), 5.07-5.03 (m, 1H), 3.18-3.07 (m, 2H), 2.92-2.80 (m, 1H), 2.72 (s, 3H), 2.62-2.47 (m, 1H), 2.35 (s, 3H), 2.24-2.14 (m, 1H), 2.05-1.97 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	544.2
324		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.32-5.15 (m, 1H), 4.84-4.64 (m, 2H), 3.07-2.92 (m, 1H), 2.73 (s, 4H), 2.63-2.51 (m, 1H), 2.49-2.40 (m, 1H), 2.40-2.28 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84-1.72 (m, 1H).	544.3
325		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.35 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.65 (s, 1H), 5.33-5.12 (m, 1H), 4.85-4.65 (m, 2H), 3.03-2.96 (m, 1H), 2.79-2.67 (m, 4H), 2.64-2.52 (m, 1H), 2.50-2.41 (m, 1H), 2.40-2.28 (m, 4H), 1.93 (s, 3H), 1.89 (s, 3H), 1.85-1.72 (m, 1H).	544.3

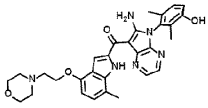
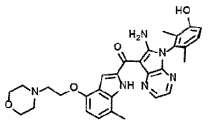
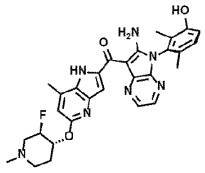
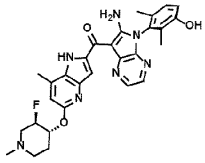
[545]

326		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(옥세탄-3-일옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.55 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.00-6.95 (m, 2H), 6.07 (d, *J* = 7.6 Hz, 1H), 5.44-5.38 (m, 1H), 5.09 (t, *J* = 6.4 Hz, 2H), 4.83-4.80 (m, 2H), 2.66 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	484.2
327		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(옥세탄-3-일옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.55 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.99-6.96 (m, 2H), 6.07 (d, *J* = 8.0 Hz, 1H), 5.44-5.38 (m, 1H), 5.09 (t, *J* = 6.8 Hz, 2H), 4.83-4.80 (m, 2H), 2.66 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	484.2
328		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.03-6.93 (m, 2H), 6.02 (d, *J* = 7.6 Hz, 1H), 5.02 (d, *J* = 6.8 Hz, 2H), 4.68 (d, *J* = 6.8 Hz, 2H), 2.66 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.82 (s, 3H).	498.2
329		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 2.4 Hz, 1H), 7.97 (d, *J* = 2.4 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.06-6.90 (m, 2H), 6.02 (d, *J* = 7.6 Hz, 1H), 5.02 (d, *J* = 6.8 Hz, 2H), 4.68 (d, *J* = 6.8 Hz, 2H), 2.65 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H), 1.82 (s, 3H).	498.2
330		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((1-(2-플루오로-2-메틸프로필)피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 2.8 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.65 (s, 1H), 5.11 (s, 1H), 3.11-2.99 (m, 2H), 2.78-2.63 (m, 7H), 2.16-2.09 (m, 2H), 1.88 (s, 3H), 1.93 (s, 4H), 1.44-1.37 (m, 6H).	586.4

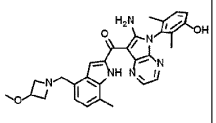
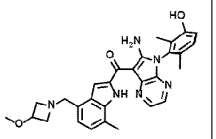
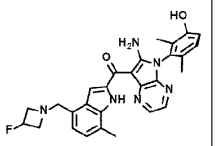
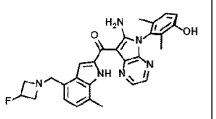
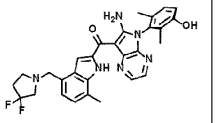
[546]

331		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((1-(2-플루오로-2-메틸프로필)피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 2.4 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.62 (s, 1H), 5.05 (td, J = 4.0, 8.0 Hz, 1H), 2.97-2.87 (m, 2H), 2.71 (s, 3H), 2.59-2.45 (m, 4H), 2.11-2.04 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.87-1.78 (m, 2H), 1.43-1.32 (m, 6H).	586.4
332		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(2-플루오로-2-메틸프로필)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, J = 3.2 Hz, 1H), 8.38 (d, J = 1.2 Hz, 1H), 8.06 (s, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.67 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 3.22 (d, J = 11.6 Hz, 2H), 2.79 (t, J = 4.0 Hz, 1H), 2.69-2.59 (m, 2H), 2.43 (t, J = 10.8 Hz, 2H), 2.08-1.94 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H), 1.44 (s, 3H).	556.4
333		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(2-플루오로-2-메틸프로필)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, J = 3.2 Hz, 1H), 8.38 (d, J = 1.2 Hz, 1H), 8.06 (s, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.67 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.18 (d, J = 11.6 Hz, 2H), 2.83-2.71 (m, 1H), 2.66-2.52 (m, 2H), 2.37 (t, J = 10.8 Hz, 2H), 2.05-1.90 (m, 7H), 1.88 (s, 3H), 1.43 (s, 3H), 1.38 (s, 3H).	556.4
334		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(모폴리노메틸)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.68 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.11 (d, J = 7.2 Hz, 1H), 7.03 (d, J = 7.2 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.89 (s, 2H), 3.72 (t, J = 4.4 Hz, 4H), 2.74 (s, 3H), 2.61 (s, 4H), 1.93 (s, 3H), 1.89 (s, 3H).	511.2
335		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.68 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.14 (s, 1H), 7.10-7.06 (m, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.08 (s, 2H), 3.79-3.72	511.2

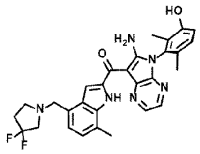
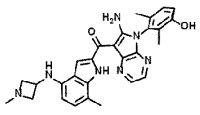
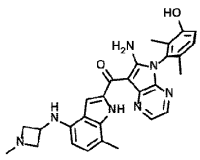
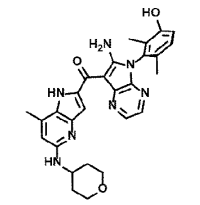
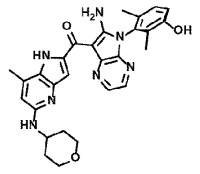
[547]

		4-(모폴리노메틸)-1H-인돌-2-일)메탄온	(m, 4H), 2.80 (s, 4H), 2.76 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	
336		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(2-모폴리노에톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 7.03-6.97 (m, 2H), 6.47 (d, J = 8.0 Hz, 1H), 4.31 (t, J = 5.6 Hz, 2H), 3.77-3.73 (m, 4H), 2.95 (t, J = 5.6 Hz, 2H), 2.75-2.71 (m, 4H), 2.67 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	541.3
337		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(2-모폴리노에톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 7.03-6.97 (m, 2H), 6.48 (d, J = 8.0 Hz, 1H), 4.31 (t, J = 5.4 Hz, 2H), 3.77-3.74 (m, 4H), 2.94 (t, J = 5.2 Hz, 2H), 2.74-2.70 (m, 4H), 2.67 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	541.3
338		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 2.8 Hz, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.24-5.21 (m, 1H), 4.83-4.66 (m, 2H), 3.03-2.96 (m, 1H), 2.81-2.74 (m, 1H), 2.72 (s, 3H), 2.63-2.52 (m, 1H), 2.50-2.41 (m, 1H), 2.37 (s, 3H), 2.35-2.30 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84-1.77 (m, 1H).	544.3
339		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.30-5.18 (m, 1H), 4.82-4.68 (m, 2H), 3.08-2.92 (m, 1H), 2.79-2.75 (m, 1H), 2.73 (s, 3H), 2.63-2.52 (m, 1H), 2.50-2.41 (m, 1H), 2.38 (s, 3H), 2.34-2.31 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.85-1.73 (m, 1H).	544.3

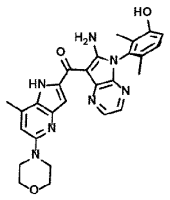
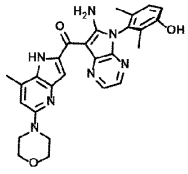
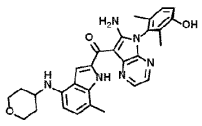
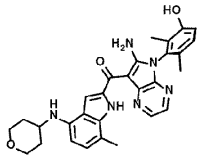
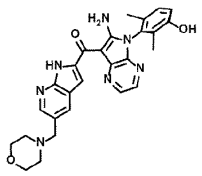
[548]

340		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (dd, *J* = 1.2, 3.2 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.60 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.11 (d, *J* = 7.2 Hz, 1H), 7.00-6.95 (m, 2H), 4.05 (t, *J* = 6.0 Hz, 1H), 3.99 (s, 2H), 3.64 (t, *J* = 6.8 Hz, 2H), 3.25 (s, 3H), 3.16-3.12 (m, 2H), 2.74 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	511.2
341		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (dd, *J* = 1.2, 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.61 (s, 1H), 7.16 (t, *J* = 8.8 Hz, 2H), 7.04 (d, *J* = 7.2 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.25 (s, 2H), 4.18-4.10 (m, 1H), 3.94-3.86 (m, 2H), 3.52-3.43 (m, 2H), 3.28 (s, 3H), 2.75 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	511.2
342		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-플루오로아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.61 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.12 (d, *J* = 6.8 Hz, 1H), 7.03-6.95 (m, 2H), 5.27-5.07 (m, 1H), 4.11 (s, 2H), 3.86-3.74 (m, 2H), 3.54-3.44 (m, 2H), 2.75 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	499.2
343		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-플루오로아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.61 (s, 1H), 7.17 (d, *J* = 8.0 Hz, 1H), 7.12 (d, *J* = 7.6 Hz, 1H), 6.99 (dd, *J* = 5.2, 7.6 Hz, 2H), 5.26 - 5.06 (m, 1H), 4.10 (s, 2H), 3.85-3.72 (m, 2H), 3.50-3.43 (m, 2H), 2.75 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	499.2
344		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.02 (br s, 1H), 8.39-8.24 (m, 1H), 7.96 (br s, 1H), 7.53 (s, 1H), 7.09 (dd, *J* = 7.6, 16.8 Hz, 2H), 6.96 (dd, *J* = 8.0, 10.4 Hz, 2H), 3.92 (s, 2H), 2.91 (t, *J* = 13.6 Hz, 2H), 2.75 (t, J = 6.8 Hz, 2H), 2.68 (s, 3H), 2.30 -2.20 (m, 2H), 1.83 (s, 3H), 1.76 (s, 3H).	531.1

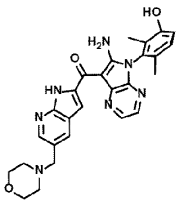
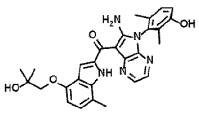
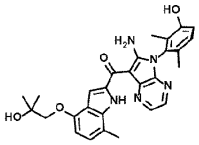
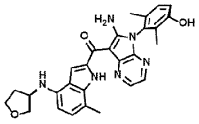
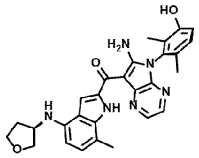
[549]

345		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (s, 1H), 9.69 (s, 1H), 8.38 (d, J = 2.8 Hz, 1H), 8.02 (d, J = 2.8 Hz, 1H), 7.57 (br s, 1H), 7.15-7.07 (m, 2H), 7.02-6.93 (m, 2H), 3.92 (br s, 2H), 3.00-2.83 (m, 2H), 2.80-2.66 (m, 5H), 2.32-2.20 (m, 2H), 1.83 (s, 3H), 1.76 (s, 3H).	531.1
346		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 2.4 Hz, 1H), 7.97 (d, J = 2.4 Hz, 1H), 7.58 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.93 (d, J = 7.2 Hz, 1H), 5.97 (d, J = 7.2 Hz, 1H), 4.42-4.33 (m, 1H), 4.17 (t, J = 7.2 Hz, 2H), 3.62-3.52 (m, 2H), 2.68 (s, 3H), 2.62 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	496.2
347		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.8 Hz, 1H), 7.58 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.93 (d, J = 7.2 Hz, 1H), 5.98 (d, J = 7.2 Hz, 1H), 4.35-4.27 (m, 1H), 4.10 - 4.00 (m, 2H), 3.41-3.37 (m, 2H), 2.62 (s, 3H), 2.58 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	496.2
348		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((테트라하이드로-2H-피란-4-일)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.27 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 4.08-3.97 (m, 3H), 3.66-3.57 (m, 2H), 2.65 (s, 3H), 2.08-2.02 (m, 2H), 1.92 (s, 3H), 1.87 (s, 3H), 1.60-1.49 (m, 2H).	512.3
349		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((테트라하이드로-2H-피란-4-일)아미노)-	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.62 (s, 1H), 5.05 (td, J = 4.0, 8.0 Hz, 1H), 2.97-2.87 (m, 2H), 2.71 (s, 3H), 2.59-2.45 (m, 4H), 2.11-2.04 (m, 2H), 1.93 (s, 3H), 1.88 (s,	512.2

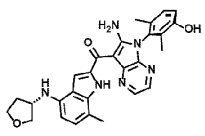
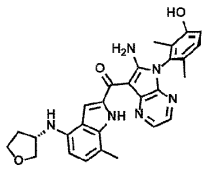
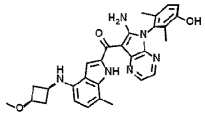
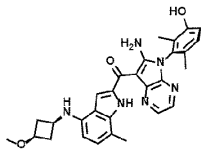
[550]

		1H-피롤로[3,2-b]피리딘-2-일)메탄온	3H), 1.87-1.78 (m, 2H), 1.43-1.32 (m, 6H).	
350		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-모폴리노-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 8.32 (s, 1H), 7.96 (s, 1H), 7.21 (s, 1H), 7.11 (d, J = 8.4 Hz, 1H), 6.97 (d, J = 8.4 Hz, 1H), 6.87 (s, 1H), 3.76-3.72 (m, 4H), 3.47-3.44 (m, 4H), 2.64 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H).	498.2
351		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-모폴리노-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 8.36 (d, J = 2.0 Hz, 1H), 7.99 (d, J = 2.4 Hz, 1H), 7.23 (d, J = 1.2 Hz, 1H), 7.12 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.88 (s, 1H), 3.76-3.72 (m, 4H), 3.47-3.44 (m, 4H), 2.65 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H).	498.2
352		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.58 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.96 (dd, J = 8.0, 16.4 Hz, 2H), 6.26 (d, J = 7.6 Hz, 1H), 4.06-4.00 (m, 2H), 3.73-3.66 (m, 1H), 3.63-3.55 (m, 2H), 2.62 (s, 3H), 2.11 (d, J = 11.6 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.69-1.58 (m, 2H).	511.1
353		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.58 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.96 (dd, J = 8.0, 16.4 Hz, 2H), 6.26 (d, J = 7.6 Hz, 1H), 4.03 (d, J = 10.8 Hz, 2H), 3.73-3.66 (m, 1H), 3.59 (t, J = 11.2 Hz, 2H), 2.62 (s, 3H), 2.10 (d, J = 12.0 Hz, 2H), 1.93 (s, 3H), 1.88 (s, 3H), 1.68-1.58 (m, 2H).	511.1
354		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-피롤로	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.76 (s, 1H), 9.67 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 8.39 (d, J = 2.0 Hz, 1H), 8.06 (d, J = 1.6 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.51 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4	498.2

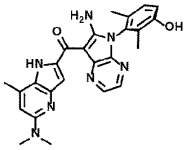
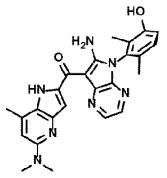
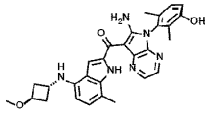
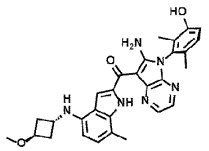
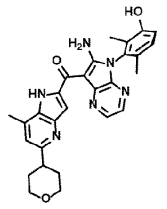
[551]

		[2,3-b]피리딘-2-일)메탄온	Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.66-3.52 (m, 6H), 2.40 (s, 4H), 1.83 (s, 3H), 1.76 (s, 3H).	
355		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.77 (s, 1H), 9.68 (s, 1H), 8.41 (d, *J* = 3.2 Hz, 1H), 8.39 (s, 1H), 8.06 (s, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.51 (s, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.59 (d, *J* = 6.8 Hz, 6H), 2.40 (s, 4H), 1.83 (s, 3H), 1.76 (s, 3H).	498.2
356		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(2-하이드록시-2-메틸프로폭시)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.89 (s, 1H), 9.67 (s, 1H), 8.36 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.49 (d, *J* = 2.0 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.0 Hz, 2H), 6.44 (d, *J* = 8.0 Hz, 1H), 4.71 (s, 1H), 3.82 (s, 2H), 2.61 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.29 (s, 6H).	500.2
357		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(2-하이드록시-2-메틸프로폭시)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.89 (s, 1H), 9.68 (s, 1H), 8.36 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.49 (d, *J* = 2.0 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 7.01-6.96 (m, 2H), 6.44 (d, *J* = 8.0 Hz, 1H), 4.72 (s, 1H), 3.82 (s, 2H), 2.61 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.29 (s, 6H).	500.2
358		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.03-6.90 (m, 2H), 6.13 (d, *J* = 7.6 Hz, 1H), 4.30-4.20 (m, 1H), 4.09-3.98 (m, 2H), 3.92-3.78 (m, 2H), 2.61 (s, 3H), 2.40-2.28 (m, 1H), 2.12-2.03 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	497.1
359		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-테트라하이드로	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.57 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.05-6.88 (m, 2H), 6.13 (d, *J* = 7.5 Hz, 1H), 4.35-4.17 (m, 1H), 4.09-3.98 (m,	497.1

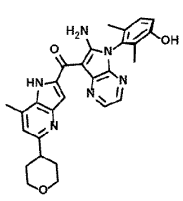
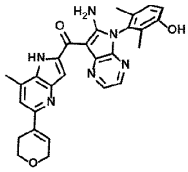
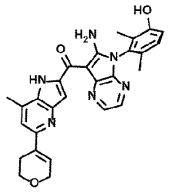
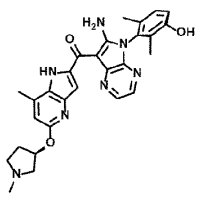
[552]

		퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	2H), 3.92-3.78 (m, 2H), 2.61 (s, 3H), 2.40-2.29 (m, 1H), 2.10-2.02 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	
360		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.01-6.90 (m, 2H), 6.14 (d, *J* = 7.6 Hz, 1H), 4.29-4.19 (m, 1H), 4.08-3.99 (m, 2H), 3.92-3.80 (m, 2H), 2.62 (s, 3H), 2.41-2.28 (m, 1H), 2.09-2.02 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	497.2
361		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.57 (d, *J* = 1.2 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.00-6.93 (m, 2H), 6.14 (d, *J* = 7.6 Hz, 1H), 4.31-4.22 (m, 1H), 4.08 - 4.01 (m, 2H), 3.91-3.80 (m, 2H), 2.62 (s, 3H), 2.39-2.29 (m, 1H), 2.10-2.03 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	497.2
362		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1s,3S)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.76 (s, 1H), 9.67 (s, 1H), 8.34 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.68 (d, *J* = 2.0 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.86 (d, *J* = 7.6 Hz, 1H), 6.07 (d, *J* = 4.4 Hz, 1H), 5.92 (d, *J* = 7.6 Hz, 1H), 3.68 (q, *J* = 7.2 Hz, 1H), 3.61-3.49 (m, 1H), 3.16 (s, 3H), 2.81-2.71 (m, 2H), 2.53 (s, 3H), 1.91-1.80 (m, 5H), 1.76 (s, 3H).	511.2
363		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1s,3S)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.77 (s, 1H), 9.69 (s, 1H), 8.34 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.68 (d, *J* = 2.0 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 6.86 (d, *J* = 7.6 Hz, 1H), 6.07 (d, *J* = 6.4 Hz, 1H), 5.92 (d, *J* = 7.6 Hz, 1H), 3.68 (t, *J* = 6.8 Hz, 1H), 3.61-3.51 (m, 1H), 3.17 (s, 3H), 2.81-2.71 (m, 2H), 2.53 (s, 3H), 1.91-1.81 (m, 5H), 1.76 (s, 3H).	511.2

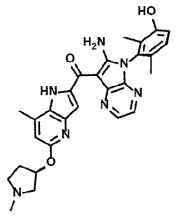
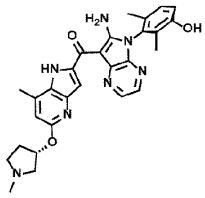
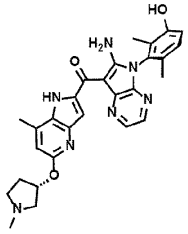
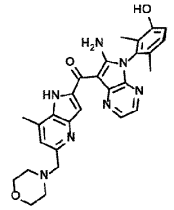
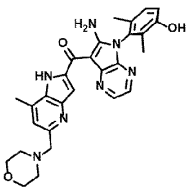
[553]

364		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸아미노)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.51 (s, 1H), 8.36 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.32 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.84 (s, 1H), 3.25 (s, 6H), 2.79 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	456.2
365		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸아미노)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.31 (s, 1H), 7.17 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.84 (s, 1H), 3.25 (s, 6H), 2.78 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	456.2
366		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1r,3R)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 3.2 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.92 (d, *J* = 7.6 Hz, 1H), 5.99 (d, *J* = 7.6 Hz, 1H), 4.21-4.09 (m, 2H), 3.30 (s, 3H), 2.61 (s, 3H), 2.50-2.39 (m, 2H), 2.37-2.27 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	511.4
367		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1r,3R)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 2.8 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.58 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.92 (d, *J* = 7.2 Hz, 1H), 5.99 (d, *J* = 7.6 Hz, 1H), 4.22-4.07 (m, 2H), 3.30 (s, 3H), 2.61 (s, 3H), 2.48-2.39 (m, 2H), 2.37-2.29 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	511.4
368		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(테트라하이드로-2H-피란-4-일)-1H-피	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.80 (s, 1H), 9.70 (s, 1H), 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 3.2 Hz, 1H), 7.51 (d, *J* = 2.0 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 7.10 (s, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.98 (dd, *J* = 3.2, 9.6 Hz, 2H), 3.50-3.45	497.3

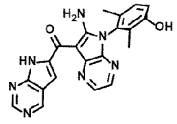
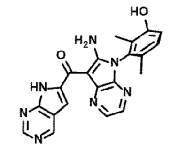
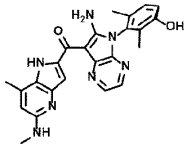
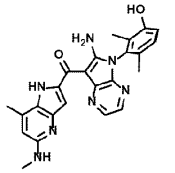
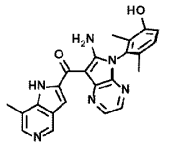
[554]

		롤로[3,2-b]피리딘-2-일)메탄온	(m, 2H), 3.02-2.95 (m, 1H), 2.69 (s, 3H), 1.91-1.80 (m, 7H), 1.76 (s, 3H).	
369		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(테트라하이드로-2H-피란-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.80 (s, 1H), 9.70 (s, 1H), 8.39 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.51 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.10 (s, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.98 (dd, J = 2.8, 10.0 Hz, 2H), 3.51-3.46 (m, 2H), 3.00 (dd, J = 4.8, 10.8 Hz, 1H), 2.69 (s, 3H), 1.92-1.79 (m, 7H), 1.76 (s, 3H).	497.3
370		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(3,6-다이하이드로-2H-피란-4-일)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.86 (s, 1H), 9.69 (s, 1H), 8.40 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.55 (d, J = 2.0 Hz, 1H), 7.46 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.3 Hz, 1H), 6.67 (s, 1H), 4.29 (d, J = 2.4 Hz, 2H), 3.85 (t, J = 5.4 Hz, 2H), 2.72 (s, 3H), 2.67 (s, 2H), 1.83 (s, 3H), 1.76 (s, 3H).	495.2
371		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(3,6-다이하이드로-2H-피란-4-일)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.86 (s, 1H), 9.69 (s, 1H), 8.40 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.55 (d, J = 2.0 Hz, 1H), 7.46 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.66 (s, 1H), 4.29 (d, J = 2.8 Hz, 2H), 3.85 (t, J = 5.6 Hz, 2H), 2.72 (s, 3H), 2.67 (s, 2H), 1.83 (s, 3H), 1.76 (s, 3H).	495.2
372		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((R)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 2.8 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.65 (s, 1H), 5.55-5.49 (m, 1H), 2.93-2.92 (m, 3H), 2.72 (s, 3H), 2.55-2.43 (m, 2H), 2.42 (s, 3H), 2.07-2.00 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2

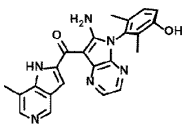
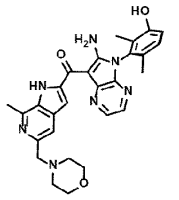
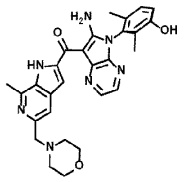
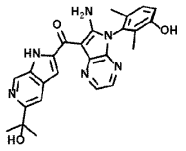
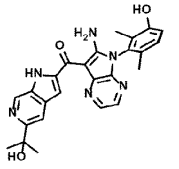
[555]

373		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((R)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 2.8 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.65 (s, 1H), 5.57-5.53 (m, 1H), 3.04 (d, J = 4.4 Hz, 3H), 2.72 (s, 3H), 2.68-2.62 (m, 1H), 2.50 (s, 3H), 2.48-2.44 (m, 1H), 2.13-2.05 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
374		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((S)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40-8.24 (m, 1H), 8.03-7.89 (m, 1H), 7.41-7.29 (m, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 6.62 (d, J = 9.6 Hz, 1H), 5.55-5.45 (m, 1H), 2.92 (s, 3H), 2.74-2.64 (m, 3H), 2.55-2.45 (m, 2H), 2.42 (s, 3H), 2.11-1.98 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
375		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((S)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (s, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.64 (s, 1H), 5.55-5.45 (m, 1H), 2.98-2.85 (m, 3H), 2.71 (s, 3H), 2.54-2.42 (m, 2H), 2.41 (s, 3H), 2.07-1.98 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
376		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 2.8 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.53 (s, 1H), 7.36 (d, J = 0.8 Hz, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.76 - 3.68 (m, 6H), 2.80 (s, 3H), 2.60-2.48 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
377		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.53 (s, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.78-3.69 (m, 6H), 2.80 (s, 3H), 2.56 (br s, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2

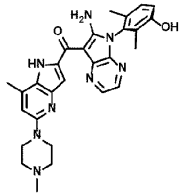
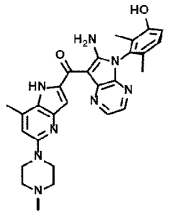
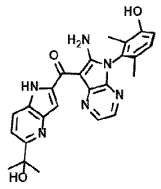
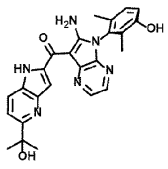
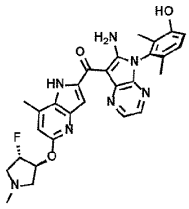
[556]

		피롤로[3,2-b]피리딘-2-일)메탄온		
378		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7H-피롤로[2,3-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (br s, 1H), 9.72 (br s, 1H), 9.25 (s, 1H), 8.93 (s, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.02 (d, J = 2.8 Hz, 1H), 7.80 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H).	400.0
379		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7H-피롤로[2,3-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (br s, 1H), 9.72 (br s, 1H), 9.25 (s, 1H), 8.93 (s, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.02 (d, J = 2.8 Hz, 1H), 7.80 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.3 Hz, 1H), 1.83 (s, 3H), 1.76 (s, 3H).	400.0
380		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(메틸아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.28 (d, J = 3.2 Hz, 1H), 8.05 (d, J = 2.8 Hz, 1H), 7.26 (s, 1H), 7.10 (s, 2H), 6.41 (s, 1H), 3.08 (s, 3H), 2.71 (s, 3H), 1.98 (s, 3H), 1.95 (s, 3H).	442.2
381		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(메틸아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.25 (s, 1H), 8.05 (s, 1H), 7.16 (s, 3H), 6.47-6.37 (m, 1H), 3.06 (s, 3H), 2.75 (s, 3H), 1.97 (s, 3H), 1.92 (s, 3H).	442.2
382		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.01 (br s, 1H), 9.71 (br s, 1H), 8.88 (s, 1H), 8.39 (d, J = 2.8 Hz, 1H), 8.15 (s, 1H), 8.02 (d, J = 2.8 Hz, 1H), 7.65 (s, 1H), 7.13 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 2.65 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	413.1

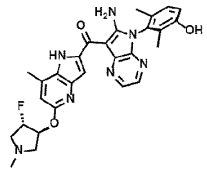
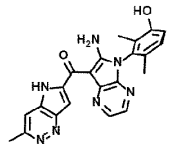
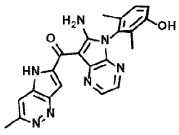
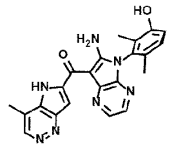
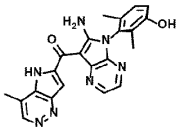
[557]

383		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.25 (br s, 1H), 9.77 (br s, 1H), 9.01 (br s, 1H), 8.39 (d, J = 2.8 Hz, 1H), 8.23 (br s, 1H), 8.14 (s, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.75 (s, 1H), 7.13 (d, J = 8.0 Hz, 1H), 7.02 (d, J = 8.0 Hz, 1H), 2.69 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	413.1
384		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.62 (s, 1H), 7.42 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.79-3.68 (m, 6H), 2.99 (s, 3H), 2.59 (s, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
385		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.42 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.78-3.70 (m, 6H), 2.99 (s, 3H), 2.59 (s, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
386		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.15 (s, 1H), 9.68 (s, 1H), 8.99 (s, 1H), 8.43 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.89 (s, 1H), 7.79 (d, J = 0.8 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.13 (s, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.51 (s, 6H).	457.2
387		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[2,3-c]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.15 (s, 1H), 9.68 (s, 1H), 8.99 (s, 1H), 8.43 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 2.8 Hz, 1H), 7.89 (s, 1H), 7.79 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.13 (s, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.51 (s, 6H).	457.2

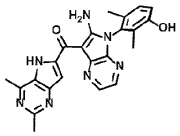
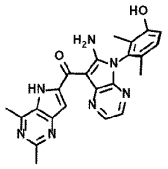
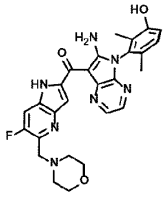
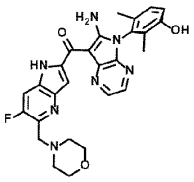
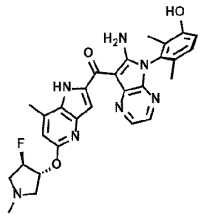
[558]

388		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(4-메틸피페라진-1-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (t, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 2.8 Hz, 1H), 7.34 (s, 1H), 7.16 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.89 (s, 1H), 3.64-3.54 (m, 4H), 2.73 (s, 3H), 2.63 (t, *J* = 4.8 Hz, 4H), 2.37 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	511.3
389		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(4-메틸피페라진-1-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.34 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.88 (s, 1H), 3.64-3.54 (m, 4H), 2.73 (s, 3H), 2.63 (t, *J* = 4.8 Hz, 4H), 2.37 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	511.3
390		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.88 (d, *J* = 3.2 Hz, 1H), 7.62 (s, 1H), 7.59 (d, *J* = 8.8 Hz, 1H), 7.07 (d, *J* = 8.4 Hz, 1H), 6.89 (d, *J* = 8.4 Hz, 1H), 1.83 (s, 3H), 1.78 (s, 3H), 1.55 (s, 6H).	457.2
391		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 2.8 Hz, 1H), 8.15 (d, *J* = 8.0 Hz, 1H), 8.01 (s, 1H), 7.74 (s, 1H), 7.70 (d, *J* = 8.4 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.01 (d, *J* = 8.4 Hz, 1H), 1.95 (s, 3H), 1.90 (s, 3H), 1.67 (s, 6H).	457.2
392		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 2.8 Hz, 1H), 8.00 (d, *J* = 2.8 Hz, 1H), 7.39 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.69 (s, 1H), 5.62-5.46 (m, 1H), 5.31-5.11 (m, 1H), 3.49-3.40 (m, 1H), 3.03-2.90 (m, 2H), 2.74 (s, 3H), 2.63 (dd, *J* = 4.4, 10.9 Hz, 1H), 2.43 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	530.2

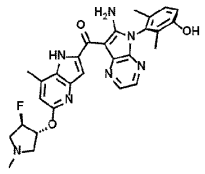
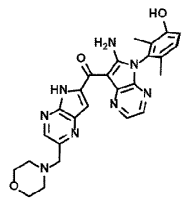
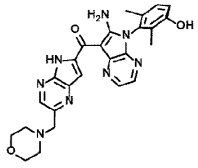
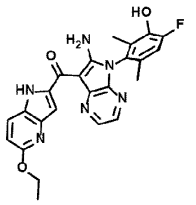
[559]

		로[3,2-b]피리딘-2-일)메탄온		
393		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 2.8 Hz, 1H), 7.99 (d, *J* = 2.8 Hz, 1H), 7.39 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.69 (s, 1H), 5.60-5.45 (m, 1H), 5.28-5.13 (m, 1H), 3.47-3.40 (m, 1H), 3.04-2.91 (m, 2H), 2.74 (s, 3H), 2.66-2.59 (m, 1H), 2.43 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	530.2
394		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.87 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.85 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	414.1
395		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.88 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.85 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	414.1
396		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.93 (br s, 1H), 8.40 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 3.2 Hz, 1H), 7.89 (s, 1H), 7.18 (d, *J* = 8.0 Hz, 1H), 7.00 (d, *J* = 8.0 Hz, 1H), 2.85 (s, 3H), 1.94 (s, 3H), 1.89 (s, 3H).	414.1
397		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.90 (s, 1H), 8.40 (d, *J* = 2.4 Hz, 1H), 8.03 (d, *J* = 2.4 Hz, 1H), 7.87 (s, 1H), 7.17 (d, *J* = 7.6 Hz, 1H), 7.00 (d, *J* = 7.6 Hz, 1H), 2.83 (s, 3H), 1.94 (s, 3H), 1.89 (s, 3H).	414.1

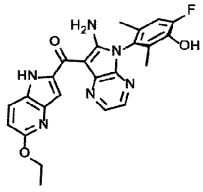
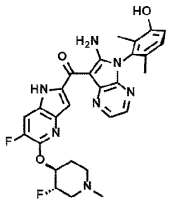
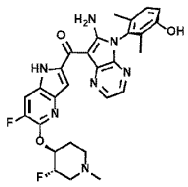
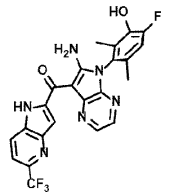
[560]

398		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2,4-다이메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.00 (s, 1H), 9.69 (s, 1H), 8.41 (d, J = 2.8 Hz, 1H), 8.04 (d, J = 3.2 Hz, 1H), 7.49 (s, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.83 (s, 3H), 2.64 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	428.2
399		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2,4-다이메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.01 (s, 1H), 9.70 (s, 1H), 8.41 (d, J = 2.4 Hz, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.49 (s, 1H), 7.13 (br d, J = 8.0 Hz, 1H), 7.00 (d, J = 8.0 Hz, 1H), 2.83 (s, 3H), 2.64 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	428.2
400		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.80 (s, 1H), 9.68 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 8.14 (s, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.94 (d, J = 10.8 Hz, 1H), 7.13 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.73 (d, J = 2.4 Hz, 2H), 3.57-3.53 (m, 4H), 3.40-3.37 (m, 2H), 3.30-3.29 (m, 2H), 1.83 (s, 3H), 1.75 (s, 3H).	516.2
401		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 13.87 - 13.72 (m, 1H), 9.68 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 8.14 (s, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.94 (d, J = 10.8 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.0 Hz, 1H), 3.73 (s, 2H), 3.57-3.53 (m, 4H), 3.38 (s, 2H), 3.27 (s, 2H), 1.83 (s, 3H), 1.75 (s, 3H).	516.2
402		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.5 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.69 (d, J = 0.8 Hz, 1H), 5.57 (dd, J = 4.4, 19.6 Hz, 1H), 5.34-5.18 (m, 1H), 3.54 (dd, J = 6.4, 11.2 Hz, 1H), 3.18-3.11 (m, 1H), 3.11-3.05 (m, 1H), 2.83-2.76 (m, 1H), 2.74 (s, 3H), 2.52 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	529.6

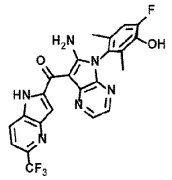
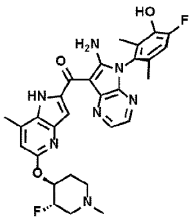
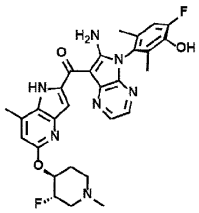
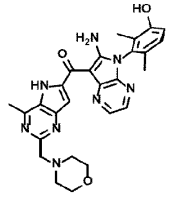
[561]

		로[3,2-b]피리딘-2-일)메탄온		
403		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.37 (d, *J* = 1.2 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.67 (s, 1H), 5.58-5.47 (m, 1H), 5.30-5.13 (m, 1H), 3.46 (dd, *J* = 6.0, 10.8 Hz, 1H), 3.06-2.99 (m, 1H), 2.96 (s, 1H), 2.72 (s, 3H), 2.65 (dd, *J* = 4.0, 11.2 Hz, 1H), 2.44 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	529.6
404		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.89 (s, 1H), 9.69 (s, 1H), 8.53 (s, 1H), 8.42 (d, *J* = 2.8 Hz, 1H), 8.03 (d, *J* = 2.8 Hz, 1H), 7.74 (d, *J* = 1.2 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.76 (s, 2H), 3.62-3.57 (m, 4H), 2.48-2.47 (m, 4H), 1.84 (s, 3H), 1.76 (s, 3H).	499.3
405		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.91 (s, 1H), 9.71 (s, 1H), 8.53 (s, 1H), 8.41 (d, *J* = 2.8 Hz, 1H), 8.03 (d, *J* = 2.8 Hz, 1H), 7.73 (d, *J* = 1.6 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.76 (s, 2H), 3.61-3.57 (m, 4H), 2.48-2.47 (m, 4H), 1.83 (s, 3H), 1.76 (s, 3H).	499.3
406		(S)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}HNMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.51 (s, 1H), 7.10 (d, *J* = 11.2 Hz, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 4.40 (d, *J* = 7.2 Hz, 2H), 1.94 (s, 3H), 1.92 (s, 3H), 1.44 (t, *J* = 7.2 Hz, 3H).	461.1

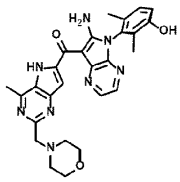
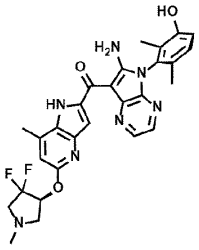
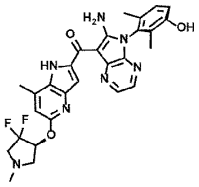
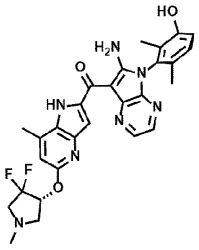
[562]

407		(R)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.50 (s, 1H), 7.09 (d, *J* = 11.2 Hz, 1H), 6.79 (d, *J* = 8.8 Hz, 1H), 4.39 (d, *J* = 7.2 Hz, 2H), 1.93 (s, 3H), 1.91 (s, 3H), 1.43 (t, *J* = 7.2 Hz, 3H).	461.1
408		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, *J* = 2.8 Hz, 1H), 7.96 (d, *J* = 2.8 Hz, 1H), 7.89 (d, *J* = 10.4 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.43-5.30 (m, 1H), 4.81-4.71 (m, 1H), 3.13-2.89 (m, 1H), 2.81-2.71 (m, 1H), 2.67-2.54 (m, 1H), 2.53-2.43 (m, 1H), 2.38 (s, 4H), 1.93 (s, 3H), 1.88 (s, 3H), 1.87-1.75 (m, 1H).	548.2
409		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 2.0 Hz, 1H), 7.95 (d, *J* = 2.4 Hz, 1H), 7.87 (d, *J* = 10.4 Hz, 1H), 7.46 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.41-5.30 (m, 1H), 4.74 (dd, *J* = 6.8, 10.8 Hz, 1H), 3.08-2.92 (m, 1H), 2.80-2.69 (m, 1H), 2.65-2.52 (m, 1H), 2.49-2.41 (m, 1H), 2.37 (s, 4H), 1.92 (s, 3H), 1.88 (s, 3H), 1.87-1.79 (m, 1H).	548.3
410		(S)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 3.2 Hz, 1H), 8.36 (d, *J* = 8.4 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.86 (s, 1H), 7.73 (d, *J* = 8.8 Hz, 1H), 7.10 (d, *J* = 10.8 Hz, 1H), 1.94 (s, 3H), 1.92 (s, 3H).	485.2

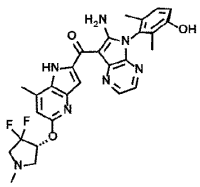
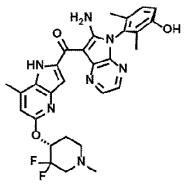
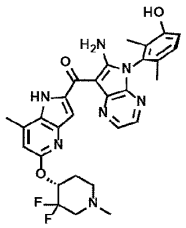
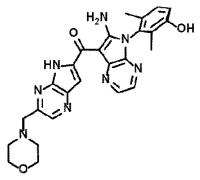
[563]

411		(R)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, *J* = 3.2 Hz, 1H), 8.35 (d, *J* = 8.4 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.85 (s, 1H), 7.73 (d, *J* = 8.8 Hz, 1H), 7.10 (d, *J* = 11.2 Hz, 1H), 1.94 (s, 3H), 1.92 (s, 3H).	485.2
412		(6-아미노-5-((S)-4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.38 (s, 1H), 7.10 (d, *J* = 11.2 Hz, 1H), 6.68 (s, 1H), 5.28-5.20 (m, 1H), 4.82-4.61 (m, 1H), 3.08-2.96 (m, 1H), 2.83-2.74 (m, 1H), 2.73 (s, 3H), 2.65-2.54 (m, 1H), 2.51-2.43 (m, 1H), 2.38 (s, 3H), 2.37-2.28 (m, 1H), 1.94 (s, 3H), 1.92 (s, 3H), 1.87-1.73 (m, 1H).	562.2
413		(6-아미노-5-((R)-4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.38 (s, 1H), 7.10 (d, *J* = 11.2 Hz, 1H), 6.68 (d, *J* = 0.8 Hz, 1H), 5.30-5.20 (m, 1H), 4.78-4.64 (m, 1H), 3.10-2.94 (m, 1H), 2.80-2.74 (m, 1H), 2.73 (s, 3H), 2.69-2.55 (m, 1H), 2.53-2.43 (m, 1H), 2.39 (s, 3H), 2.34 (dd, *J* = 6.4, 8.4 Hz, 1H), 1.94 (s, 3H), 1.92 (s, 3H), 1.87-1.74 (m, 1H).	562.2
414		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-2-(모폴리노메틸)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.04 (d, *J* = 0.8 Hz, 1H), 9.87 - 9.53 (m, 1H), 8.41 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 3.2 Hz, 1H), 7.59 (s, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 3.71 (s, 2H), 3.61-3.54 (m, 4H), 2.87 (s, 3H), 2.55-2.52 (m, 4H), 1.84 (s, 3H), 1.76 (s, 3H).	513.2

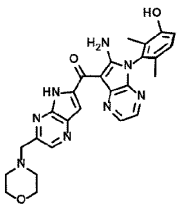
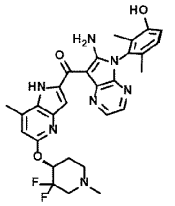
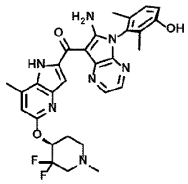
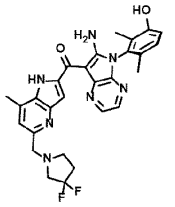
[564]

415		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-2-(모폴리노메틸)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 3.2 Hz, 1H), 7.50 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 4.09 (s, 2H), 3.85-3.79 (m, 4H), 3.01 (s, 3H), 2.98-2.80 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H).	513.2
416		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.72 (s, 1H), 5.71-5.56 (m, 1H), 3.40 (dd, *J* = 6.4, 10.4 Hz, 1H), 3.16-2.94 (m, 2H), 2.78 (dd, *J* = 4.8, 11.2 Hz, 1H), 2.74 (s, 3H), 2.42 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	548.2
417		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 7.99 (d, *J* = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.72 (s, 1H), 5.72-5.58 (m, 1H), 3.44 (dd, *J* = 6.4, 10.8 Hz, 1H), 3.20-3.01 (m, 2H), 2.88-2.81 (m, 1H), 2.75 (s, 3H), 2.46 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	548.2
418		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, *J* = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.34 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.70 (s, 1H), 5.71-5.55 (m, 1H), 3.42 (dd, J = 6.4, 10.8 Hz, 1H), 3.20-3.09 (m, 1H), 3.08-2.95 (m, 1H), 2.82 (dd, *J* = 4.8, 9.6 Hz, 1H), 2.71 (s, 3H), 2.44 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	548.3

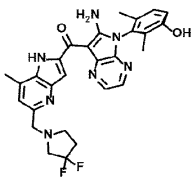
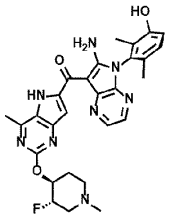
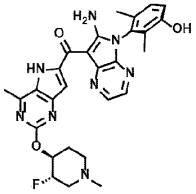
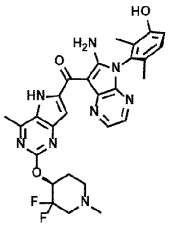
[565]

419		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, J = 3.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.30 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.71 (s, 1H), 5.79-5.68 (m, 1H), 3.70-3.58 (m, 1H), 3.48-3.33 (m, 2H), 3.18 (dd, J = 2.4, 11.6 Hz, 1H), 2.69 (s, 3H), 2.65 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	548.3
420		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.71 (s, 1H), 5.56-5.44 (m, 1H), 3.09-2.96 (m, 1H), 2.92-2.81 (m, 1H), 2.80-2.74 (m, 1H), 2.73 (s, 3H), 2.67-2.54 (m, 1H), 2.44 (s, 3H), 2.29-2.17 (m, 1H), 2.13-2.04 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	562.2
421		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.72 (s, 1H), 5.57-5.46 (m, 1H), 3.15-3.01 (m, 1H), 2.98-2.85 (m, 1H), 2.84-2.77 (m, 1H), 2.74 (s, 3H), 2.71-2.60 (m, 1H), 2.47 (s, 3H), 2.29-2.19 (m, 1H), 2.16-2.05 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	562.2
422		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.64 (s, 1H), 8.41 (s, 1H), 8.02 (d, J = 2.8 Hz, 1H), 7.58 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 3.87 (s, 2H), 3.78-3.71 (m, 4H), 2.62 (d, J = 4.4 Hz, 4H), 1.93 (s, 3H), 1.89 (s, 3H).	499.3

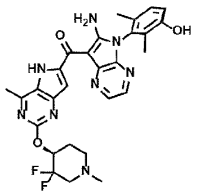
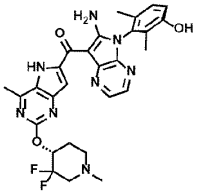
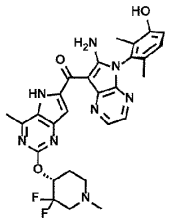
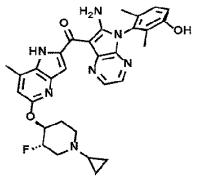
[566]

423		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.65 (s, 1H), 8.41 (d, J = 2.0 Hz, 1H), 8.03 (d, J = 2.8 Hz, 1H), 7.60 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.99 (s, 2H), 3.78 (t, J = 4.4 Hz, 4H), 2.73 (s, 4H), 1.94 (s, 3H), 1.89 (s, 3H).	499.3
424		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.71 (d, J = 0.8 Hz, 1H), 5.53-5.44 (m, 1H), 3.03-2.92 (m, 1H), 2.83-2.76 (m, 1H), 2.74 (s, 1H), 2.71-2.65 (m, 1H), 2.59-2.52 (m, 1H), 2.39 (s, 3H), 2.25-2.18 (m, 1H), 2.11-2.04 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	562.2
425		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (s, 1H), 7.99 (s, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.71 (s, 1H), 5.52-5.43 (m, 1H), 3.05-2.91 (m, 1H), 2.86-2.76(m, 1H), 2.73 (s, 3H), 2.70-2.61 (m, 1H), 2.59-2.50 (m, 1H), 2.39 (s, 3H), 2.26-2.17 (m, 1H), 2.11-2.01 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	562.2
426		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.55 (s, 1H), 7.35 (s, 1H), 7.23 (s, 1H), 6.99 (d, J = 8.4 Hz, 1H), 3.87 (s, 2H), 2.97 (t, J = 13.2 Hz, 2H), 2.87-2.84 (m, 2H), 2.82 (s, 3H), 2.40-2.20 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	532.2

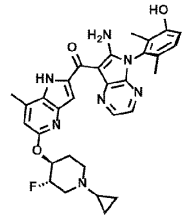
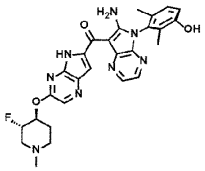
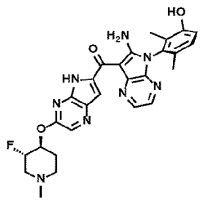
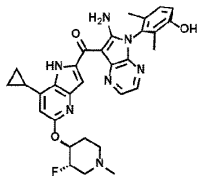
[567]

427		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.55 (s, 1H), 7.35 (s, 1H), 7.17 (s, 1H), 7.05 - 6.99 (m, 1H), 3.88 (s, 2H), 2.98 (t, *J* = 13.2 Hz, 2H), 2.87-2.83 (m, 2H), 2.83 (s, 3H), 2.40-2.20 (m, 2H), 1.94 (s, 3H), 1.89 (s, 3H).	532.2
428		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.23 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.31-5.20 (m, 1H), 4.80-4.69 (m, 1H), 3.07-2.94 (m, 1H), 2.86 (s, 3H), 2.80-2.70 (m, 1H), 2.64-2.52 (m, 1H), 2.50-2.40 (m, 1H), 2.37 (s, 4H), 1.94 (s, 3H), 1.89 (s, 3H), 1.88-1.79 (m, 1H).	545.2
429		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ = 8.36 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.25 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.33-5.21 (m, 1H), 4.80 - 4.69 (m, 1H), 3.08-2.94 (m, 1H), 2.87 (s, 3H), 2.81-2.70 (m, 1H), 2.64-2.53 (m, 1H), 2.50-2.41 (m, 1H), 2.37 (s, 4H), 1.93 (s, 3H), 1.89 (s, 3H), 1.87-1.77 (m, 1H).	545.2
430		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 3.2 Hz, 1H), 7.31 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.57-5.51 (m, 1H), 3.11-2.96 (m, 1H), 2.92 (s, 3H), 2.89-2.78 (m, 1H), 2.75-2.46 (m, 2H), 2.40 (s, 3H), 2.28-2.09 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	563.2

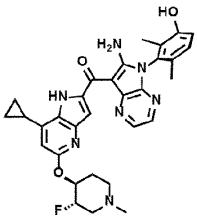
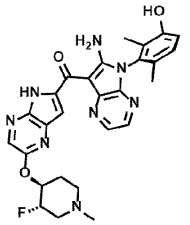
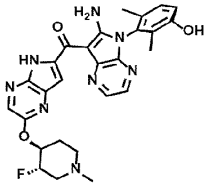
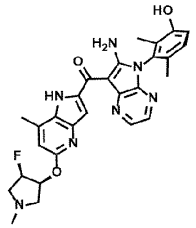
[568]

431		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 3.2 Hz, 1H), 7.28 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.58 - 5.48 (m, 1H), 3.05-2.95 (m, 1H), 2.90 (s, 3H), 2.87-2.76 (m, 1H), 2.74-2.53 (m, 2H), 2.40 (s, 3H), 2.28-2.06 (m, 2H), 1.93 (s, 3H), 1.89 (s, 3H).	563.2
432		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 15.43 (s, 1H), 8.34 (d, *J* = 3.2 Hz, 1H), 8.10 (d, *J* = 3.2 Hz, 1H), 7.38 (d, *J* = 2.0 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 5.67-5.61 (m, 1H), 3.08-2.96 (m, 1H), 2.93 (s, 3H), 2.90-2.78 (m, 1H), 2.76-2.68 (m, 1H), 2.64-2.56 (m, 1H), 2.42 (s, 3H), 2.39-2.00 (m, 3H), 1.97 (d, *J* = 11.2 Hz, 6H).	563.2
433		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, $CDCl_3$): δ 15.44 (s, 1H), 8.37 - 8.32 (m, 1H), 8.10 (d, *J* = 3.2 Hz, 1H), 7.37 (d, *J* = 1.6 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 5.68-5.59 (m, 1H), 3.09-2.97 (m, 1H), 2.94 (s, 3H), 2.90-2.78 (m, 1H), 2.77-2.66 (m, 1H), 2.63-2.54 (m, 1H), 2.42 (s, 3H), 2.39-2.00 (m, 3H), 1.96 (d, *J* = 11.2 Hz, 6H).	563.2
434		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, *J* = 3.2 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.40-7.34 (m, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.67 (s, 1H), 5.31-5.16 (m, 1H), 4.74-4.62 (m, 1H), 3.29-3.19 (m, 1H), 3.03-2.91 (m, 1H), 2.72 (s, 3H), 2.72-2.58 (m, 2H), 2.38-2.24 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86 (d, *J* = 4.0 Hz, 1H), 1.79-1.62 (m, 1H), 0.64-0.40 (m, 4H).	570.2

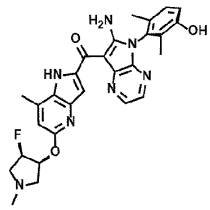
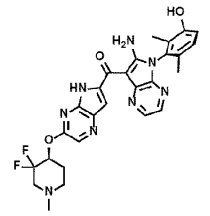
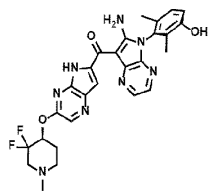
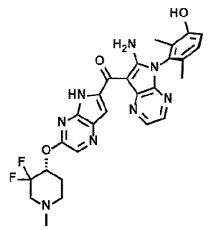
[569]

435		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.40-7.33 (m, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.33-5.19 (m, 1H), 4.72-4.62 (m, 1H), 3.27 (d, J = 8.0 Hz, 1H), 3.10-2.95 (m, 1H), 2.90-2.75 (m, 1H), 2.72 (s, 4H), 2.38-2.26 (m, 1H), 1.98-1.90 (m, 4H), 1.88 (s, 3H), 1.83-1.68 (m, 1H), 0.67-0.43 (m, 4H).	570.2
436		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 8.24 (s, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.62 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 5.64 (s, 1H), 5.28-5.13 (m, 1H), 3.66-3.47 (m, 2H), 3.41-3.32 (m, 2H), 2.89 (s, 3H), 2.53-2.46 (m, 1H), 2.33-2.30 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	531.2
437		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 2.0 Hz, 1H), 8.20 (s, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.61 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.63-5.49 (m, 1H), 5.11-4.96 (m, 1H), 3.49-3.32 (m, 1H), 3.22-3.03 (m, 2H), 2.99-2.84 (m, 1H), 2.67 (s, 3H), 2.51-2.37 (m, 1H), 2.19-2.04 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H).	531.2
438		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.47 (s, 1H), 5.27-5.20 (m, 1H), 4.82-4.67 (m, 1H), 3.12-2.96 (m, 1H), 2.83-2.73 (m, 1H), 2.71-2.57 (m, 1H), 2.56-2.45 (m, 1H), 2.44-2.29 (m, 5H), 1.93 (s, 3H), 1.89 (s, 3H), 1.85-1.72 (m, 1H), 1.35-1.30 (m, 2H), 1.15-1.07 (m, 2H).	570.3

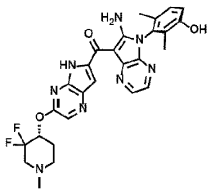
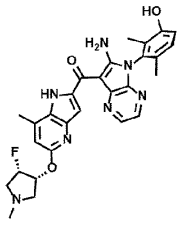
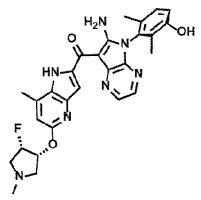
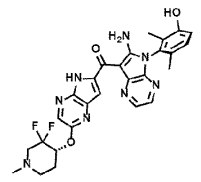
[570]

439		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, *J* = 3.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.46 (s, 1H), 5.27-5.20 (m, 1H), 4.80-4.66 (m, 1H), 3.07-2.92 (m, 1H), 2.79-2.67 (m, 1H), 2.66-2.53 (m, 1H), 2.50-2.41 (m, 1H), 2.41-2.27 (m, 5H), 1.93 (s, 3H), 1.89 (s, 3H), 1.84-1.72 (m, 1H), 1.34-1.28 (m, 2H), 1.14-1.06 (m, 2H).	570.3
440		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.09 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.35-5.26 (m, 1H), 4.84-4.68 (m, 1H), 3.12-2.97 (m, 1H), 2.84-2.69 (m, 1H), 2.62-2.50 (m, 1H), 2.48-2.41 (m, 1H), 2.38 (s, 3H), 2.38-2.31 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.86-1.77 (m, 1H).	531.3
441		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.10 (s, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.39 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.37-5.28 (m, 1H), 4.81-4.76 (m, 1H), 3.14-3.04 (m, 1H), 2.85-2.78 (m, 1H), 2.70-2.60 (m, 1H), 2.56-2.48 (m, 1H), 2.43 (s, 3H), 2.41-2.35 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.88-1.83 (m, 1H).	531.3
442		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, *J* = 2.8 Hz, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.34 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.68 (s, 1H), 5.57-5.48 (m, 1H), 5.48-5.30 (m, 1H), 3.09-2.88 (m, 4H), 2.71 (s, 3H), 2.44 (s, 3H), 1.93 (s, 3H), 1.89 (s, 3H).	530.2

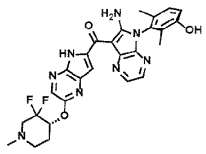
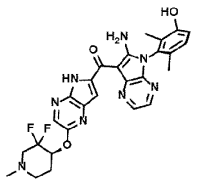
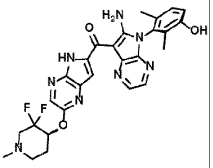
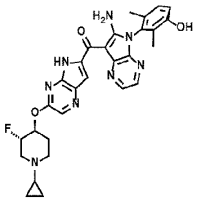
[571]

443		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37-7.30 (m, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.67 (s, 1H), 5.56-5.48 (m, 1H), 5.47-5.31 (m, 1H), 3.09-2.89 (m, 4H), 2.70 (s, 3H), 2.44 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	530.2
444		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.20 (s, 1H), 7.98 (d, J = 2.8 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.72-5.60 (m, 1H), 3.06-2.93 (m, 1H), 2.91-2.79 (m, 1H), 2.79-2.68 (m, 1H), 2.67-2.55 (m, 1H), 2.42 (s, 3H), 2.34-2.24 (m, 1H), 2.21-2.09 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H).	549.3
445		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.21 (s, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.74-5.59 (m, 1H), 3.06-2.98 (m, 1H), 2.94-2.81 (m, 1H), 2.80-2.71 (m, 1H), 2.69-2.58 (m, 1H), 2.43 (s, 3H), 2.35-2.24 (m, 1H), 2.16 (dt, J = 3.2, 6.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	549.3
446		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.4 Hz, 1H), 8.23 (s, 1H), 7.99 (d, J = 2.4 Hz, 1H), 7.62 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.0 Hz, 1H), 5.76 (d, J = 5.6 Hz, 1H), 3.30-3.11 (m, 2H), 3.05-2.82 (m, 2H), 2.62 (s, 3H), 2.38-2.18 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2

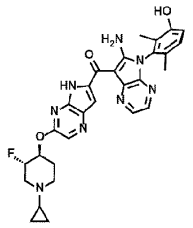
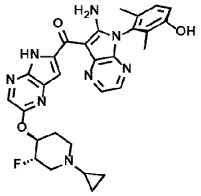
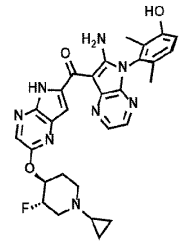
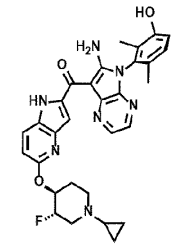
[572]

447		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, *J* = 2.0 Hz, 1H), 8.26 (s, 1H), 8.02 (d, *J* = 2.4 Hz, 1H), 7.65 (s, 1H), 7.19 (d, *J* = 8.0 Hz, 1H), 7.01 (d, *J* = 8.0 Hz, 1H), 5.80-5.77 (m, 1H) , 3.30-3.09 (m, 2H), 3.03-2.83 (m, 2H), 2.63 (s, 3H), 2.41-2.24 (m, 2H), 1.95 (s, 3H), 1.90 (s, 3H).	549.2
448		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.97 (d, *J* = 1.2 Hz, 1H), 9.67 (s, 1H), 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 3.2 Hz, 1H), 7.35 (d, *J* = 2.0 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.69 (d, *J* = 0.8 Hz, 1H), 5.49-5.23 (m, 2H), 3.08-2.93 (m, 2H), 2.85-2.71 (m, 2H), 2.67 (s, 3H), 2.34 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H).	530.2
449		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.96 (s, 1H), 9.67 (s, 1H), 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 3.2 Hz, 1H), 7.35 (d, *J* = 1.6 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.69 (s, 1H), 5.50-5.23 (m, 2H), 3.07-2.93 (m, 2H), 2.83-2.71 (m, 2H), 2.67 (s, 3H), 2.34 (s, 3H), 1.83 (s, 3H), 1.75 (s, 3H).	530.2
450		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.17 (s, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.40 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.74-5.56 (m, 1H), 3.47-3.34 (m, 1H), 3.29-3.16 (m, 1H), 3.09-2.85 (m, 2H), 2.66 (s, 3H), 2.40-2.15 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2

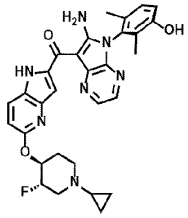
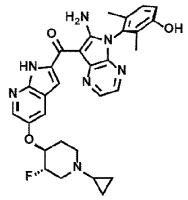
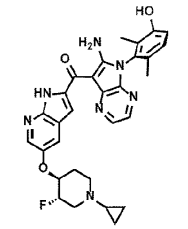
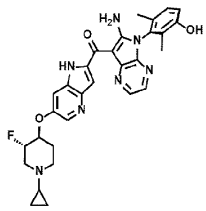
[573]

451		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.14 (s, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.40 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.63-5.47 (m, 1H), 3.10-2.94 (m, 1H), 2.86-2.69 (m, 2H), 2.62-2.52 (m, 1H), 2.41 (s, 3H), 2.33-2.03 (m, 2H), 1.93 (s, 3H), 1.89 (s, 3H).	549.2
452		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.11 (s, 1H), 7.98 (d, *J* = 3.2 Hz, 1H), 7.35 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.58-5.51 (m, 1H), 3.04-2.96 (m, 1H), 2.83-2.71 (m, 2H), 2.61-2.53 (m, 1H), 2.40 (s, 3H), 2.29-2.22 (m, 1H), 2.14-2.08 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H).	549.2
453		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.15 (s, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.41 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.59-5.54 (m, 1H), 3.06-2.94 (m, 1H), 2.82-2.70 (m, 2H), 2.61-2.53 (m, 1H), 2.41 (s, 3H), 2.29-2.23 (m, 1H), 2.15-2.09 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2
454		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 2.8 Hz, 1H), 8.16 (s, 1H), 7.99 (d, *J* = 2.8 Hz, 1H), 7.62 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.49-5.35 (m, 1H), 4.80-4.65 (m, 1H), 3.26 (d, *J* = 3.2 Hz, 1H), 3.05-2.95 (m, 1H), 2.75-2.61 (m, 2H), 2.41-2.29 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.87-1.82 (m, 1H), 1.81-1.72 (m, 1H), 0.58-0.52 (m, 2H), 0.49-0.46 (m, 2H).	557.2

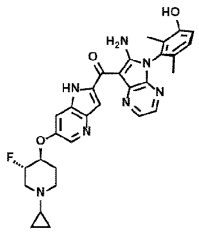
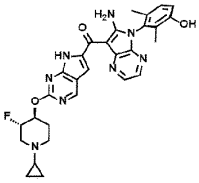
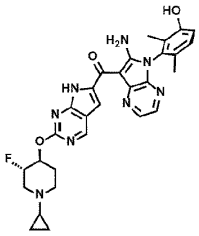
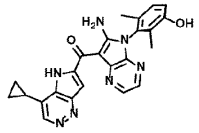
[574]

455		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 8.15 (s, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.49-5.37 (m, 1H), 4.80-4.64 (m, 1H), 3.26 (d, J = 4.4 Hz, 1H), 3.07-2.94 (m, 1H), 2.75-2.60 (m, 2H), 2.41-2.32 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.83 (m, 1H), 1.82-1.73 (m, 1H), 0.60-0.52 (m, 2H), 0.49-0.46 (m, 2H).	557.2
456		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.09 (s, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.40 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.38-5.20 (m, 1H), 4.69-4.60 (m, 1H), 3.28-3.22 (m, 1H), 3.06-2.90 (m, 1H), 2.78-2.53 (m, 2H), 2.42-2.28 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.80 (m, 1H), 1.79-1.66 (m, 1H), 0.59-0.51 (m, 2H), 0.51-0.39 (m, 2H).	557.3
457		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, J = 3.2 Hz, 1H), 8.09 (s, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.40 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.38-5.20 (m, 1H), 4.69-4.60 (m, 1H), 3.28-3.22 (m, 1H), 3.06-2.90 (m, 1H), 2.78-2.53 (m, 2H), 2.42-2.28 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.80 (m, 1H), 1.79-1.66 (m, 1H), 0.59-0.51 (m, 2H), 0.51-0.39 (m, 2H).	557.3
458		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.49 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.81 (d, J = 8.8 Hz, 1H), 5.25 (tt, J = 4.4, 11.6 Hz, 1H), 4.61 (dt, J = 4.4, 7.6 Hz, 1H), 3.29-3.17 (m, 1H), 3.00-2.89 (m, 1H), 2.72-2.53 (m, 2H), 2.38-2.27 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.85-1.77 (m, 1H), 1.75-1.63 (m, 1H),	556.3

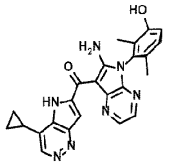
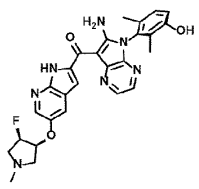
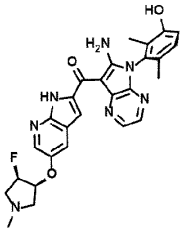
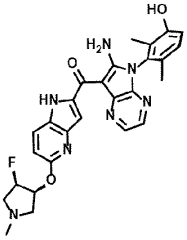
[575]

			0.58-0.38 (m, 4H).	
459		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.50 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.82 (d, *J* = 8.8 Hz, 1H), 5.37-5.21 (m, 1H), 4.70-4.64 (m, 1H), 3.30-3.23 (m, 1H), 3.08-2.96 (m, 1H), 2.86-2.62 (m, 2H), 2.42-2.27 (m, 1H), 1.95-1.89 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.83-1.66 (m, 1H), 0.65-0.41 (m, 4H).	556.3
460		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, *J* = 2.8 Hz, 1H), 8.24 (d, *J* = 2.4 Hz, 1H), 8.00 (d, *J* = 2.8 Hz, 1H), 7.85 (d, *J* = 2.4 Hz, 1H), 7.41 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.80-4.65 (m, 1H), 4.47-4.35 (m, 1H), 3.29-3.22 (m, 1H), 3.03-2.89 (m, 1H), 2.66-2.47 (m, 2H), 2.26-2.16 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.82-1.69 (m, 2H), 0.57-0.50 (m, 2H), 0.49-0.39 (m, 2H).	556.3
461		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.44 (d, *J* = 2.8 Hz, 1H), 8.24 (d, *J* = 2.4 Hz, 1H), 8.01 (d, *J* = 2.8 Hz, 1H), 7.86 (d, *J* = 2.4 Hz, 1H), 7.42 (s, 1H), 7.17 (d, *J* = 8.0 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.83-4.68 (m, 1H), 4.52-4.33 (m, 1H), 3.30-3.22 (m, 1H), 3.02-2.90 (m, 1H), 2.70-2.40 (m, 2H), 2.27-2.14 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.84-1.73 (m, 2H), 0.58-0.51 (m, 2H), 0.50-0.40 (m, 2H).	556.3
462		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, *J* = 3.2 Hz, 1H), 8.23 (d, *J* = 2.4 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.84 (d, *J* = 2.0 Hz, 1H), 7.66 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 4.83-4.71 (m, 1H), 4.65-4.59 (m, 1H), 3.30-3.23 (m, 1H), 3.03-2.91 (m, 1H), 2.65 (td, *J* = 8.0, 11.2 Hz, 1H), 2.59-2.49 (m, 1H), 2.26 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.83-1.71	556.3

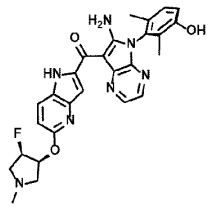
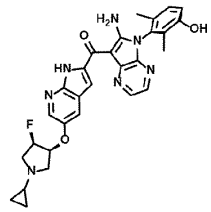
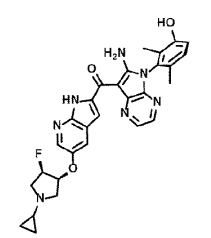
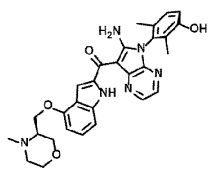
[576]

		일)메탄온	(m, 2H), 0.58-0.51 (m, 2H), 0.51-0.41 (m, 2H).	
463		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.42 (d, J = 3.2 Hz, 1H), 8.23 (d, J = 2.4 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.84 (d, J = 2.0 Hz, 1H), 7.66 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 4.84-4.71 (m, 1H), 4.66-4.59 (m, 1H), 3.30-3.24 (m, 1H), 3.02-2.93 (m, 1H), 2.65 (td, J = 7.6, 11.2 Hz, 1H), 2.59-2.50 (m, 1H), 2.31-2.20 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.83-1.72 (m, 2H), 0.57-0.50 (m, 2H), 0.50-0.41 (m, 2H).	556.3
464		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7H-피롤로[2,3-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.95 (s, 1H), 8.40 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.61 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.43-5.29 (m, 1H), 4.82-4.62 (m, 1H), 3.29-3.20 (m, 1H), 3.04-2.93 (m, 1H), 2.77-2.57 (m, 2H), 2.40-2.28 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.85-1.73 (m, 2H), 0.62-0.38 (m, 4H).	557.3
465		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7H-피롤로[2,3-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.96 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.62 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.45-5.32 (m, 1H), 4.82-4.63 (m, 1H), 3.29-3.20 (m, 1H), 3.06-2.95 (m, 1H), 2.83-2.59 (m, 2H), 2.41-2.28 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.86-1.76 (m, 2H), 0.58-0.44 (m, 4H).	557.3
466		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로	^{1}H NMR (400 MHz, MeOD): δ 8.81 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 3.2 Hz, 1H), 7.78 (s, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.50-2.42 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.49-1.43 (m, 2H), 1.41-1.37 (m, 2H).	440.2

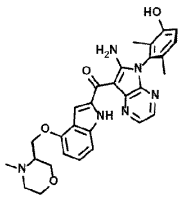
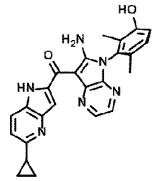
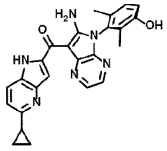
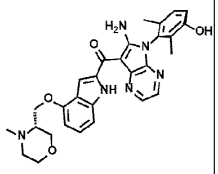
[577]

		[3,2-c]피리다진-6-일) 메탄온		
467		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일) 메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.81 (s, 1H), 8.41 (d, *J* = 3.2 Hz, 1H), 8.05 (d, *J* = 3.2 Hz, 1H), 7.78 (s, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 2.53-2.40 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.49-1.43 (m, 2H), 1.42-1.37 (m, 2H).	440.2
468		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, *J* = 2.8 Hz, 1H), 8.26 (d, *J* = 2.8 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.84 (d, *J* = 2.8 Hz, 1H), 7.41 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.45-5.27 (m, 1H), 4.99-4.92 (m, 1H) , 3.02-2.89 (m, 1H), 3.08-2.89 (m, 3H), 2.45 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	516.2
469		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, *J* = 3.2 Hz, 1H), 8.26 (d, *J* = 2.8 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.84 (d, *J* = 2.8 Hz, 1H), 7.41 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.45-5.27 (m, 1H), 5.01-4.92 (m, 1H) , 3.02-2.89 (m, 1H), 3.08-2.89 (m, 3H), 2.45 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	516.2
470		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.48 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.85 (d, *J* = 8.8 Hz, 1H), 5.62-5.51 (m, 1H), 5.51-5.33 (m, 1H), 3.12-2.92 (m, 4H), 2.45 (s, 3H), 1.92 (s, 3H), 1.88 (s, 3H).	516.3

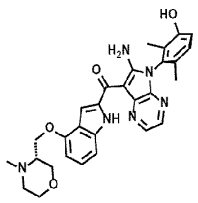
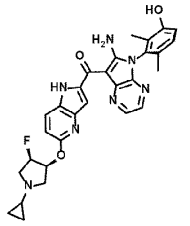
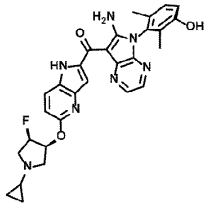
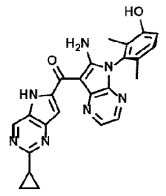
[578]

471		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.84 (d, J = 8.8 Hz, 1H), 5.61-5.51 (m, 1H), 5.50-5.33 (m, 1H), 3.16-2.91 (m, 4H), 2.46 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	516.3
472		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.43 (d, J = 2.8 Hz, 1H), 8.26 (d, J = 2.8 Hz, 1H), 8.00 (d, J = 3.2 Hz, 1H), 7.84 (d, J = 2.4 Hz, 1H), 7.41 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.43-5.22 (m, 1H), 4.97-4.91 (m, 1H), 3.29-3.18 (m, 2H), 3.15-3.09 (m, 2H), 1.98-1.94 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 0.55-0.45 (m, 4H).	542.2
473		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (d, J = 2.8 Hz, 1H), 8.15 (d, J = 2.8 Hz, 1H), 7.90 (d, J = 3.2 Hz, 1H), 7.74 (d, J = 2.4 Hz, 1H), 7.31 (s, 1H), 7.06 (d, J = 8.4 Hz, 1H), 6.88 (d, J = 8.4 Hz, 1H), 5.32-5.09 (m, 1H), 4.84 (d, J = 4.8 Hz, 1H), 3.18-3.09 (m, 2H), 3.06-3.00 (m, 2H), 1.88-1.81 (m, 4H), 1.78 (s, 3H), 0.43-0.35 (m, 4H).	542.2
474		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.67 (s, 1H), 7.29-7.21 (m, 2H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.56 (dd, J = 1.6, 6.4 Hz, 1H), 4.30 (dd, J = 4.8, 10.4 Hz, 1H), 4.15 (dd, J = 5.6, 10.0 Hz, 1H), 4.08 (dd, J = 3.2, 11.2 Hz, 1H), 3.89-3.81 (m, 1H), 3.76-3.66 (m, 1H), 3.60 (dd, J = 10., 11.2 Hz, 1H), 2.84-2.78 (m, 1H), 2.78-2.69 (m, 1H), 2.51 (s, 3H), 2.49-2.42 (m, 1H), 1.92 (s,	527.3

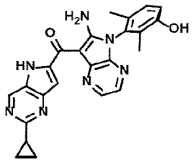
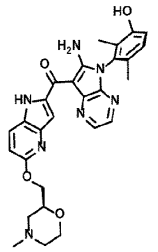
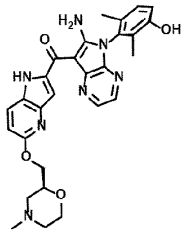
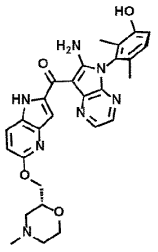
[579]

			3H), 1.88 (s, 3H).	
475		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 3.2 Hz, 1H), 7.66 (s, 1H), 7.28-7.20 (m, 2H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 6.63-6.48 (m, 1H), 4.29 (dd, *J* = 4.8, 10.4 Hz, 1H), 4.14 (dd, *J* = 5.6, 10.4 Hz, 1H), 4.07 (dd, *J* = 3.2, 11.6 Hz, 1H), 3.84 (d, *J* = 11.6 Hz, 1H), 3.70 (dt, *J* = 2.4, 11.2 Hz, 1H), 3.59 (dd, *J* = 10.0, 11.2 Hz, 1H), 2.84-2.77 (m, 1H), 2.73 (dt, *J* = 4.8, 9.2 Hz, 1H), 2.50 (s, 3H), 2.49-2.42 (m, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	527.3
476		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로필-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.01 (dd, *J* = 0.8, 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.61 (d, *J* = 0.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.13 (d, *J* = 8.8 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 2.25-2.18 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.09 - 1.00 (m, 4H).	439.2
477		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로필-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.01 (dd, *J* = 0.8, 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.61 (d, *J* = 0.8 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.13 (d, *J* = 8.8 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 2.25-2.18 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 1.09 - 0.99 (m, 4H).	439.2
478		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.29 (d, *J* = 3.2 Hz, 1H), 7.85 (d, *J* = 3.2 Hz, 1H), 7.57 (s, 1H), 7.19-7.11 (m, 2H), 7.06 (d, *J* = 8.4 Hz, 1H), 6.88 (d, *J* = 8.4 Hz, 1H), 6.46 (dd, *J* = 1.2, 6.8 Hz, 1H), 4.20 (dd, *J* = 4.8, 10.4 Hz, 1H), 4.06 (dd, *J* = 5.6, 10.4 Hz, 1H), 3.98 (dd, *J* = 3.2, 11.6 Hz, 1H), 3.80-3.71 (m, 1H), 3.61 (dt, *J* = 2.4, 11.2 Hz, 1H), 3.50 (dd, *J* = 9.6, 11.2 Hz, 1H), 2.76-2.70 (m, 1H), 2.66 (td, *J* = 4.4, 8.8 Hz, 1H), 2.47-2.32 (m, 4H), 1.82 (s,	527.3

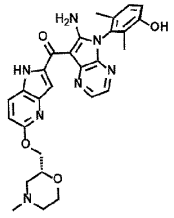
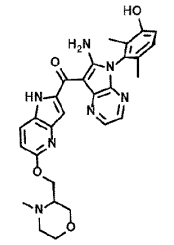
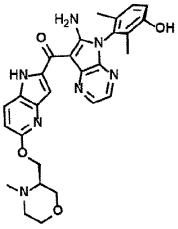
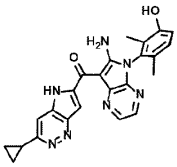
[580]

			3H), 1.77 (s, 3H).	
479		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.29 (d, J = 3.2 Hz, 1H), 7.85 (d, J = 3.2 Hz, 1H), 7.57 (s, 1H), 7.19-7.11 (m, 2H), 7.06 (d, J = 8.4 Hz, 1H), 6.88 (d, J = 8.4 Hz, 1H), 6.46 (dd, J = 1.2, 6.8 Hz, 1H), 4.20 (dd, J = 4.4, 10.4 Hz, 1H), 4.06 (dd, J = 5.6, 10.4 Hz, 1H), 3.98 (dd, J = 3.2, 11.6 Hz, 1H), 3.80-3.71 (m, 1H), 3.61 (dt, J = 2.4, 11.2 Hz, 1H), 3.50 (dd, J = 9.6, 11.2 Hz, 1H), 2.76-2.70 (m, 1H), 2.66 (td, J = 4.4, 8.8 Hz, 1H), 2.47-2.32 (m, 4H), 1.82 (s, 3H), 1.77 (s, 3H).	527.3
480		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.06-8.00 (m, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.84 (d, J = 8.8 Hz, 1H), 5.58-5.48 (m, 1H), 5.47-5.31 (m, 1H), 3.30-3.06 (m, 4H), 2.00-1.94 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H), 0.55-0.45 (m, 4H).	542.2
481		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 9.2 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.84 (d, J = 8.8 Hz, 1H), 5.57-5.47 (m, 1H), 5.47-5.30 (m, 1H), 3.30-3.03 (m, 4H), 1.99-1.94 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 0.57-0.42 (m, 4H).	542.2
482		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)	^{1}H NMR (400 MHz, MeOD): δ 9.14 (s, 1H), 8.43 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.52 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.35-2.27 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.19-1.13 (m, 2H), 1.11-1.05 (m, 2H).	440.1

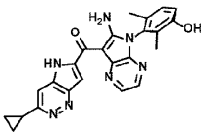
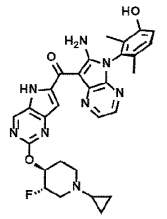
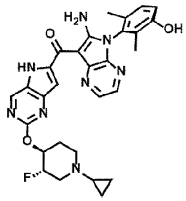
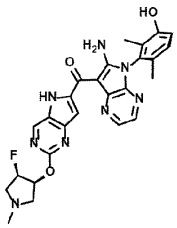
[581]

		메탄온		
483		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.14 (s, 1H), 8.43 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.53 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.36-2.26 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.19-1.13 (m, 2H), 1.11-1.04 (m, 2H).	440.1
484		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.49 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.84 (d, *J* = 8.8 Hz, 1H), 4.44-4.37 (m, 2H), 4.07-3.95 (m, 2H), 3.80-3.68 (m, 1H), 3.15-3.06 (m, 1H), 2.88 (d, *J* = 13.2 Hz, 1H), 2.46 (s, 3H), 2.43-2.35 (m, 1H), 2.34-2.25 (m, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	528.2
485		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.40 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.49 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.42-4.34 (m, 2H), 4.01-3.97 (m, 1H), 3.96-3.93 (m, 1H), 3.72 (dt, *J* = 2.4, 11.6 Hz, 1H), 2.97 (d, *J* = 11.6 Hz, 1H), 2.74 (d, *J* = 11.6 Hz, 1H), 2.34 (s, 3H), 2.22 (dt, *J* = 3.2, 11.6 Hz, 1H), 2.10 (t, *J* = 11.6 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	528.2
486		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.03 (d, *J* = 9.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.49 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.38 (t, *J* = 4.8 Hz, 2H), 4.07-3.92 (m, 2H), 3.78-3.64 (m, 1H), 3.02 (d, *J* = 11.6 Hz, 1H), 2.80 (d, *J* = 11.6 Hz, 1H), 2.39 (s, 3H), 2.30 (d, *J* = 3.2 Hz, 1H), 2.18 (s, 1H), 1.92 (s, 3H), 1.87 (s, 3H).	528.2

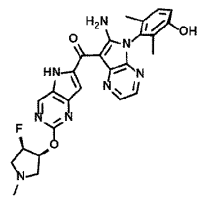
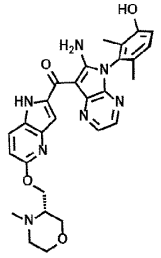
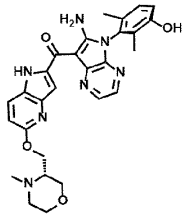
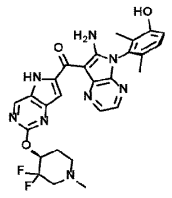
[582]

487		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, *J* = 3.2 Hz, 1H), 8.02 (d, *J* = 9.2 Hz, 1H), 7.97 (d, *J* = 3.2 Hz, 1H), 7.48 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.44 (t, *J* = 4.8 Hz, 2H), 4.07-3.92 (m, 2H), 3.78-3.64 (m, 1H), 2.99 (d, *J* = 11.6 Hz, 1H), 2.77 (d, *J* = 11.6 Hz, 1H), 2.37 (s, 3H), 2.30 (d, *J* = 3.2 Hz, 1H), 2.14 (s, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	528.2
488		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 9.2 Hz, 1H), 7.89 (d, *J* = 3.6 Hz, 1H), 7.41 (s, 1H), 7.07 (d, *J* = 8.8 Hz, 1H), 6.89 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.51 (d, *J* = 3.6 Hz, 1H), 4.48 (d, *J* = 3.6 Hz, 1H), 4.12 (d, *J* = 11.2 Hz, 1H), 4.01-3.91 (m, 1H), 3.82-3.69 (m, 2H), 3.61-3.46 (m, 1H), 2.93 (s, 3H), 1.83 (s, 3H), 1.78 (s, 3H).	528.3
489		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.30 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 9.2 Hz, 1H), 7.89 (d, *J* = 3.6 Hz, 1H), 7.41 (s, 1H), 7.07 (d, *J* = 8.8 Hz, 1H), 6.89 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 4.51 (d, *J* = 3.6 Hz, 1H), 4.48 (d, *J* = 3.6 Hz, 1H), 4.12 (d, *J* = 11.2 Hz, 1H), 4.01-3.91 (m, 1H), 3.82-3.69 (m, 2H), 3.61-3.46 (m, 1H), 2.93 (s, 3H), 1.83 (s, 3H), 1.78 (s, 3H).	528.3
490		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 2.8 Hz, 1H), 8.03-7.97 (m, 2H), 7.71 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.49-2.41 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.23-1.12 (m, 4H).	440.3

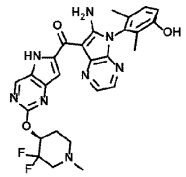
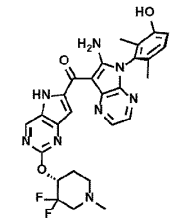
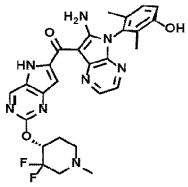
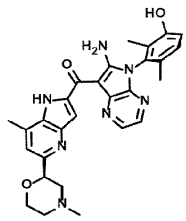
[583]

491		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.41 (d, *J* = 3.2 Hz, 1H), 8.04-7.96 (m, 2H), 7.71 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 2.49-2.41 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.23-1.12 (m, 4H).	440.3
492		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.42 (s, 1H), 9.70 (s, 1H), 9.10 (s, 1H), 8.40 (s, 1H), 8.01 (s, 1H), 7.67 (s, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.25-5.14 (m, 1H), 4.78-4.53 (m, 1H), 3.21 (dd, *J* = 4.4, 11.6 Hz, 1H), 2.93-2.81 (m, 1H), 2.60-2.54 (m, 1H), 2.42-2.36 (m, 1H), 2.25-2.18 (m, 1H), 1.83 (s, 3H), 1.81-1.77 (m, 1H), 1.76 (s, 3H), 1.57 (q, *J* = 9.6 Hz, 1H), 0.47 (d, *J* = 6.4 Hz, 2H), 0.40-0.30 (m, 2H).	557.2
493		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.39 (s, 1H), 9.69 (s, 1H), 9.11 (s, 1H), 8.41 (d, *J* = 2.8 Hz, 1H), 8.02 (d, *J* = 2.8 Hz, 1H), 7.69 (s, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.27-5.12 (m, 1H), 4.78-4.55 (m, 1H), 3.22-3.14 (m, 1H), 2.88-2.85 (m, 1H), 2.60-2.55 (m, 1H), 2.43-2.40 (m, 1H), 2.24-2.19 (m, 1H), 1.83 (s, 3H), 1.82-1.77 (m, 1H), 1.76 (s, 3H), 1.62-1.52 (m, 1H), 0.52-0.42 (m, 2H), 0.40-0.28 (m, 2H).	557.2
494		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.09 (s, 1H), 8.43 (d, *J* = 2.8 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.43 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.53-5.37 (m, 2H), 3.17-3.12 (m, 1H), 3.09-2.96 (m, 3H), 2.46 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	517.2

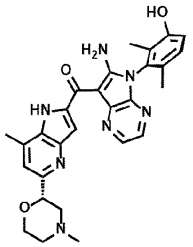
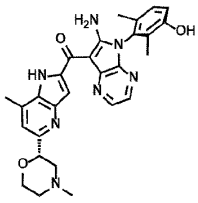
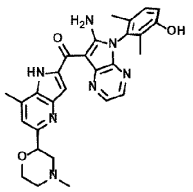
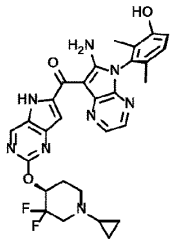
[584]

495		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.09 (s, 1H), 8.43 (d, J = 2.8 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.42 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.54-5.37 (m, 1H), 3.18-3.13 (m, 1H), 3.10-2.98 (m, 3H), 2.47 (s, 3H), 1.93 (s, 3H), 1.88 (s, 3H).	517.2
496		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 9.2 Hz, 1H), 7.96 (d, J = 3.2 Hz, 1H), 7.49 (s, 1H), 7.16 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.84 (d, J = 8.8 Hz, 1H), 4.51 (dd, J = 4.0, 11.6 Hz, 1H), 4.39 (dd, J = 5.6, 11.6 Hz, 1H), 4.00 (dd, J = 3.2, 11.6 Hz, 1H), 3.83 (m, 1H), 3.68 (dt, J = 2.4, 11.2 Hz, 1H), 3.57 (dd, J = 10.0, 11.6 Hz, 1H), 2.80 (m, 1H), 2.66-2.58 (m, 1H), 2.50-2.40 (m, 4H), 1.92 (s, 3H), 1.88 (s, 3H).	528.3
497		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.39 (d, J = 2.8 Hz, 1H), 8.03 (d, J = 8.8 Hz, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.49 (s, 1H), 7.16 (d, J = 8.0 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 6.84 (d, J = 8.8 Hz, 1H), 4.55-4.48 (m, 1H), 4.44-4.35 (m, 1H), 4.00 (dd, J = 3.2, 11.6 Hz, 1H), 3.83 (m, 1H), 3.74-3.64 (m, 1H), 3.57 (t, J = 10.8 Hz, 1H), 2.80 (m, 1H), 2.66-2.57 (m, 1H), 2.50-2.41 (m, 4H), 1.92 (s, 3H), 1.88 (s, 3H).	528.2
498		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥	^{1}H NMR (400 MHz, MeOD): δ 9.11 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.43 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.62-5.50 (m, 1H), 3.05-2.95 (m, 1H), 2.90-2.79 (m, 1H), 2.76-2.68 (m, 1H), 2.63-2.55 (m, 1H), 2.41 (s, 3H), 2.28-	549.2

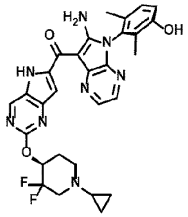
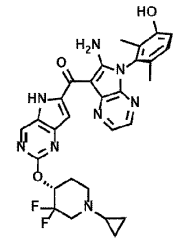
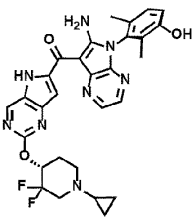
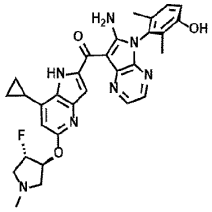
[585]

		시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	2.20 (m, 1H), 2.17-2.09 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	
499		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.11 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.43 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.65-5.51 (m, 1H), 3.13-3.03 (m, 1H), 3.02-2.87 (m, 1H), 2.85-2.74 (m, 1H), 2.73-2.61 (m, 1H), 2.47 (s, 3H), 2.31-2.22 (m, 1H), 2.21-2.11 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2
500		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.11 (s, 1H), 8.43 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.44 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.66-5.47 (m, 1H), 3.06-2.79 (m, 2H), 2.77-2.56 (m, 2H), 2.41 (s, 3H), 2.28-2.10 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2
501		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.10 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.43 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.55-5.47 (m, 1H), 3.06-2.80 (m, 2H), 2.75-2.55 (m, 2H), 2.41 (s, 3H), 2.27-2.11 (m, 2H), 1.93 (s, 3H), 1.88 (s, 3H).	549.2
502		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((R)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.00 (d, J = 2.8 Hz, 1H), 7.54 (s, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 4.76 (dd, J = 2.4, 10.4 Hz, 1H), 4.11 (dd, J = 2.4, 11.6 Hz, 1H), 3.89 (dt, J = 2.4, 11.6 Hz, 1H), 3.19 (d, J = 11.6 Hz, 1H), 2.87 (d, J = 11.2 Hz, 1H), 2.81 (s, 3H), 2.41 (s, 3H), 2.39-2.35 (m, 1H), 2.28 (t, J = 10.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.3

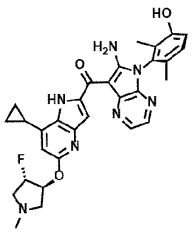
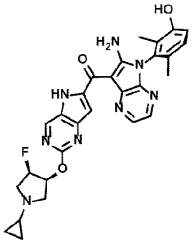
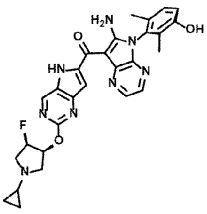
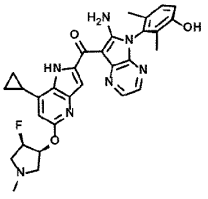
[586]

503		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((S)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.54 (s, 1H), 7.36 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.74 (dd, *J* = 2.8, 10.8 Hz, 1H), 4.10 (dd, *J* = 2.0, 11.6 Hz, 1H), 3.88 (dt, *J* = 2.0, 11.2 Hz, 1H), 3.17-3.12 (m, 1H), 2.88-2.82 (m, 1H), 2.82 (s, 3H), 2.37 (s, 3H), 2.35-2.29 (m, 1H), 2.20 (t, *J* = 10.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.3
504		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((S)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, *J* = 2.8 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.54 (s, 1H), 7.36 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 4.74 (dd, *J* = 2.4, 10.4 Hz, 1H), 4.10 (dd, *J* = 2.0, 11.6 Hz, 1H), 3.88 (dt, *J* = 2.0, 11.6 Hz, 1H), 3.15 (d, *J* = 11.6 Hz, 1H), 2.88-2.82 (m, 1H), 2.81 (s, 3H), 2.37 (s, 3H), 2.33 (dt, *J* = 3.6, 12.0 Hz, 1H), 2.20 (t, *J* = 10.8 Hz, 1H), 1.93 (s, 3H), 1.88 (s, 3H).	512.2
505		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((R)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 3.2 Hz, 1H), 8.00 (d, *J* = 3.2 Hz, 1H), 7.54 (s, 1H), 7.36 (s, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.97 (d, *J* = 8.4 Hz, 1H), 4.74 (dd, *J* = 2.4, 10.4 Hz, 1H), 4.10 (dd, *J* = 2.0, 11.6 Hz, 1H), 3.88 (dt, *J* = 2.4, 11.6 Hz, 1H), 3.14 (d, *J* = 12.4 Hz, 1H), 2.88-2.82 (m, 1H), 2.81 (s, 3H), 2.37 (s, 3H), 2.32 (dt, *J* = 3.6, 12.0 Hz, 1H), 2.20 (t, *J* = 10.8 Hz, 1H), 1.92 (s, 3H), 1.88 (s, 3H).	512.2
506		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.45 (s, 1H), 9.68 (d, *J* = 3.2 Hz, 1H), 9.12 (s, 1H), 8.40 (d, *J* = 2.4 Hz, 1H), 8.02 (d, *J* = 2.4 Hz, 1H), 7.69 (s, 1H), 7.13 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.55-5.41 (m, 1H), 3.16-3.04 (m, 1H), 2.97-2.83 (m, 2H), 2.71-2.67 (m, 1H), 2.15-2.05 (m, 1H), 1.86 (d, *J* = 2.8 Hz, 2H), 1.83 (s, 3H), 1.76 (s, 3H), 0.48 (d, *J* = 6.4 Hz, 2H), 0.42-0.30 (m, 2H).	575.3

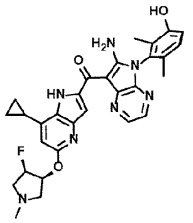
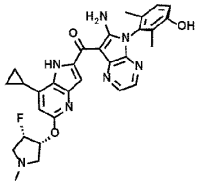
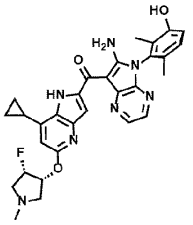
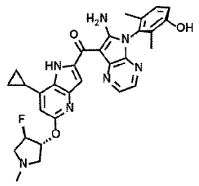
[587]

507		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.42 (s, 1H), 9.67 (s, 1H), 9.13 (s, 1H), 8.41 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.57-5.38 (m, 1H), 3.15-3.05 (m, 1H), 2.98-2.84 (m, 2H), 2.72-2.68 (m, 1H), 2.18-2.04 (m, 1H), 1.93-1.84 (m, 2H), 1.83 (s, 3H), 1.76 (s, 3H), 0.53-0.44 (m, 2H), 0.42-0.30 (m, 2H).	575.3
508		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.86 (s, 1H), 9.68 (s, 1H), 9.12 (s, 1H), 8.40 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.70 (s, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 5.66-5.35 (m, 1H), 3.18-3.06 (m, 1H), 2.98-2.84 (m, 2H), 2.67 (s, 1H), 2.15-2.02 (m, 1H), 1.89-1.82 (m, 5H), 1.76 (s, 3H), 0.49 (d, J = 6.8 Hz, 2H), 0.40-0.34 (m, 2H).	575.2
509		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.43 (s, 1H), 9.68 (s, 1H), 9.13 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.71 (s, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.54-5.42 (m, 1H), 3.17-3.00 (m, 1H), 2.99-2.82 (m, 2H), 2.73 (s, 1H), 2.13-2.08 (m, 1H), 1.89-1.83 (m, 5H), 1.76 (s, 3H), 0.49 (d, J = 6.8 Hz, 2H), 0.40-0.34 (m, 2H).	575.2
510		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.39 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.51 (s, 1H), 5.68-5.50 (m, 1H), 5.40-5.17 (m, 1H), 3.64-3.54 (m, 1H), 3.20-3.11 (m, 2H), 2.94-2.86 (m, 1H), 2.59 (s, 3H), 2.44-2.41 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.35-1.32 (m, 2H), 1.14-1.09 (m, 2H).	556.2

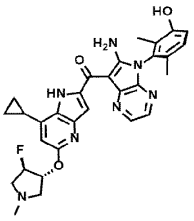
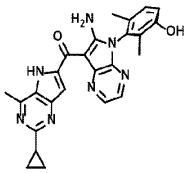
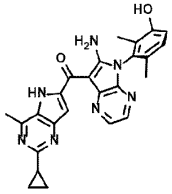
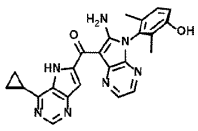
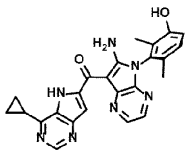
[588]

511		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 5.61-5.46 (m, 1H), 5.29-5.13 (m, 1H), 3.52-3.43 (m, 1H), 3.12-2.95 (m, 2H), 2.70 (dd, J = 3.6, 11.6 Hz, 1H), 2.47 (s, 3H), 2.44-2.37 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.39-1.30 (m, 2H), 1.16-1.07 (m, 2H).	556.2
512		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.09 (s, 1H), 8.43 (d, J = 2.8 Hz, 1H), 8.01 (d, J = 2.8 Hz, 1H), 7.42 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.51-5.34 (m, 2H), 3.27-3.04 (m, 4H), 2.00-1.95 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 0.53-0.47 (m, 4H).	543.2
513		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 9.09 (s, 1H), 8.43 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.43 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.50-5.33 (m, 1H), 5.40-5.30 (m, 1H), 3.27-3.04 (m, 4H), 2.00-1.95 (m, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 0.53-0.47 (m, 4H).	543.2
514		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.34 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.35 (s, 1H), 7.10 (d, J = 8.4 Hz, 1H), 6.93 (d, J = 8.4 Hz, 1H), 6.51 (s, 1H), 5.56-5.29 (m, 2H), 3.07-2.89 (m, 4H), 2.47-2.37 (m, 4H), 1.90 (s, 3H), 1.87 (s, 3H), 1.35-1.30 (m, 2H), 1.16-1.05 (m, 2H).	556.3

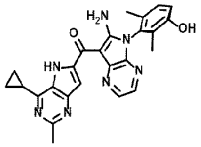
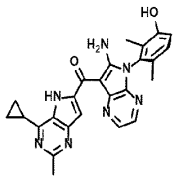
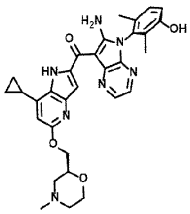
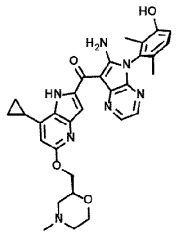
[589]

515		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.33 (s, 1H), 7.97 (d, J = 3.2 Hz, 1H), 7.34 (s, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.96 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 5.54-5.27 (m, 2H), 3.07-2.87 (m, 4H), 2.46-2.32 (m, 4H), 1.91 (s, 3H), 1.87 (s, 3H), 1.34-1.26 (m, 2H), 1.10 (d, J = 5.2 Hz, 2H).	556.3
516		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.51 (s, 1H), 5.55-5.32 (m, 2H), 3.11-2.95 (m, 4H), 2.47 (s, 3H), 2.47-2.43 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.36-1.30 (m, 2H), 1.14-1.09 (m, 2H).	556.2
517		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.36 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.51 (s, 1H), 5.55-5.32 (m, 2H), 3.11-2.95 (m, 4H), 2.47 (s, 3H), 2.47-2.43 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.36-1.30 (m, 2H), 1.14-1.09 (m, 2H).	556.2
518		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.40 (s, 1H), 7.19 (d, J = 8.4 Hz, 1H), 7.01 (d, J = 8.4 Hz, 1H), 6.52 (s, 1H), 5.60-5.50 (m, 1H), 5.30-5.15 (m, 1H), 3.49-3.44 (m, 1H), 3.13-2.94 (m, 2H), 2.68 (dd, J = 3.6, 10.4 Hz, 1H), 2.50-2.39 (m, 4H), 1.95 (s, 3H), 1.90 (s, 3H), 1.38-1.32 (m, 2H), 1.16-1.10 (m, 2H).	556.2

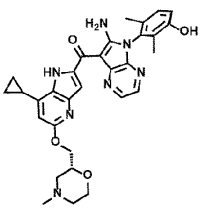
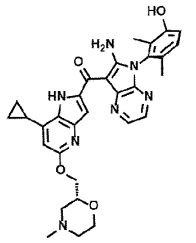
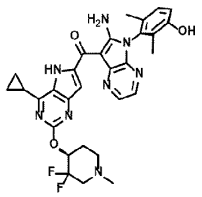
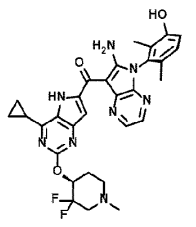
[590]

519		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.0 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 5.60-5.42 (m, 1H), 5.28-5.11 (m, 1H), 3.49-3.44 (m, 1H), 3.06-2.88 (m, 2H), 2.62 (dd, J = 4.0, 10.8 Hz, 1H), 2.47-2.37 (m, 4H), 1.93 (s, 3H), 1.88 (s, 3H), 1.37-1.31 (m, 2H), 1.15-1.07 (m, 2H).	556.2
520		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.98 (s, 1H), 9.69 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 3.2 Hz, 1H), 7.47 (d, J = 1.6 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.82 (s, 3H), 2.26-2.19 (m, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.03-0.99 (m, 2H), 0.98-0.94 (m, 2H).	454.3
521		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 14.97 (s, 1H), 9.69 (s, 1H), 8.42 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 3.2 Hz, 1H), 7.46 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.81 (s, 3H), 2.26-2.19 (m, 1H), 1.83 (s, 3H), 1.76 (s, 3H), 1.03-0.99 (m, 2H), 0.98-0.93 (m, 2H).	454.3
522		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.69 (s, 1H), 8.39 (d, J = 3.2 Hz, 1H), 8.03 (d, J = 3.2 Hz, 1H), 7.47 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 2.73-2.61 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.53-1.47 (m, 2H), 1.47-1.41 (m, 2H).	440.2
523		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)	^{1}H NMR (400 MHz, MeOD): δ 8.69 (s, 1H), 8.55 (s, 1H), 8.37 (d, J = 3.2 Hz, 1H), 8.02 (d, J = 3.2 Hz, 1H), 7.47 (s, 1H), 7.09 (d, J = 8.4 Hz, 1H), 6.92 (d, J = 8.4 Hz, 1H), 2.72-2.66 (m, 1H), 1.92-1.89 (m, 3H), 1.87 (s, 3H), 1.53-1.47 (m,	440.2

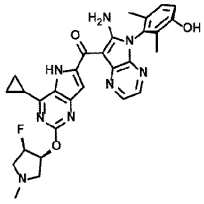
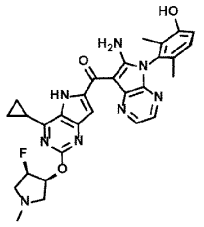
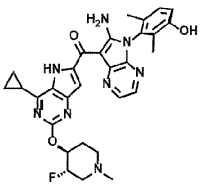
[591]

		메탄온	2H), 1.47-1.41 (m, 2H).	
524		(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.13 (s, 1H), 9.80 (s, 1H), 8.45 (d, J = 2.8 Hz, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.48 (d, J = 2.0 Hz, 1H), 7.13 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.67-2.66 (m, 1H), 2.58 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.32-1.26 (m, 4H).	454.2
525		(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.13 (s, 1H), 9.74 (s, 1H), 8.45 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 2.8 Hz, 1H), 7.48 (d, J = 1.6 Hz, 1H), 7.13 (d, J = 8.0 Hz, 1H), 7.00 (d, J = 8.4 Hz, 1H), 2.68-2.65 (m, 1H), 2.58 (s, 3H), 1.83 (s, 3H), 1.76 (s, 3H), 1.31-1.25 (m, 4H).	454.2
526		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38 – 8.32 (m, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 4.36 (t, J = 5.2 Hz, 2H), 3.99 (dd, J = 2.8, 11.6 Hz, 2H), 3.74 (dt, J = 2.4, 11.6 Hz, 1H), 3.09 (d, J = 11.6 Hz, 1H), 2.88 (d, J = 11.6 Hz, 1H), 2.46 (s, 3H), 2.44-2.35 (m, 2H), 2.34-2.23 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.36-1.31 (m, 2H), 1.14-1.09 (m, 2H).	568.3
527		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.38-8.32 (m, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 4.36 (t, J = 5.2 Hz, 2H), 3.99 (dd, J = 2.8, 11.6 Hz, 2H), 3.74 (dt, J = 2.4, 11.6 Hz, 1H), 3.09 (d, J = 11.6 Hz, 1H), 2.88 (d, J = 11.6 Hz, 1H), 2.46 (s, 3H), 2.44-2.35 (m, 2H), 2.34-2.23 (m, 1H), 1.93 (s, 3H), 1.89 (s, 3H), 1.36-1.31 (m, 2H), 1.14-1.09 (m, 2H).	568.3

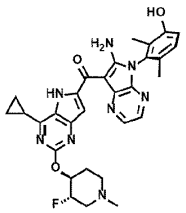
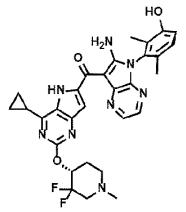
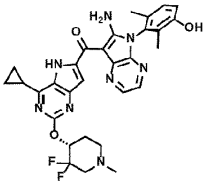
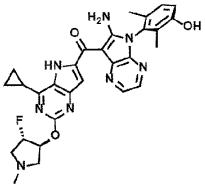
[592]

528		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.38 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 4.34 (t, J = 4.4 Hz, 2H), 4.01-3.88 (m, 2H), 3.79-3.64 (m, 1H), 2.97 (d, J = 11.2 Hz, 1H), 2.76 (d, J = 11.2 Hz, 1H), 2.41 (s, 1H), 2.36 (s, 3H), 2.31-2.24 (m, 1H), 2.11 (s, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.37-1.30 (m, 2H), 1.12 (d, J = 5.6 Hz, 2H).	568.4
529		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.35 (d, J = 3.2 Hz, 1H), 7.98 (d, J = 3.2 Hz, 1H), 7.37 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 6.49 (s, 1H), 4.34 (t, J = 4.4 Hz, 2H), 4.06 - 3.85 (m, 2H), 3.79-3.64 (m, 1H), 2.99 (d, J = 11.2 Hz, 1H), 2.77 (d, J = 11.2 Hz, 1H), 2.40 (s, 1H), 2.37 (s, 3H), 2.31-2.21 (m, 1H), 2.08 (s, 1H), 1.93 (s, 3H), 1.88 (s, 3H), 1.35-1.30 (m, 2H), 1.11 (d, J = 5.6 Hz, 2H).	568.4
530		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.26 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.54-5.38 (m, 1H), 3.04-2.92 (m, 1H), 2.88-2.77 (m, 1H), 2.75-2.70 (m, 1H), 2.65-2.54 (m, 2H), 2.40 (s, 3H), 2.24-2.14 (m, 1H), 2.10-2.05 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.54-1.46 (m, 2H), 1.45-1.39 (m, 2H).	589.4
531		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥	^{1}H NMR (400 MHz, MeOD): δ 8.38 (d, J = 3.2 Hz, 1H), 8.01 (d, J = 3.2 Hz, 1H), 7.27 (s, 1H), 7.17 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.54-5.37 (m, 1H), 3.05-2.92 (m, 1H), 2.89-2.77 (m, 1H), 2.75-2.67 (m, 1H), 2.66-2.55 (m, 2H), 2.40 (s, 3H), 2.25-2.16 (m, 1H), 2.14-2.05 (m, 1H), 1.93 (s, 3H), 1.89 (s,	589.4

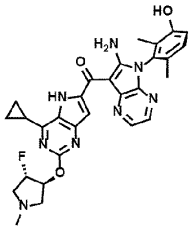
[593]

		시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	3H), 1.54-1.46 (m, 2H), 1.45-1.38 (m, 2H).	
532		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (t, *J* = 3.6 Hz, 1H), 8.06-7.87 (m, 1H), 7.25-7.13 (m, 2H), 6.98 (d, *J* = 8.4 Hz, 1H), 5.49-5.26 (m, 2H), 3.18-2.95 (m, 4H), 2.59-2.51 (m, 1H), 2.47 (s, 3H), 1.94 (s, 3H), 1.89 (s, 3H), 1.45 (d, *J* = 2.8 Hz, 2H), 1.41-1.34 (m, 2H).	557.3
533		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.32 (d, *J* = 9.6 Hz, 1H), 8.06-7.87 (m, 1H), 7.24-7.15 (m, 2H), 7.00 (d, *J* = 8.4 Hz, 1H), 5.59-5.31 (m, 2H), 3.30-3.08 (m, 4H), 2.61-2.50 (m, 4H), 1.95 (s, 3H), 1.91 (s, 3H), 1.49-1.43 (m, 2H), 1.43-1.37 (m, 2H).	557.3
534		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.25 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.29-5.20 (m, 1H), 4.94-4.76 (m, 1H), 3.18-3.05 (m, 1H), 2.93-2.70 (m, 2H), 2.67-2.55 (m, 2H), 2.46 (s, 3H), 2.39-2.28 (m, 1H), 1.98-1.94 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.51-1.44 (m, 2H), 1.43-1.35 (m, 2H).	571.3

[594]

535		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.36 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.25 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.31-5.22 (m, 1H), 4.97-4.80 (m, 1H), 3.24-3.09 (m, 1H), 3.02-2.78 (m, 2H), 2.77-2.64 (m, 1H), 2.63-2.57 (m, 1H), 2.52 (s, 3H), 2.40-2.28 (m, 1H), 2.03-1.94 (m, 1H), 1.94 (s, 3H), 1.89 (s, 3H), 1.50-1.44 (m, 2H), 1.44-1.37 (m, 2H).	571.3
536		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 3.2 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.27 (s, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.53-5.40 (m, 1H), 3.09-2.93 (m, 1H), 2.91-2.67 (m, 2H), 2.66-2.51 (m, 2H), 2.41 (s, 3H), 2.27-2.03 (m, 2H), 1.94 (s, 3H), 1.89 (s, 3H), 1.54-1.45 (m, 2H), 1.45-1.37 (m, 2H).	589.3
537		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, MeOD): δ 8.37 (d, *J* = 2.8 Hz, 1H), 8.01 (d, *J* = 3.2 Hz, 1H), 7.26 (d, *J* = 2.0 Hz, 1H), 7.17 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.54-5.38 (m, 1H), 3.10-2.94 (m, 1H), 2.92-2.67 (m, 2H), 2.66-2.53 (m, 2H), 2.42 (s, 3H), 2.27-2.03 (m, 2H), 1.93 (s, 3H), 1.89 (s, 3H), 1.55-1.46 (m, 2H), 1.45-1.35 (m, 2H).	589.3
538		(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.21 (s, 1H), 9.69 (s, 1H), 8.47 (d, *J* = 3.2 Hz, 1H), 8.04 (d, *J* = 3.2 Hz, 1H), 7.40 (d, *J* = 2.0 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 5.37-5.28 (m, 1H), 5.24-5.08 (m, 1H), 3.31-3.28 (m, 1H), 2.87-2.82 (m, 1H), 2.80-2.73 (m, 1H), 2.71-2.68 (m, 1H), 2.41-2.36 (m, 1H), 2.30 (s, 3H), 1.84 (s, 3H), 1.77 (s,	557.2

[595]

		d]피리미딘-6-일)메탄온	3H), 1.35-1.28 (m, 4H).	
539		(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온	^{1}H NMR (400 MHz, DMSO-d_6): δ 15.21 (s, 1H), 9.69 (s, 1H), 8.47 (d, J = 3.2 Hz, 1H), 8.04 (d, J = 3.2 Hz, 1H), 7.40 (d, J = 2.0 Hz, 1H), 7.14 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 8.4 Hz, 1H), 5.40-5.27 (m, 1H), 5.25-5.07 (m, 1H), 3.32-3.26 (m, 1H), 2.87-2.81 (m, 1H), 2.80-2.72 (m, 1H), 2.70-2.66 (m, 1H), 2.41-2.36 (m, 1H), 2.30 (s, 3H), 1.84 (s, 3H), 1.77 (s, 3H), 1.35-1.28 (m, 4H).	557.2

[596] **실험예 1: 실시예 화합물의 PKMYT1 열 이동 분석 평가**

[597] 본 발명 실시예 화합물이 PKMYT1 키나아제 도메인에 결합하는 정도를 열 이동 분석법 (Thermal Shift Assay)를 통해 시험하였다. 각각의 단백질 2 μM 농도로 50 mM Tris (pH 7.5)에 100 μM 화합물을 희석하였다. 그 용액에 SYPRO™ 오렌지 다이를 넣고 QuantStudio3 리얼-타임 PCR 시스템 (Applied Biosystems by Thermo Fisher Scientific) 장비에 플레이트를 옮겼다. 온도를 25℃에서 99℃까지 1초에 0.1℃씩 증가시켜 변형되는 온도값(Tm)을 Protein Thermal Shift software (version 1.3) (Applied Biosystems, Grand Island, NY)을 통해 계산하였다. DMSO 대비 화합물 존재 시 단백질의 변형되는 온도 정도를 다음 식 1에 따라 계산하였다.

[598] [식 1]

[599] ΔTm = Tm (실시예 화합물의 온도) - Tm (DMSO의 온도)

[600] 상기 ΔTm 값은 세포활성과 상당한 상관관계를 가지는 값이며, 그 결과를 하기 표 2에 나타내었다.

[601] [표 2]

[602]

실시예 화합물	ΔTm (℃)	실시예 화합물	ΔTm (℃)	실시예 화합물	ΔTm (℃)	실시예 화합물	ΔTm (℃)	실시예 화합물	ΔTm (℃)
1	A	109	B	217	B	325	B	433	A
2	B	110	B	218	B	326	B	434	B
3	A	111	A	219	A	327	A	435	A
4	B	112	A	220	B	328	B	436	B
5	A	113	B	221	A	329	A	437	A
6	B	114	A	222	A	330	B	438	B
7	A	115	B	223	B	331	A	439	A
8	B	116	A	224	B	332	A	440	A
9	A	117	B	225	A	333	B	441	B
10	B	118	B	226	B	334	B	442	A
11	A	119	A	227	A	335	A	443	B
12	B	120	B	228	A	336	B	444	A
13	A	121	A	229	B	337	A	445	B
14	B	122	A	230	B	338	A	446	A
15	A	123	B	231	A	339	B	447	B
16	B	124	B	232	B	340	B	448	A
17	B	125	A	233	A	341	A	449	B
18	A	126	A	234	A	342	A	450	A
19	A	127	B	235	B	343	B	451	B
20	B	128	A	236	B	344	B	452	A
21	B	129	B	237	A	345	A	453	B
22	A	130	B	238	A	346	B	454	B
23	B	131	A	239	B	347	A	455	A
24	A	132	B	240	B	348	A	456	B
25	A	133	A	241	A	349	A	457	A
26	B	134	A	242	B	350	A	458	A
27	A	135	B	243	A	351	B	459	B
28	B	136	B	244	B	352	B	460	B
29	B	137	A	245	A	353	A	461	A
30	A	138	A	246	A	354	B	462	B
31	A	139	B	247	B	355	A	463	A
32	A	140	A	248	A	356	B	464	B
33	A	141	B	249	B	357	A	465	A

[603]

34	B	142	B	250	B	358	B	466	B
35	A	143	A	251	A	359	A	467	A
36	B	144	A	252	A	360	B	468	B
37	A	145	B	253	B	361	A	469	A
38	A	146	A	254	B	362	B	470	A
39	A	147	B	255	A	363	A	471	B
40	A	148	A	256	A	364	B	472	B
41	A	149	B	257	B	365	A	473	A
42	B	150	B	258	A	366	B	474	B
43	A	151	A	259	B	367	A	475	A
44	B	152	A	260	A	368	A	476	A
45	B	153	B	261	B	369	B	477	B
46	A	154	B	262	A	370	B	478	B
47	B	155	A	263	A	371	A	479	A
48	A	156	B	264	A	372	B	480	A
49	A	157	A	265	A	373	A	481	B
50	B	158	A	266	B	374	B	482	A
51	B	159	B	267	A	375	A	483	B
52	A	160	B	268	B	376	A	484	A
53	A	161	A	269	A	377	B	485	B
54	B	162	A	270	B	378	B	486	A
55	A	163	B	271	A	379	A	487	B
56	B	164	A	272	A	380	B	488	A
57	A	165	B	273	A	381	A	489	B
58	B	166	A	274	B	382	A	490	A
59	A	167	B	275	A	383	B	491	B
60	B	168	A	276	A	384	A	492	A
61	A	169	B	277	A	385	B	493	B
62	B	170	A	278	B	386	B	494	A
63	A	171	B	279	A	387	A	495	B
64	B	172	A	280	B	388	B	496	A
65	A	173	B	281	A	389	A	497	B
66	B	174	B	282	B	390	A	498	A
67	A	175	A	283	A	391	B	499	B
68	B	176	B	284	B	392	A	500	A

[604]

69	A	177	A	285	A	393	B	501	B
70	B	178	A	286	B	394	A	502	A
71	A	179	B	287	A	395	B	503	A
72	A	180	B	288	B	396	A	504	B
73	B	181	A	289	A	397	B	505	B
74	B	182	A	290	B	398	B	506	A
75	A	183	B	291	A	399	A	507	B
76	B	184	A	292	B	400	A	508	A
77	A	185	B	293	A	401	B	509	B
78	A	186	B	294	B	402	A	510	B
79	B	187	A	295	A	403	B	511	A
80	A	188	B	296	B	404	A	512	A
81	B	189	A	297	A	405	B	513	B
82	B	190	B	298	B	406	A	514	B
83	A	191	A	299	A	407	B	515	A
84	A	192	B	300	B	408	A	516	B
85	B	193	A	301	A	409	B	517	A
86	B	194	B	302	B	410	A	518	B
87	A	195	A	303	A	411	B	519	A
88	B	196	B	304	B	412	A	520	B
89	A	197	A	305	A	413	B	521	A
90	A	198	B	306	B	414	A	522	B
91	B	199	A	307	A	415	B	523	A
92	A	200	B	308	B	416	A	524	B
93	B	201	A	309	A	417	B	525	A
94	A	202	B	310	B	418	A	526	B
95	B	203	A	311	A	419	B	527	A
96	A	204	A	312	B	420	B	528	B
97	B	205	B	313	A	421	A	529	A
98	B	206	B	314	A	422	B	530	B
99	A	207	A	315	B	423	A	531	A
100	A	208	B	316	B	424	A	532	B
101	B	209	A	317	A	425	B	533	A
102	A	210	B	318	A	426	A	534	B
103	B	211	A	319	B	427	B	535	A

[605]

104	A	212	B	320	A	428	A	536	A
105	B	213	A	321	B	429	B	537	B
106	A	214	A	322	A	430	A	538	B
107	B	215	B	323	B	431	B	539	A
108	A	216	A	324	A	432	B		
A: ΔTm (℃) ≥ 5℃; B: 5℃ > ΔTm (℃)									

[606] **실험예 2: 실시예 화합물에 의한 PKMYT1 키나아제에 대한 억제 활성 평가**

[607] 본 발명 실시예 화합물의 PKMYT1 키나아제에 대한 억제활성을 평가하기 위하여, 실시예 화합물을 정제된 human PKMYT1 효소와 반응시켜 하기와 같은 방법으로 평가하였다.

[608] 반응 버퍼는 200 mM Tris-HCl pH 7.4, 100 mM $MgCl_2$, 0.5 mg/mL BSA, 0.25 mM DTT 조성으로 사용하였으며, 모든 시험물의 반응은 반응 버퍼 상에서 이루어졌다. 화합물은 10 mM DMSO stock을 12 단계의 계열 희석법으로 희석하였으며, 최종 화합물의 농도 10 ~ 0.00005645 μM에서 효소 활성을 측정하였다. 시험시 적정 농도의 PKMYT1 효소, 정제된 ATP, 및 효소 기질 (CDK1)과 25℃에서 1시간 동안 반응시킨 후, 효소 활성을 in vitro ADP-GloTM kinase assay (Promega)를 이용하여 확인하였다. 2:2:1 비율로 효소 활성 반응액과 ADP-Glo 반응액, 효소능 검출 용액을 반응시켜서 효소의 활성 저해도를 발광(luminescence)으로 측정하였다. 화합물을 처리하지 않은 용매 대조군에 대한 효소 활성의 형광도를 기준으로 각 화합물들의 처리 농도에 따른 효소 활성 저해 정도를 산출하였으며, 이때 효소 활성 저해를 50 % 억제하는 각 화합물의 농도를 IC_{50} (nM) 값으로 결정하였고, GraphPad Prism 8.3.0 (GraphPad software Inc., San Diego) 소프트웨어를 이용하여 구하였다. 그 결과를 하기 표 3에 나타내었다.

[609] [표 3]

[610]

실시예 화합물	IC_{50} (nM)	실시예 화합물	IC_{50} (nM)	실시예 화합물	IC_{50} (nM)	실시예 화합물	IC_{50} (nM)	실시예 화합물	IC_{50} (nM)
1	A	104	A	211	A	332	A	439	A
3	A	106	A	213	A	335	A	440	A
5	A	108	A	214	A	337	A	442	A
7	A	111	A	216	A	338	A	444	A
9	B	112	A	219	A	341	A	447	A
13	A	114	A	221	A	342	A	449	A
15	A	116	A	222	A	345	A	451	A
18	A	119	A	225	A	347	A	453	A
19	A	121	A	237	B	348	A	455	A
22	A	122	A	238	A	349	B	457	A
24	A	125	A	241	A	350	A	458	A
25	A	126	A	243	A	353	B	461	A
27	A	128	A	245	A	355	A	463	A
28	B	131	A	246	A	357	A	465	A
30	A	133	A	248	A	359	A	467	A
31	A	134	A	251	A	361	A	469	A
32	A	137	A	252	A	363	A	470	A
33	A	138	A	255	A	365	A	473	A
35	A	140	A	256	A	367	A	475	A
37	A	143	A	258	A	368	A	476	A
38	A	144	A	260	A	371	A	479	A
39	B	146	A	263	A	373	A	480	A
40	A	148	A	264	B	375	A	482	A
41	A	151	A	269	A	376	A	484	A
43	A	152	A	271	A	379	A	486	A
46	A	155	A	272	A	381	A	488	A
48	A	157	A	275	B	382	A	490	A
49	A	158	A	281	A	384	A	492	A
52	B	161	A	283	B	387	A	494	A
53	A	162	A	285	A	389	A	496	A
55	A	164	A	287	A	390	A	498	A
57	A	166	A	289	A	392	A	500	A

[611]

59	A	168	A	291	A	394	A	502	A
61	A	170	A	293	A	396	A	503	A
65	A	172	A	295	A	399	A	506	A
67	A	175	A	297	A	400	A	511	A
69	A	177	A	299	A	402	A	512	A
71	A	178	A	301	A	404	A	515	A
75	A	181	A	303	A	406	A	517	A
77	A	182	A	305	A	408	A	519	A
78	A	184	A	307	A	410	A	521	A
80	A	187	A	309	A	412	A	523	A
83	A	189	A	311	A	414	A	525	A
84	A	191	A	313	A	416	B	527	A
87	A	193	A	314	A	418	B	529	A
89	A	195	A	317	A	421	B	531	A
90	A	197	A	318	A	423	A	533	A
92	A	199	A	320	A	424	A	535	A
94	A	201	A	322	A	426	A	536	A
96	A	203	A	324	A	428	A	539	A
99	A	204	A	327	A	430	A		
100	A	207	A	329	A	433	A		
102	A	209	A	331	A	437	A		
A: IC_{50} ≤ 200 nM; B: 200 nM < IC_{50} ≤ 500 nM; C: 500 nM < IC_{50}									

[612] **실험예 3: 실시예 화합물에 의한 종양세포 증식 억제 평가**

[613] 본 발명 실시예 화합물의 세포 증식 억제 활성을 평가하기 위해 다음과 같은 실험을 수행하였다. CCNE1 양성 세포주인 HCC1569 세포주 (한국세포주은행 #9S1569)와 MKN1 세포주 (한국세포주은행 #80101)를 각각 10 % fetal bovine serum (FBS)와 1 % 페니실린/스트렙토마이신이 함유된 RPMI1640 medium (Gibco #11875093) 배지로 배양하면서 세포 생존율 분석을 수행하였다. 시험 수행시 HCC1569세포주 또는 MKN1 세포주를 96-웰 평저 플레이트 (Corning #3903)에 각각 5,000개 세포/웰 또는 3,000개 세포/웰의 농도로 분주한 후, 37 ℃, 5 % CO_2 조건에서 24 시간 동안 배양하였다. 화합물은 10 μM을 최고 농도로 3배 농도 구배를 주어 11개 농도 별로 각 웰에 처리하였다. 대조군으로는 다이메틸설폭사이드 (DMSO)를 화합물 처리시와 동일한 0.5 % (v/v)의 농도로 처리하였고, 화합물 처리가 끝난 세포는 144 시간 또는 72 시간 동안 배양하였다. 세포의 생존 정도를 확인하기 위하여 상기 각 배양된 세포의 배지에 Cell Titer-Glo (Promega #G7573) 100 μL를 첨가하고 상온에서 10분간 배양한 뒤 마이크로플레이트 리더기를 이용하여 luminescence 값을 측정하였다. 화합물을 처리하지 않은 대조군 세포의 luminescence 값을 기준으로 각 화합물들의 처리 농도에 따른 세포 증식 억제 활

성 정도를 산출하였으며, 이 때 세포 증식 억제 활성이 50 %인 농도를 GI_{50} (μM) 값으로 결정하였다. GI_{50} (μM) 값의 산출은 프리즘(버전 8.4.3 #GraphPad) 소프트웨어를 이용하여 구하였으며, 그 결과를 하기 표 4에 나타내었다.

[614] [표 4]

[615]

실시예	GI_{50} (μM)		실시예	GI_{50} (μM)		실시예	GI_{50} (μM)		실시예	GI_{50} (μM)	
화합물	HCC1569	MKN1	화합물	HCC1569	MKN1	화합물	HCC1569	MKN1	화합물	HCC1569	MKN1
1	-	B	144	B	A	295	A	A	418	B	A
5	B	B	146	A	A	297	B	A	421	B	B
7	B	B	148	A	A	299	A	A	423	A	A
9	A	B	151	A	A	301	B	A	424	A	A
13	-	A	152	A	A	303	A	A	426	A	A
15	A	A	155	B	A	305	A	A	428	A	A
18	B	A	158	B	A	306	B	-	430	A	A
19	A	A	161	B	A	307	A	A	433	A	A
22	A	A	162	A	A	309	B	A	435	B	A
24	A	A	164	A	A	313	B	A	437	A	A
25	A	A	168	A	A	314	A	A	439	A	A
27	A	A	172	-	B	317	B	B	440	A	A
30	A	A	175	A	A	318	A	A	442	A	A
31	A	A	177	B	A	320	A	A	444	A	A
32	A	A	178	B	B	322	A	A	447	B	A
33	A	A	184	B	B	324	A	A	449	A	A
35	A	A	189	A	A	327	A	A	451	A	A
37	A	A	191	A	A	329	A	A	453	A	A
38	A	A	193	A	A	331	-	B	455	B	B
39	A	A	195	B	A	332	A	A	457	-	B
40	B	A	199	A	A	335	B	B	458	B	B
46	A	A	200	A	-	337	A	B	461	A	A
55	B	A	201	A	A	338	A	A	463	A	A
57	A	A	204	B	A	341	B	B	465	A	A
59	A	A	207	A	B	342	B	B	467	A	A
67	-	B	209	A	A	347	B	B	469	A	A
69	A	A	214	B	A	348	A	A	470	A	A
75	-	B	216	A	A	349	A	A	473	A	A
77	A	A	219	A	A	350	A	A	475	A	A
78	A	A	221	A	A	353	B	B	476	A	A
80	A	A	222	A	A	355	A	A	479	A	A
83	A	A	225	A	A	357	A	A	480	A	A

[616]

84	B	A	227	A	A	359	A	A	482	A	A
87	A	A	228	A	A	361	B	A	484	A	A
89	A	A	231	A	A	363	B	B	486	A	A
90	A	A	233	A	A	365	A	A	488	A	A
92	A	A	234	A	A	367	B	-	490	A	A
94	A	A	238	A	A	368	A	A	492	A	A
96	A	A	241	A	B	371	A	A	494	A	A
99	A	A	243	A	B	373	A	A	496	A	A
100	B	A	245	A	A	375	A	A	498	A	A
102	B	-	246	A	A	376	A	A	500	A	A
104	A	A	248	B	B	379	A	A	502	A	A
106	B	A	251	B	A	381	A	A	503	A	A
108	A	A	252	B	B	382	A	A	506	A	A
111	A	A	255	A	A	384	A	A	508	A	A
112	A	A	256	A	A	387	A	A	511	A	A
114	A	A	258	A	A	389	A	A	512	A	A
116	A	A	260	A	A	390	A	A	515	A	A
119	A	A	263	A	A	392	B	A	517	A	A
121	A	A	264	A	B	394	A	A	519	A	A
122	A	A	267	A	A	396	A	A	521	A	A
125	A	A	268	-	B	399	A	A	523	A	A
126	A	A	269	A	A	400	A	A	525	A	A
128	A	A	271	A	A	402	A	A	527	A	A
131	A	A	272	A	A	404	A	A	529	A	A
133	A	A	275	A	A	406	B	A	531	A	A
134	A	A	281	A	A	408	A	A	533	A	A
137	A	A	289	A	A	410	B	B	535	A	A
138	A	A	291	A	A	412	A	A	536	A	A
140	A	A	292	B	-	414	A	A	539	A	A
143	-	B	293	A	A	416	B	B			
A: GI_{50} ≤ 0.5 μM; B: 0.5 μM < GI_{50} ≤ 1 μM; C: 1 μM < GI_{50}											

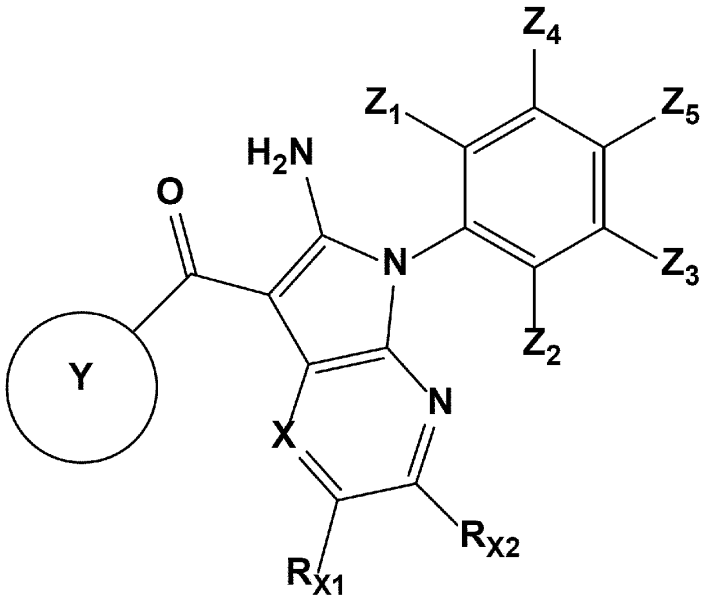
[617] 이상 실험예의 결과를 통해, 본 발명의 실시예 화합물들이 PKMYT1에 대하여 높은 억제 활성을 나타내고, CCNE1 과잉 활성화, 증폭, 또는 과발현되어 있는 세포에서 PKMYT1 저해로 인한 합성치사 유도를 통하여 높은 세포 증식 억제능을 가지는 것을 확인할 수 있었다.

[618] 이상, 본 발명을 바람직한 실시예 및 실험예를 통해 상세히 설명하였으나, 본 발명의 범위는 특정 실시예 화합물에 한정되는 것은 아니며, 첨부된 특허청구범위에 의하여 해석되어야 할 것이다. 또한, 이 기술분야에서 통상의 지식을 습득한 자라면, 본 발명의 범위에서 벗어나지 않으면서도 많은 수정과 변형이 가능함을 이해하여야 할 것이다.

청구범위

[청구항 1] 하기 화학식 1로 표시되는 화합물, 이의 입체 이성질체 또는 이의 약학적으로 허용가능한 염:

[화학식 1]



상기 화학식 1에서,

X는 CH 또는 N이고;

R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -C_{2-6}알케닐, -C_{2-6}알키닐, -C_{1-6}아미노알킬, -C_{1-6}하이드록시알킬, -C_{1-6}할로알킬, -CN, -NH(C_{1-6}알킬), -N(C_{1-6}알킬)(C_{1-6}알킬), -O-(C_{1-6}알킬), -(3-6원 사이클로알킬), -(4-6원 헤테로사이클로알킬), -페닐, 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 사이클로알킬), -(4-6원 헤테로사이클로알킬), -페닐, 또는 -(5-6원 헤테로아릴)의 고리 내 하나 이상의 H는 -C_{1-6}알킬로 치환될 수 있음; 또는 R_{X1} 및 R_{X2}가 서로 결합하여 12-13원 방향족 융합 고리를 형성하는 것이고;

고리 Y는 -(5-10원 헤테로아릴)이고, 여기서 상기 -(5-10원 헤테로아릴) 고리는 고리 내 하나 이상의 N, O, 또는 S 원자를 포함할 수 있고, 상기 -(5-10원 헤테로아릴) 고리의 고리 내 하나 이상의 H는 -C_{1-6}알킬, -C_{1-6}아미노알킬, -C_{1-6}하이드록시알킬, -C_{1-6}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -$S(=O)_2$-C_{1-6}알킬, 또는 -P(=O)-(C_{1-6}알킬)(C_{1-6}알킬)로 치환될 수 있음;

m은 0, 1, 2, 3, 또는 4이고;

R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상

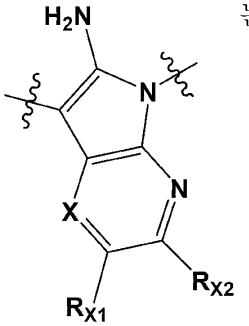
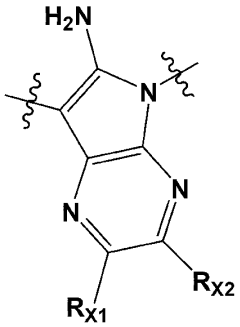
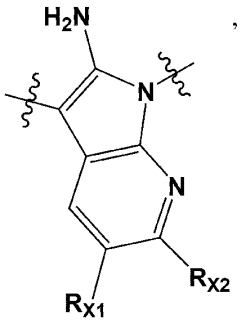
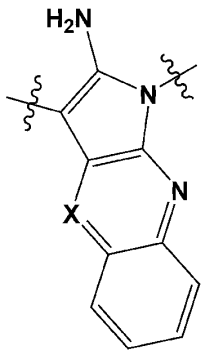
기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-6}알킬, -C_{1-6}알킬-O-C_{1-6}알킬, -O-C_{1-6}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

R_b 및 R_c는 각각 독립적으로 -C_{1-6}알킬, -C_{1-6}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-6}알킬, -S(=O)$_2$-C_{1-6}알킬, -S(=O)$_2$-(3-6원 사이클로알킬), -(CH$_2$)n-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 헤테로사이클로알킬), 또는 -(CH$_2$)n-(5-6원 헤테로아릴)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 헤테로사이클로알킬), 또는 -(CH_2)n-(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-6}알킬, -O-C_{1-6}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

n은 0, 1, 2, 3, 또는 4이고;

Z_1 내지 Z_5는 각각 독립적으로 -H, -C_{1-6}알킬, -OH, 또는 -할로이다.

[청구항 2] 제 1 항에 있어서,


는

,

, 또는

이고,

R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -(3-6원 사이클로알킬), 또는 -(4-6원 헤테로사이클로알킬)이고, 여기서 상기 -(3-6원 사이클로알킬) 또는 -(4-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬로 치환될 수 있음;

화학식 1로 표시되는 화합물, 이의 입체 이성질체 또는 이의 약학적으로 허용가능한 염.

[청구항 3] 제 1 항에 있어서,

고리 Y는 -(8-9원 헤테로아릴)이고;

Z_1 및 Z_2는 각각 독립적으로 -C_{1-3}알킬이고;

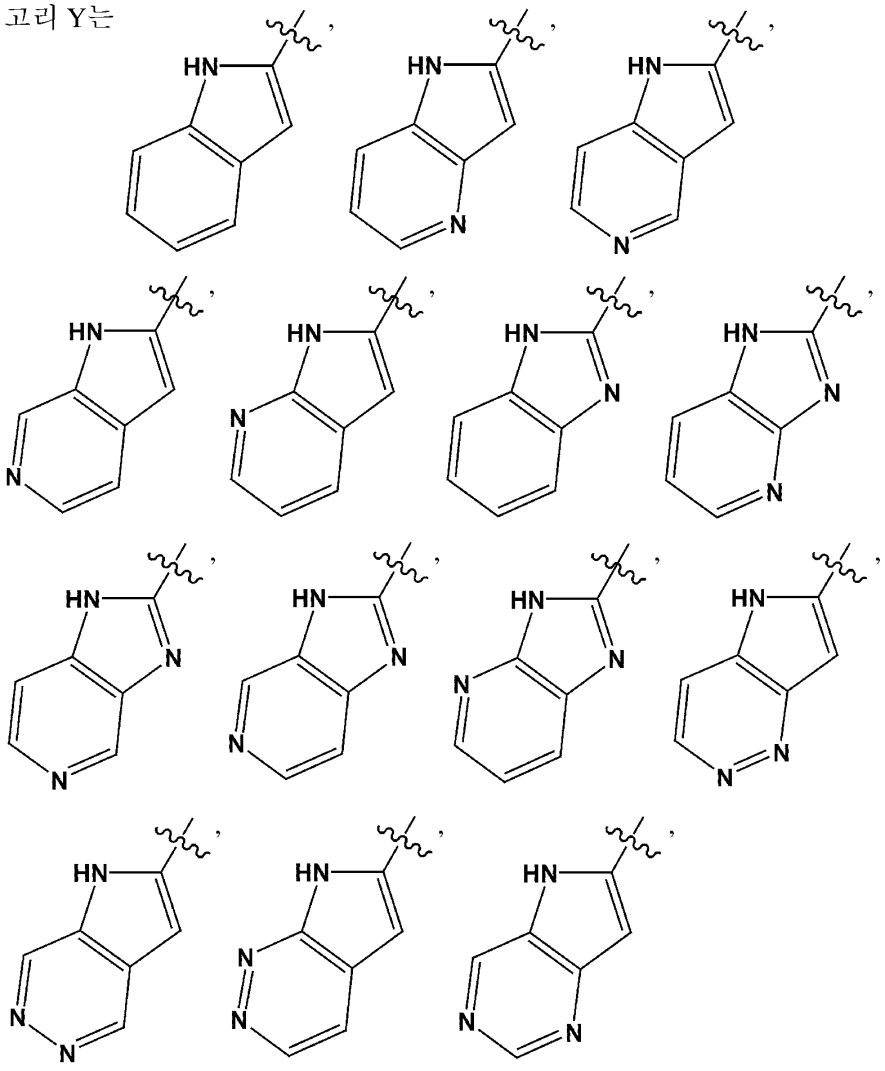
Z_3 및 Z_4는 중 어느 하나는 -OH이고, 나머지 하나는 -H이고;

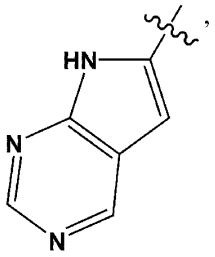
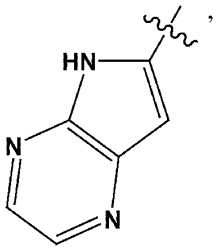
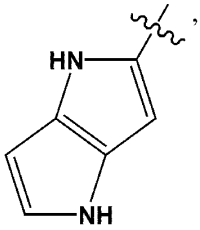
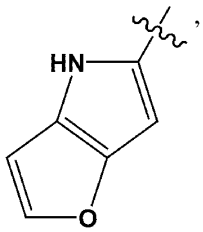
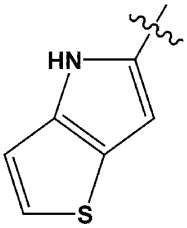
Z_5는 -H 또는 -할로인,

화학식 1로 표시되는 화합물, 이의 입체 이성질체 또는 이의 약학적으로 허용가능한 염.

[청구항 4] 제 1 항에 있어서,

고리 Y는







, 또는 
이고, 여기서 상기 고리 Y의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}아미노알킬, -C_{1-3}하이드록시알킬, -C_{1-3}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -$S(=O)_2$-C_{1-3}알킬, 또는 -P(=O)-(C_{1-3}알킬)(C_{1-3}알킬)로 치환될 수 있음;

m은 0 또는 1이고;

R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}알킬-O-C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

R_b 및 R_c는 각각 독립적으로 -C_{1-3}알킬, -C_{1-3}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-3}알킬, -$S(=O)_2$-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

n은 0, 1 또는 2인;

화학식 1로 표시되는 화합물, 이의 입체 이성질체 또는 이의 약학적으로 허용가능한 염.

[청구항 5] 하기 화합물로 이루어진 군으로부터 선택된 것인 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염:

1	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
2	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
3	(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온
4	(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온
5	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온
6	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온
7	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온
8	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온
9	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
10	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
11	(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온
12	(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-5,6-다이메틸-1H-피롤로[2,3-b]피리딘-3-일)(1H-벤조[d]이미다졸-2-일)메탄온
13	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온
14	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-싸이에노[3,2-b]피롤-5-일)메탄온
15	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-모폴리노-1H-피롤로[3,2-c]피리딘-2-일)메탄온
16	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-모폴리노-1H-피롤로[3,2-c]피리딘-2-일)메탄온
17	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온
18	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(4H-퓨로[3,2-b]피롤-5-일)메탄온

19	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-인돌-2-일)메탄온
20	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-인돌-2-일)메탄온
21	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(4-메틸피페라진-1-일)-1H-인돌-2-일)메탄온
22	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(4-메틸피페라진-1-일)-1H-인돌-2-일)메탄온
23	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-c]피리딘-2-일)메탄온
24	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-c]피리딘-2-일)메탄온
25	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온
26	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온
27	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
28	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
29	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-c]피리딘-2-일)메탄온
30	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-c]피리딘-2-일)메탄온
31	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((헥사하이드로피롤로[1,2-a]피라진-2(1H)-일)메틸)-1H-인돌-2-일)메탄온
32	(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-인돌-2-일)메탄온
33	(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
34	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
35	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
36	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-b]피리딘-2-일)메탄온

37	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[2,3-b]피리딘-2-일)메탄온
38	(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-(4-메틸피페라진-1-일)-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
39	(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-모폴리노-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
40	(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1H-피라졸-4-일)-1H-인돌-2-일)메탄온
41	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
42	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
43	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
44	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
45	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(메틸설폰일)-1H-인돌-2-일)메탄온
46	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(메틸설폰일)-1H-인돌-2-일)메탄온
47	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
48	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
49	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((4-메틸테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온
50	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((4-메틸테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온
51	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온
52	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-인돌-2-일)메탄온
53	N-(2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-인돌-7-일)사이클로프로페인설폰아마이드
54	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온

55	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
56	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
57	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
58	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온
59	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온
60	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((R)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온
61	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((R)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온
62	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-인돌-2-일)메탄온
63	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-인돌-2-일)메탄온
64	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-1H-인돌-2-일)메탄온
65	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-1H-인돌-2-일)메탄온
66	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-플루오로-1H-인돌-2-일)메탄온
67	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-플루오로-1H-인돌-2-일)메탄온
68	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
69	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
70	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((S)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온
71	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((S)-1-메톡시프로판-2-일)아미노)-1H-인돌-2-일)메탄온
72	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((1-메톡시-2-메틸프로판-2-일)아미노)-1H-인돌-2-일)메탄온

73	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((1-메톡시-2-메틸프로판-2-일)아미노)-1H-인돌-2-일)메탄온
74	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온
75	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온
76	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온
77	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-클로로-1H-인돌-2-일)메탄온
78	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
79	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
80	(6-((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
81	(6-((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
82	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
83	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
84	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온
85	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온
86	(6-(3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
87	(6-(3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
88	(6-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
89	(6-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
90	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온

91	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
92	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
93	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
94	(5-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-피롤로[3,2-b]피리딘-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
95	(5-((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)-1H-피롤로[3,2-b]피리딘-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
96	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
97	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
98	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(다이메틸포스포릴)-1H-인돌-2-일)메탄온
99	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(다이메틸포스포릴)-1H-인돌-2-일)메탄온
100	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로페인카보닐)-1H-인돌-2-일)메탄온
101	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로페인카보닐)-1H-인돌-2-일)메탄온
102	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
103	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
104	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
105	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
106	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(다이메틸포스포릴)-1H-인돌-2-일)메탄온
107	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(다이메틸포스포릴)-1H-인돌-2-일)메탄온
108	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸포스포릴)-1H-인돌-2-일)메탄온

109	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸포스포릴)-1H-인돌-2-일)메탄온
110	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-에틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
111	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-에틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
112	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
113	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
114	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
115	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
116	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
117	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
118	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(옥세탄-3-일아미노)-1H-인돌-2-일)메탄온
119	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(옥세탄-3-일아미노)-1H-인돌-2-일)메탄온
120	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-에틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
121	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-에틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
122	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
123	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
124	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
125	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
126	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온

127	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
128	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
129	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
130	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
131	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
132	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
133	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
134	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온
135	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3aR,6aS)-테트라하이드로-1H-퓨로[3,4-c]피롤-5(3H)-일)-1H-인돌-2-일)메탄온
136	(5-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
137	(5-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
138	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
139	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
140	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
141	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
142	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온
143	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-1H-인돌-2-일)메탄온
144	(4-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온

145	(4-(((1R,4R)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
146	(5-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
147	(5-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
148	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
149	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
150	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
151	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
152	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
153	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
154	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
155	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-클로로-1H-피롤로[3,2-b]피리딘-2-일)메탄온
156	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
157	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
158	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
159	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
160	(4-((3-옥사-6-아자바이사이클로[3.1.1]헵탄-6-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
161	(4-((3-옥사-6-아자바이사이클로[3.1.1]헵탄-6-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
162	(S)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]퀴녹살린-3-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온

163	(R)-(2-아미노-1-(3-하이드록시-2,6-다이메틸페닐)-1H-피롤로[2,3-b]퀴녹살린-3-일)(1H-피롤로[3,2-b]피리딘-2-일)메탄온
164	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
165	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
166	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시-3-메틸아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
167	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시-3-메틸아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
168	(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
169	(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
170	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3S,4R)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온
171	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3S,4R)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온
172	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온
173	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온
174	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
175	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
176	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
177	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
178	(4-((6-옥사-3-아자바이사이클로[3.1.1]헵탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
179	(4-((6-옥사-3-아자바이사이클로[3.1.1]헵탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
180	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3R,4S)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온

181	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((3R,4S)-3-플루오로-4-메톡시피페리딘-1-일)메틸)-1H-인돌-2-일)메탄온
182	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
183	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
184	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
185	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
186	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온
187	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온
188	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
189	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
190	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
191	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
192	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
193	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-((4-메틸피페라진-1-일)메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
194	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메틸)-1H-인돌-2-일)메탄온
195	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)메틸)-1H-인돌-2-일)메탄온
196	(4-((3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
197	(4-((3-옥사-8-아자바이사이클로[3.2.1]옥탄-8-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
198	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온

199	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
200	(R)-2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-피롤로[3,2-b]피리딘-7-카보나이트릴
201	(S)-2-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-카보닐)-1H-피롤로[3,2-b]피리딘-7-카보나이트릴
202	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
203	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-2-(메톡시메틸)아제티딘-1-일)메틸)-1H-인돌-2-일)메탄온
204	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이플루오로메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
205	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이플루오로메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
206	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
207	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
208	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
209	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-메틸피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
210	(4-(((1R,5S)-8-옥사-3-아자바이사이클로[3.2.1]옥탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
211	(4-(((1R,5S)-8-옥사-3-아자바이사이클로[3.2.1]옥탄-3-일)메틸)-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
212	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온
213	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-3-메톡시피롤리딘-1-일)메틸)-1H-인돌-2-일)메탄온
214	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
215	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
216	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온

217	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
218	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
219	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
220	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
221	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
222	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
223	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
224	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
225	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메톡시-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
226	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
227	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
228	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
229	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
230	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
231	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)메톡시)-1H-인돌-2-일)메탄온
232	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
233	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
234	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온

235	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-클로로-5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
236	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
237	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)아미노)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
238	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
239	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
240	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
241	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(1H-인돌-2-일)메탄온
242	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
243	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-(((3-메틸옥세탄-3-일)메틸)아미노)-1H-인돌-2-일)메탄온
244	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
245	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
246	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로폭시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
247	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로폭시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
248	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로필메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
249	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(사이클로프로필메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
250	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
251	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-((3-메틸옥세탄-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
252	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온

253	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
254	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5,7-다이메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
255	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5,7-다이메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
256	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
257	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-메톡시-5-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
258	(R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
259	(S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
260	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
261	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
262	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
263	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(6-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
264	(R)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
265	(S)-(6-아미노-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
266	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
267	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-플루오로-4-((3-메틸옥세탄-3-일)아미노)-1H-인돌-2-일)메탄온
268	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
269	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
270	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온

271	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
272	(R)-(6-아미노-2-사이클로프로필-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
273	(S)-(6-아미노-2-사이클로프로필-5-(3-플루오로-5-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
274	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
275	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
276	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
277	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
278	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-(모폴리노메틸)-1H-인돌-2-일)메탄온
279	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-(모폴리노메틸)-1H-인돌-2-일)메탄온
280	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-인돌-2-일)메탄온
281	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-인돌-2-일)메탄온
282	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
283	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(모폴리노메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
284	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
285	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(5-메틸-7-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
286	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
287	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((4-메틸피페라진-1-일)메틸)-7-(트라이플루오로메틸)-1H-인돌-2-일)메탄온
288	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-인돌-2-일)메탄온

289	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸-1,2,3,6-테트라하이드로피리딘-4-일)-1H-인돌-2-일)메탄온
290	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
291	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((4-메틸피페라진-1-일)메틸)-1H-인돌-2-일)메탄온
292	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸피페리딘-4-일)-1H-인돌-2-일)메탄온
293	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-메틸피페리딘-4-일)-1H-인돌-2-일)메탄온
294	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온
295	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온
296	(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-7-메틸-1H-인돌-2-일)(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
297	(4-(((1S,4S)-2-옥사-5-아자바이사이클로[2.2.1]헵탄-5-일)메틸)-7-메틸-1H-인돌-2-일)(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)메탄온
298	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
299	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
300	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
301	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
302	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)옥시)-1H-인돌-2-일)메탄온
303	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)옥시)-1H-인돌-2-일)메탄온
304	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온
305	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온
306	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온

307	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)옥시)-1H-인돌-2-일)메탄온
308	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)메톡시)-1H-인돌-2-일)메탄온
309	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)메톡시)-1H-인돌-2-일)메탄온
310	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
311	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-2,3-다이메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
312	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온
313	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-1-메틸피롤리딘-2-일)메톡시)-1H-인돌-2-일)메탄온
314	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
315	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
316	(R)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
317	(S)-(6-아미노-2-사이클로프로필-5-(3-하이드록시-2,6-다이메틸페닐)-3-메틸-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸피페리딘-4-일)메톡시)-1H-인돌-2-일)메탄온
318	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
319	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(옥세탄-3-일)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
320	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
321	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
322	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
323	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
324	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온

325	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
326	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(옥세탄-3-일옥시)-1H-인돌-2-일)메탄온
327	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(옥세탄-3-일옥시)-1H-인돌-2-일)메탄온
328	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
329	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((3-메틸옥세탄-3-일)옥시)-1H-인돌-2-일)메탄온
330	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((1-(2-플루오로-2-메틸프로필)피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
331	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((1-(2-플루오로-2-메틸프로필)피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
332	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(2-플루오로-2-메틸프로필)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
333	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(1-(2-플루오로-2-메틸프로필)피페리딘-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
334	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(모폴리노메틸)-1H-인돌-2-일)메탄온
335	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(모폴리노메틸)-1H-인돌-2-일)메탄온
336	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(2-모폴리노에톡시)-1H-인돌-2-일)메탄온
337	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(2-모폴리노에톡시)-1H-인돌-2-일)메탄온
338	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
339	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
340	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온
341	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-메톡시아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온
342	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-플루오로아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온

343	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3-플루오로아제티딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온
344	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온
345	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-인돌-2-일)메탄온
346	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)아미노)-1H-인돌-2-일)메탄온
347	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((1-메틸아제티딘-3-일)아미노)-1H-인돌-2-일)메탄온
348	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((테트라하이드로-2H-피란-4-일)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
349	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((테트라하이드로-2H-피란-4-일)아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
350	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-모폴리노-1H-피롤로[3,2-b]피리딘-2-일)메탄온
351	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-모폴리노-1H-피롤로[3,2-b]피리딘-2-일)메탄온
352	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온
353	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-((테트라하이드로-2H-피란-4-일)아미노)-1H-인돌-2-일)메탄온
354	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
355	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(모폴리노메틸)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
356	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(2-하이드록시-2-메틸프로폭시)-7-메틸-1H-인돌-2-일)메탄온
357	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(2-하이드록시-2-메틸프로폭시)-7-메틸-1H-인돌-2-일)메탄온
358	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온
359	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((R)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온
360	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온

361	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-4-(((S)-테트라하이드로퓨란-3-일)아미노)-1H-인돌-2-일)메탄온
362	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1s,3S)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온
363	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1s,3S)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온
364	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸아미노)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
365	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(다이메틸아미노)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
366	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1r,3R)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온
367	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((1r,3R)-3-메톡시사이클로부틸)아미노)-7-메틸-1H-인돌-2-일)메탄온
368	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(테트라하이드로-2H-피란-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
369	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(테트라하이드로-2H-피란-4-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
370	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(3,6-다이하이드로-2H-피란-4-일)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
371	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(3,6-다이하이드로-2H-피란-4-일)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
372	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((R)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
373	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((R)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
374	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((S)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
375	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(((S)-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
376	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
377	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
378	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7H-피롤로[2,3-d]피리미딘-6-일)메탄온

379	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7H-피롤로[2,3-d]피리미딘-6-일)메탄온
380	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(메틸아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
381	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(메틸아미노)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
382	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-c]피리딘-2-일)메탄온
383	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-1H-피롤로[3,2-c]피리딘-2-일)메탄온
384	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[2,3-c]피리딘-2-일)메탄온
385	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(모폴리노메틸)-1H-피롤로[2,3-c]피리딘-2-일)메탄온
386	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[2,3-c]피리딘-2-일)메탄온
387	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[2,3-c]피리딘-2-일)메탄온
388	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(4-메틸피페라진-1-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
389	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-(4-메틸피페라진-1-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
390	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
391	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(2-하이드록시프로판-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
392	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
393	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
394	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온
395	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온
396	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온

397	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-5H-피롤로[3,2-c]피리다진-6-일)메탄온
398	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2,4-다이메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
399	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2,4-다이메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
400	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
401	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(모폴리노메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
402	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
403	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
404	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온
405	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온
406	(S)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
407	(R)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-에톡시-1H-피롤로[3,2-b]피리딘-2-일)메탄온
408	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
409	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-플루오로-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
410	(S)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메틸)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
411	(R)-(6-아미노-5-(4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(트라이플루오로메탈)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
412	(6-아미노-5-((S)-4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
413	(6-아미노-5-((R)-4-플루오로-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
414	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-2-(모폴리노메틸)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온

415	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-메틸-2-(모폴리노메틸)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
416	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
417	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
418	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
419	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4,4-다이플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
420	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
421	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
422	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온
423	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(모폴리노메틸)-5H-피롤로[2,3-b]피라진-6-일)메탄온
424	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
425	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
426	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
427	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-((3,3-다이플루오로피롤리딘-1-일)메틸)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
428	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
429	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
430	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
431	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
432	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온

433	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
434	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
435	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
436	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
437	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
438	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
439	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
440	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
441	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
442	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
443	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
444	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
445	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
446	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
447	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
448	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
449	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-7-메틸-1H-피롤로[3,2-b]피리딘-2-일)메탄온
450	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온

451	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
452	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
453	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
454	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
455	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
456	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
457	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-5H-피롤로[2,3-b]피라진-6-일)메탄온
458	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
459	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
460	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
461	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
462	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
463	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(6-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
464	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7H-피롤로[2,3-d]피리미딘-6-일)메탄온
465	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4S)-1-사이클로프로필-3-플루오로피페리딘-4-일)옥시)-7H-피롤로[2,3-d]피리미딘-6-일)메탄온
466	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일)메탄온
467	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일)메탄온
468	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온

469	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
470	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
471	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
472	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
473	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[2,3-b]피리딘-2-일)메탄온
474	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온
475	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((R)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온
476	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로필-1H-피롤로[3,2-b]피리딘-2-일)메탄온
477	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-사이클로프로필-1H-피롤로[3,2-b]피리딘-2-일)메탄온
478	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온
479	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-(((S)-4-메틸모폴린-3-일)메톡시)-1H-인돌-2-일)메탄온
480	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
481	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
482	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
483	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
484	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
485	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
486	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온

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488	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((R)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
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490	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(3-사이클로프로필-5H-피롤로[3,2-c]피리다진-6-일)메탄온
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494	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
495	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
496	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
497	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(5-(((S)-4-메틸모폴린-3-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
498	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
499	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
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502	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((R)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
503	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((S)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
504	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-메틸-5-((S)-4-메틸모폴린-2-일)-1H-피롤로[3,2-b]피리딘-2-일)메탄온

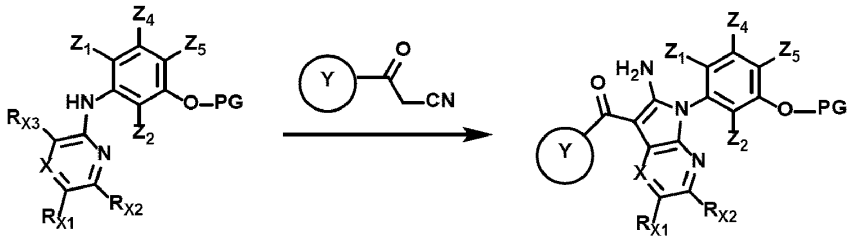
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506	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
507	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((S)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
508	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
509	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((R)-1-사이클로프로필-3,3-다이플루오로피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
510	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
511	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
512	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
513	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-(((3S,4R)-1-사이클로프로필-4-플루오로피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
514	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
515	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
516	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
517	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
518	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
519	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
520	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
521	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(2-사이클로프로필-4-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
522	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온

523	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
524	(R)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
525	(S)-(6-아미노-5-(3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-메틸-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
526	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
527	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((S)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
528	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
529	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(7-사이클로프로필-5-(((R)-4-메틸모폴린-2-일)메톡시)-1H-피롤로[3,2-b]피리딘-2-일)메탄온
530	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
531	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((S)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
532	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
533	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
534	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
535	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
536	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
537	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((R)-3,3-다이플루오로-1-메틸피페리딘-4-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
538	(6-아미노-5-((R)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온
539	(6-아미노-5-((S)-3-하이드록시-2,6-다이메틸페닐)-5H-피롤로[2,3-b]피라진-7-일)(4-사이클로프로필-2-(((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)옥시)-5H-피롤로[3,2-d]피리미딘-6-일)메탄온

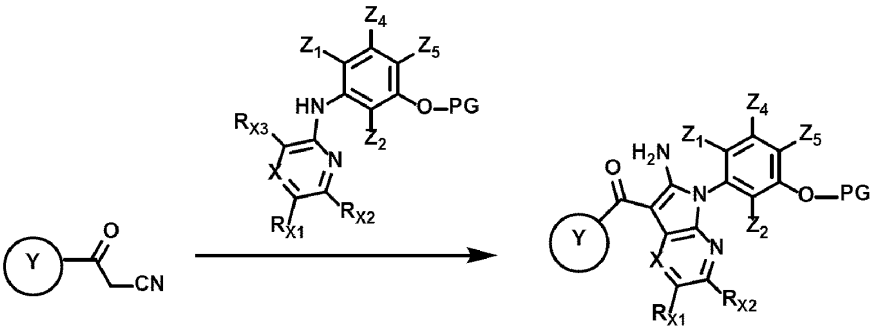
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[청구항 6] 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염을 제조하기 위한 방법으로서,하기 반응식 I 또는 II로 표시되는 단계를 포함하는 방법:

[반응식 I]



[반응식 II]

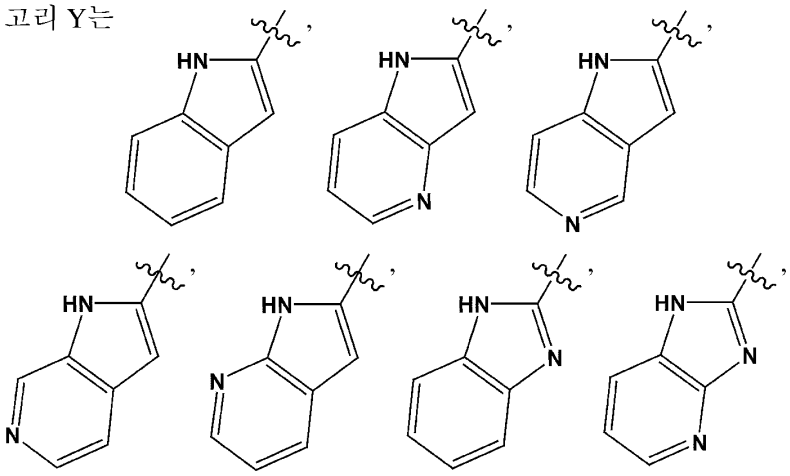


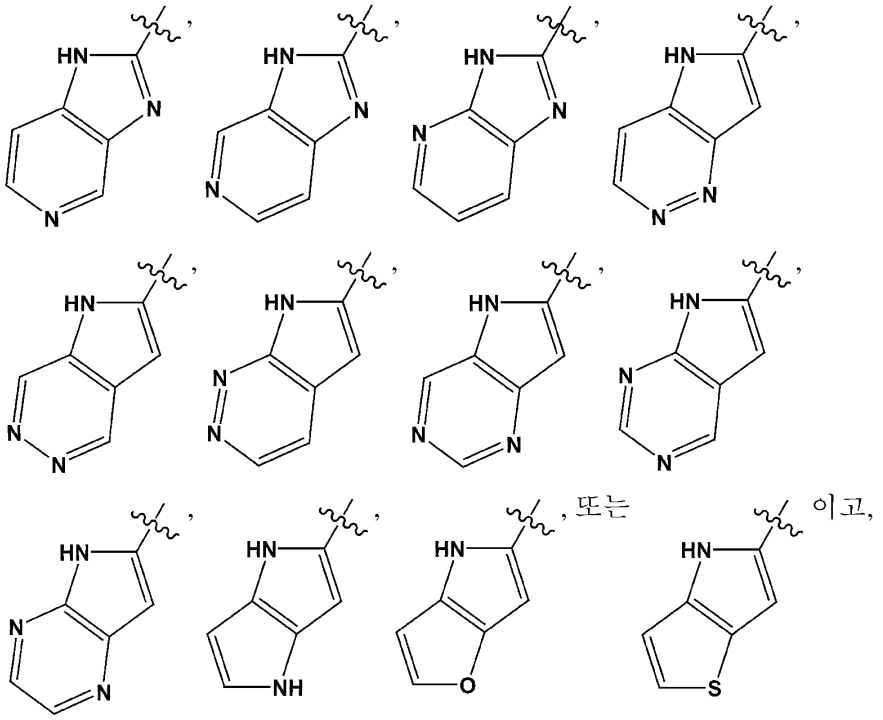
상기 반응식 I 또는 II에서,

R_{X1} 및 R_{X2}는 각각 독립적으로 -H, -C_{1-6}알킬, -(3-6원 사이클로알킬), 또는 -(4-6원 헤테로사이클로알킬)이고, 여기서 상기 -(3-6원 사이클로알킬) 또는 -(4-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬로 치환될 수 있음;

R_{X3}는 -할로이고;

고리 Y는





여기서 상기 고리 Y의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}아미노알킬, -C_{1-3}하이드록시알킬, -C_{1-3}할로알킬, -CN, -(CH_2)m-R_a, -NH-R_b, -O-R_c, -할로, -(3-6원 사이클로알킬), -C(=O)-(3-6원 사이클로알킬), -$S(=O)_2$-C_{1-3}알킬, 또는 -P(=O)-(C_{1-3}알킬)(C_{1-3}알킬)로 치환될 수 있음;

m은 0 또는 1이고;

R_a는 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴)이고, 여기서 상기 -(3-6원 헤테로사이클로알킬), -(7-12원 헤테로바이사이클로알킬), -(3-6원 헤테로사이클로알케닐), 또는 -(5-6원 헤테로아릴) 고리 내 하나 이상의 H는 -C_{1-3}알킬, -C_{1-3}알킬-O-C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 헤테로사이클로알킬)로 치환될 수 있음;

R_b 및 R_c는 각각 독립적으로 -C_{1-3}알킬, -C_{1-3}할로알킬, -C_{1-6}하이드록시알킬, -C_{1-6}알킬-O-C_{1-3}알킬, -$S(=O)_2$-(3-6원 사이클로알킬), -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)이고, 여기서 상기 -(CH_2)n-(3-6원 사이클로알킬) 또는 -(CH_2)n-(3-6원 헤테로사이클로알킬)의 고리 내 하나 이상의 H는 -C_{1-3}알킬, -O-C_{1-3}알킬, -C_{1-6}할로알킬, -할로, 또는 -(3-6원 사이클로알킬)로 치환될 수 있음;

n은 0, 1 또는 2이고;

Z_1 및 Z_2는 각각 독립적으로 -C_{1-3}알킬이고;

Z_4는 -H이고;

Z_5는 -H 또는 -할로이고;

PG는 -OH 보호기이다.

[청구항 7] 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염, 및 약학적으로 허용가능한 첨가제를 포함하는, 약학적 조성물.

[청구항 8] 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염을 유효성분으로 함유하는, 암의 예방 또는 치료용 약학적 조성물.

[청구항 9] 제 8 항에 있어서,

PKMYT1 및/또는 CCNE1을 억제하는 것인, 약학적 조성물.

[청구항 10] 제 8 항에 있어서,

상기 암은 PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 것인, 약학적 조성물.

[청구항 11] 제 8 항에 있어서,

상기 암은 PPP2R1A 및/또는 FBXW7 불활성화 돌연변이 (inactivating mutation)와 관련된 것인, 약학적 조성물.

[청구항 12] 제 8 항에 있어서,

상기 암은 자궁암, 자궁내막암 (Endometrial Cancer), 유두상 장액성 자궁내막암 (UPSC; uterine papillary serous carcinoma), 자궁 육종 (Uterine Carcinosarcoma), 자궁체부암 (Uterine Corpus Cancer), 자궁체부내막암 (Uterine corpus endometrial carcinoma), 자궁경부암, 난소암 (Ovarian cancer), 장액성 난소암, 고등급 장액성 난소암 (High grade serous Ovarian cancer, HGSOC), 유방암, 삼중음성유방암 (TNBC), 췌장암, 췌장 도관 선종암 (PDAC; Pancreatic ductal adenocarcinoma), 대장암 (CRC), 직장암, 위암 (gastric cancer), 식도암, 간암, 간세포암 (LIHC; Liver hepatocellular carcinoma), 폐암, 비소세포폐암 (NSCLC), 폐 편평상피세포암, 백혈병, 만성 골수성 백혈병, 림프종, 전립선암, 방광암, 고환암, 신장암, 유두상 신세포암 (KIRP; Kidney renal papillary cell carcinoma), 투명세포형 신세포암 (KIRC; Kidney renal clear cell carcinoma), 뼈암, 골육종, 유잉육종, 연골육종, 연조직암, 뇌암, 교모세포종, 신경교종, 뇌 하급 신경교종 (LGG; Brain Lower Grade Glioma), 두경부암, 선낭암종 (ACC; Adenoid Cystic Carcinoma), 피부암, 흑색종, 및 흉선종으로 이루어진 군으로부터 선택되는 1종 이상인, 약학적 조성물.

[청구항 13] PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환의 치료 또는 예방에 사용하기 위한 약제의 제조에 사용하기 위한, 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염의 용도.

[청구항 14] 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염의 치료학적으로 유효한 양을, 이를 필요로 하는 대상에게 투여하는 단계를 포함하는, PKMYT1 및/또는 CCNE1 과잉 활성화, 증폭, 또는 과발현과 관련된 질환을 치료 또는 예방하는 방법.

[청구항 15] 제 1 항 내지 제 5 항 중 어느 한 항에 따른 화합물, 이의 입체 이성질체, 또는 이의 약학적으로 허용가능한 염의 치료학적으로 유효한 양을, 이를 필요로 하는 대상에게 투여하는 것을 포함하는, 자궁암, 자궁내막암 (Endometrial Cancer), 유두상 장액성 자궁내막암 (UPSC; uterine papillary serous carcinoma), 자궁 육종 (Uterine Carcinosarcoma), 자궁체부암 (Uterine Corpus Cancer), 자궁체부내막암 (Uterine corpus endometrial carcinoma), 자궁경부암, 난소암 (Ovarian cancer), 장액성 난소암, 고등급 장액성 난소암 (High grade serous Ovarian cancer, HGSOC), 유방암, 삼중음성유방암 (TNBC), 췌장암, 췌장 도관 선종암 (PDAC; Pancreatic ductal adenocarcinoma), 대장암 (CRC), 직장암, 위암 (gastric cancer), 식도암, 간암, 간세포암 (LIHC; Liver hepatocellular carcinoma), 폐암, 소세포폐암 (SCLC), 비소세포폐암 (NSCLC), 폐 편평상피세포암, 백혈병, 급성 골수성 백혈병, 만성 골수성 백혈병, 림프종, 전립선암, 방광암, 고환암, 신장암, 유두상 신세포암 (KIRP; Kidney renal papillary cell carcinoma), 투명세포형 신세포암 (KIRC; Kidney renal clear cell carcinoma), 뼈암, 골육종, 유잉육종, 연골육종, 연조직암, 뇌암, 교모세포종, 신경교종, 뇌 하급 신경교종 (LGG; Brain Lower Grade Glioma), 두경부암, 선낭암종 (ACC; Adenoid Cystic Carcinoma), 피부암, 흑색종, 및 흉선종으로 이루어진 군으로부터 선택되는 1종 이상의 질환을 치료 또는 예방하는 방법.