

명세서

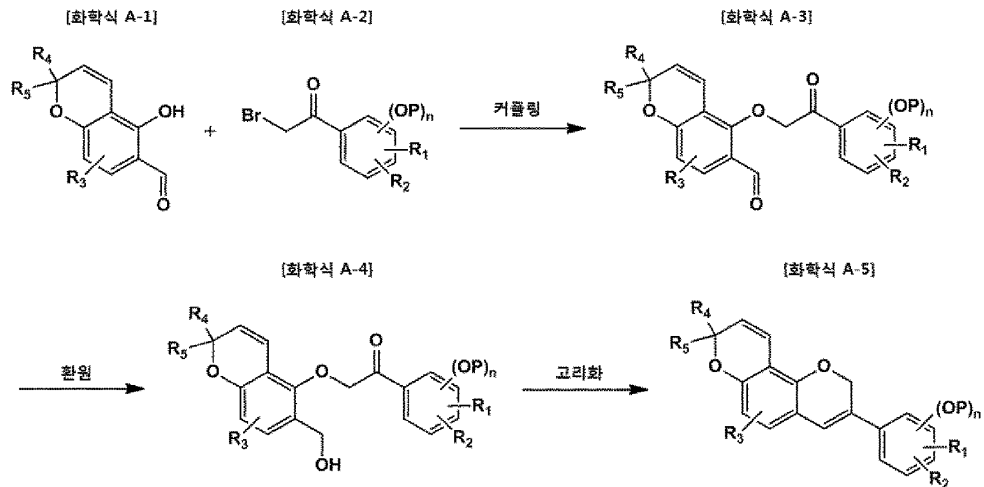
발명의 명칭: 2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체의 합성 방법

기술분야

- [1] 본 명세서는 2019년 7월 30일에 한국특허청에 제출된 한국 특허 출원 제10-2019-0092711호의 출원일의 이익을 주장하며, 그 내용 전부는 본 발명에 포함된다.
- [2] 본 발명은 2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체의 합성 방법에 관한 것이다.
- [3]

배경기술

- [4] 특허문헌 1[대한민국 공개 특허 제10-2015-0075030호]은 피라노크로메닐페놀 유도체가 고지혈증, 지방간, 당대사 이상, 당뇨병 및 비만을 포함한 각종 대사증후군의 예방 및 치료에 효과가 있음을 개시하고 있으며, 특허문헌 2[대한민국 공개 특허 제10-2018-0037584호]는 이들 피라노크로메닐페놀 유도체를 합성하기 위한 핵심 중간체로서 3-페닐-2,3,4,8,9,10-헥사히드로피라노[2,3-f]크로멘 유도체를 제조하는 방법을 개시하고 있다. 즉, 특허문헌 2에는 아래의 반응식 A와 같이 화학식 A-1의 화합물과 화학식 A-2의 화합물을 커플링하여 화학식 A-3의 화합물을 수득하고, 이를 환원시켜 화학식 A-4의 화합물을 수득하고, 고리화 반응을 진행하여 화학식 A-5의 화합물을 수득하고, 최종적으로 수소첨가 반응을 통해서 특허문헌 1에 개시된 각종 유도체들을 합성하는 방법을 개시하고 있다. 여기에서, 화학식 A-3의 화합물로부터 화학식 A-4의 화합물을 제조하는 단계는 L-selectride[®]를 극저온인 -78 °C에서 천천히 첨가하여 반응을 진행시킬 뿐만 아니라 L-selectride[®]가 고가이기 때문에 화학식 A-4로 표시되는 2-((6-(히드록시메틸)-2H-크로멘-5-일)옥시)-1-페닐에타논 유도체를 상업적으로 대량 생산하는데 하는데 상당한 수고와 어려움이 따를 수 있다.
- [5] [반응식 A]
- [6]



[7] 이에, 화학식 A-4로 표시되는 2-((6-(히드록시메틸)-2H-크로멘-5-일)옥시)-1-페닐에타논 유도체를 온화한 조건에서 대량 생산할 수 있는 합성 방법이 필요한 실정이다.

[8]

[9] [선행기술문헌]

[10] [특허문헌]

[11] 대한민국 공개 특허 제10-2015-0075030호

[12] 대한민국 공개 특허 제10-2018-0037584호

[13]

발명의 상세한 설명

기술적 과제

[14] 본 발명이 이루고자 하는 기술적 과제는

2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체를 온화한 조건에서 대량 생산할 수 있는 합성 방법을 제공하는 것이다.

[15] 다만, 본 발명이 해결하고자 하는 과제는 상기 언급한 과제로 제한되지 않으며, 언급되지 않은 또 다른 과제들은 하기의 기재로부터 당업자에게 명확하게 이해될 수 있을 것이다.

[16]

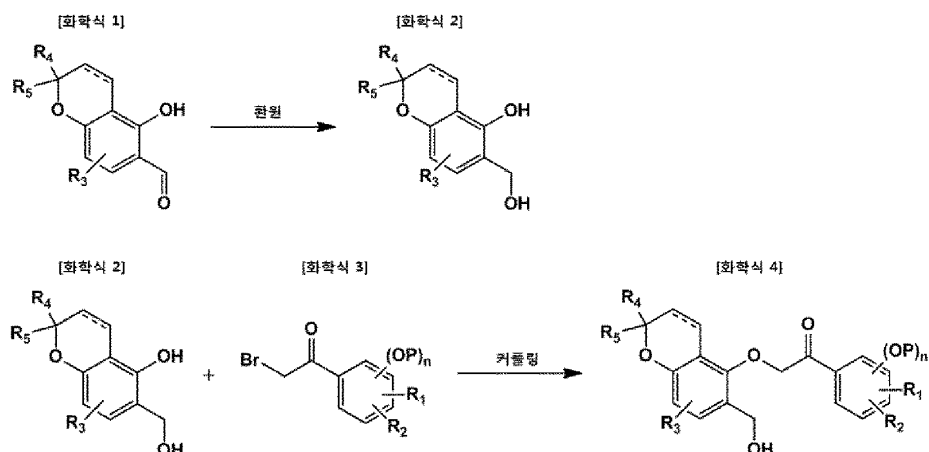
과제 해결 수단

[17] 본 발명의 일 실시상태는 (a) 화학식 1의 화합물을 환원시켜 화학식 2의 화합물을 제조하는 단계; 및 (b) 상기 화학식 2의 화합물을 화학식 3의 화합물과 커플링시키는 단계를 포함하는 화학식 4로 표시되는

2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체의 합성 방법을 제공한다:

[18] [반응식 1]

[19]



[20] 상기 화학식들에서,

[21] 점선은 선택적 이중결합이며;

[22] R_1 및 R_2 는 각각 독립적으로 수소 원자; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_6 알킬기; 할로젠 원자; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_6 알콕시기; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_4 티오알킬기; 치환 또는 비치환 아릴옥시기; 치환 또는 비치환 아릴옥시기; 및 페닐기 중 어느 하나이고;

[23] R_3 은 수소 원자; C_1-C_3 알킬기; C_1-C_3 알콕시기; 및 할로젠 원자 중 어느 하나이며;

[24] R_4 및 R_5 는 각각 독립적으로 수소 원자; 또는 C_1-C_2 알킬기 중 어느 하나이고;

[25] P 는 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_4 알킬기; 치환 또는 비치환된 벤질기; 알릴기; *t*-부틸다이메틸실릴기; *t*-부틸다이페닐실릴기; 다이메틸페닐실릴기; 트리메틸실릴기; $MeSO_2$; *p*-톨루엔설포닐기; 및 2,4,6-트리메틸벤젠설포닐기 중 어느 하나이며;

[26] n 은 1 내지 3이고;

[27] OP 가 복수개일 때는 동일 또는 상이하며;

[28] 상기 치환 알킬기, 치환 알콕시기, 치환 티오알킬기, 치환 알릴옥시기, 치환 아릴옥시기 및 치환 벤질기의 경우, 상기 치환기는 벤질옥시기, 할로젠 원자, 직쇄 또는 분지쇄 C_1-C_5 알킬기, 직쇄 또는 분지쇄 C_1-C_5 알콕시기, 직쇄 또는 분지쇄 C_1-C_3 티오알킬기, 니트로기 및 나프탈렌기 중 어느 하나이다.

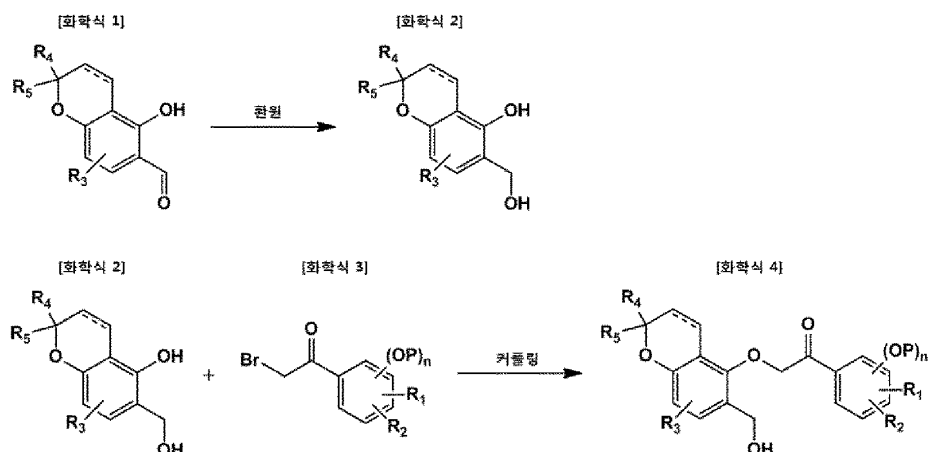
[29] 본 발명의 다른 실시상태는 (i) 본 발명의 일 실시상태에 따라 제조된 화학식 4의 화합물을 고리화시켜 화학식 5의 화합물을 제조하는 단계; 및 (ii) 상기 화학식 5의 화합물을 환원시키는 단계를 포함하는 화학식 I의 3-페닐-2,3,4,8,9,10-헥사히드로피라노[2,3-*f*]크로멘 유도체를 합성하는 방법을 제공한다:

[30] [반응식 2]

[31]

[43] [반응식 1]

[44]



[45] 상기 화학식들에서,

[46] 점선은 선택적 이중결합이며;

[47] R_1 및 R_2 는 각각 독립적으로 수소 원자; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_6 알킬기; 할로젠 원자; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_6 알콕시기; 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_4 티오알킬기; 치환 또는 비치환 아릴옥시기; 및 페닐기 중 어느 하나이고;

[48] R_3 은 수소 원자; C_1-C_3 알킬기; C_1-C_3 알콕시기; 및 할로젠 원자 중 어느 하나이며;

[49] R_4 및 R_5 는 각각 독립적으로 수소 원자; 또는 C_1-C_2 알킬기 중 어느 하나이고;

[50] P 는 치환 또는 비치환, 직쇄 또는 분지쇄 C_1-C_4 알킬기; 치환 또는 비치환된 벤질기; 알릴기; *t*-부틸다이메틸실릴기; *t*-부틸다이페닐실릴기; 다이메틸페닐실릴기; 트리메틸실릴기; $MeSO_2$; *p*-톨루엔설포닐기; 및 2,4,6-트리메틸벤젠설포닐기 중 어느 하나이며;

[51] n 은 1 내지 3이고;

[52] OP 가 복수개일 때는 동일 또는 상이하며;

[53] 상기 치환 알킬기, 치환 알콕시기, 치환 티오알킬기, 치환 알릴옥시기, 치환 아릴옥시기 및 치환 벤질기의 경우, 상기 치환기는 벤질옥시기, 할로젠 원자, 직쇄 또는 분지쇄 C_1-C_5 알킬기, 직쇄 또는 분지쇄 C_1-C_5 알콕시기; 직쇄 또는 분지쇄 C_1-C_3 티오알킬기, 니트로기 및 나프탈렌기 중 어느 하나이다.

[54] 상기 특허문헌 2[대한민국 공개 특허 제10-2018-0037584호]의 반응식 A와 같이 화학식 A-4의 화합물(본 발명의 화학식 4의 화합물)을 합성하는 경우에는 극저온에서 반응을 진행해야 할 뿐만 아니라, 고가인 L-selectride[®]를 사용하여야 하므로 상업적으로 대량 생산하는데 어려움이 따를 수 있었다. 그러나, 본 발명의 일 실시상태에 따라 화학식 4의 화합물을 합성하는 경우에는 먼저 화학식 1의 화합물을 환원시킨 후, 제조된 화학식 2의 화합물을 화학식 3의 화합물과 커플링 시킴으로써, 극저온에서 환원 반응을 진행해야 할 필요도 없고

값비싼 환원제를 사용할 필요도 없다. 따라서,

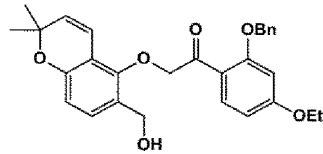
2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체를 간단하고 상업적으로 용이하게 제조할 수 있다.

[55] 상기 화학식 4로 표시되는

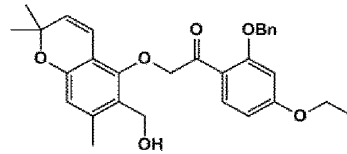
2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체의 예로는 하기의 화합물들이 있다.

[56]

[화합물 4-1]

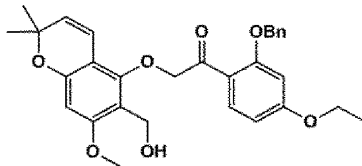


[화합물 4-2]

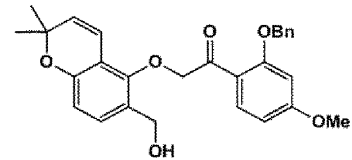


[57]

[화합물 4-3]

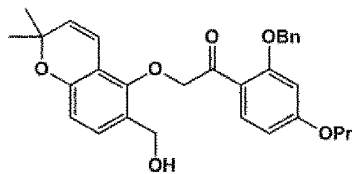


[화합물 4-4]

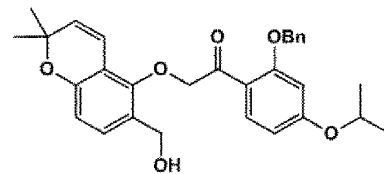


[58]

[화합물 4-5]

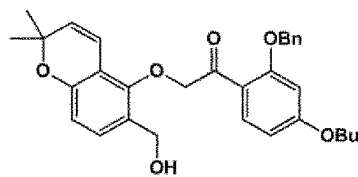


[화합물 4-6]

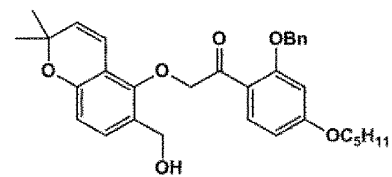


[59]

[화합물 4-7]

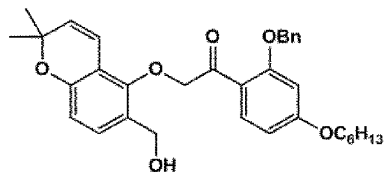


[화합물 4-8]

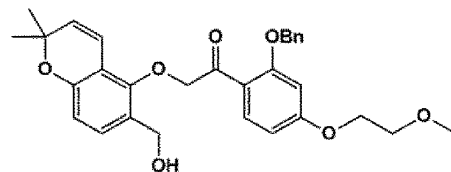


[60]

[화합물 4-9]

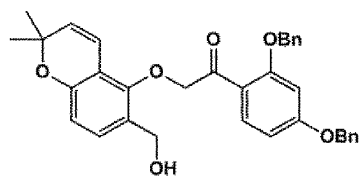


[화합물 4-10]

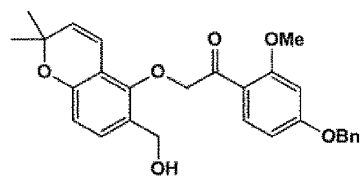


[61]

[화합물 4-11]

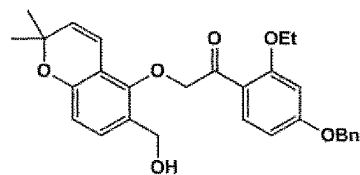


[화합물 4-12]

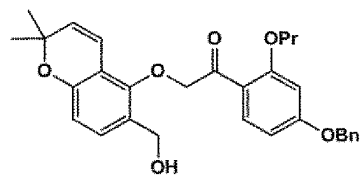


[62]

[화합물 4-13]

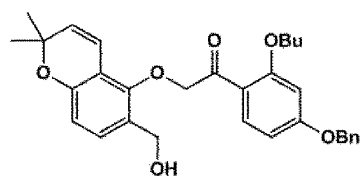


[화합물 4-14]

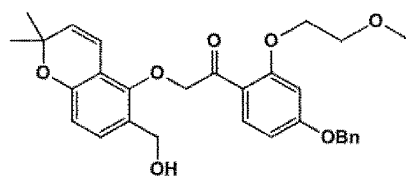


[63]

[화합물 4-15]

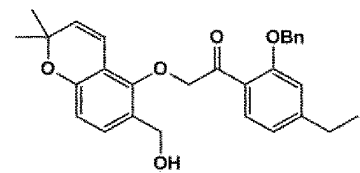


[화합물 4-16]

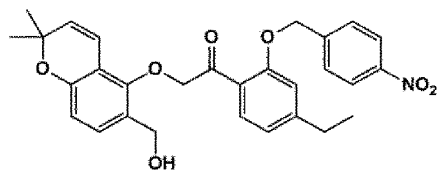


[64]

[화합물 4-17]

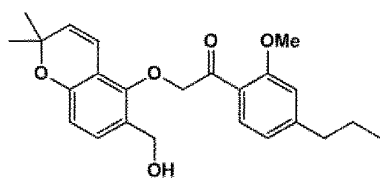


[화합물 4-18]

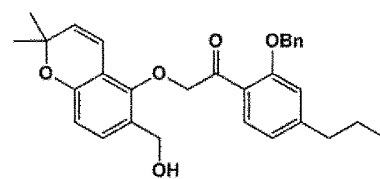


[65]

[화합물 4-19]

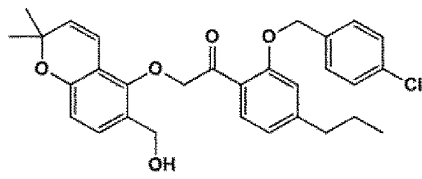


[화합물 4-20]

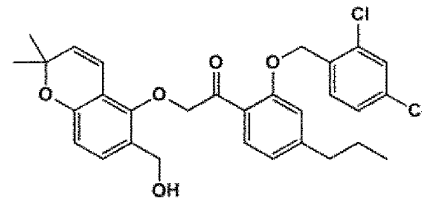


[66]

[화합물 4-21]

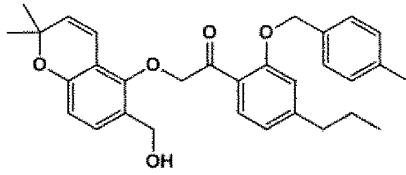


[화합물 4-22]

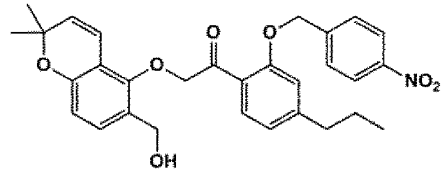


[67]

[화합물 4-23]

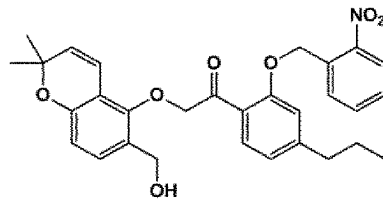


[화합물 4-24]

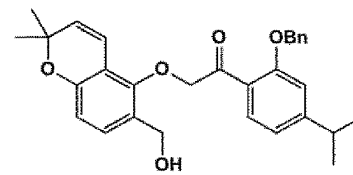


[68]

[화합물 4-25]

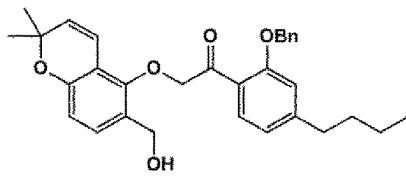


[화합물 4-26]

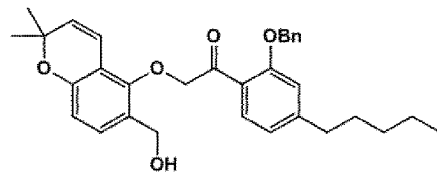


[69]

[화합물 4-27]

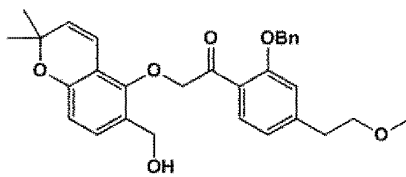


[화합물 4-28]

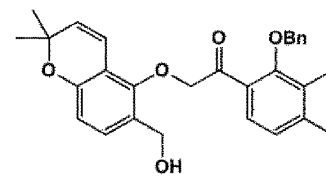


[70]

[화합물 4-29]

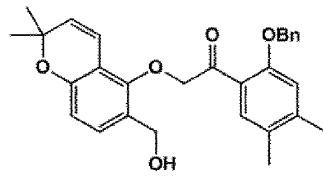


[화합물 4-30]

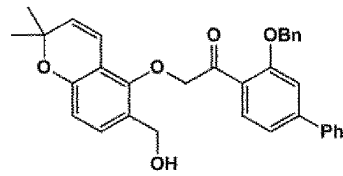


[71]

[화합물 4-31]

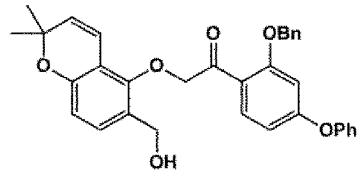


[화합물 4-32]

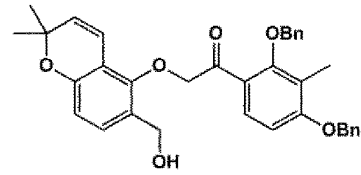


[72]

[화합물 4-33]

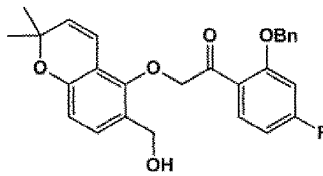


[화합물 4-34]

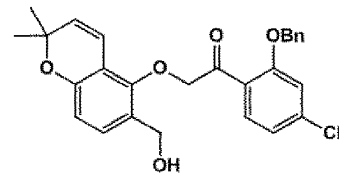


[73]

[화합물 4-35]

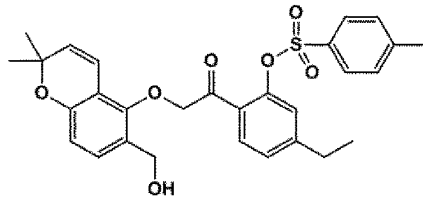


[화합물 4-36]

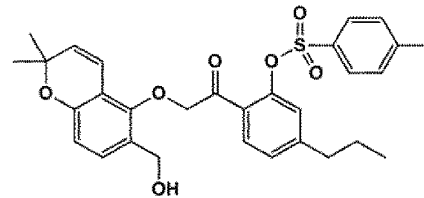


[74]

[화합물 4-37]

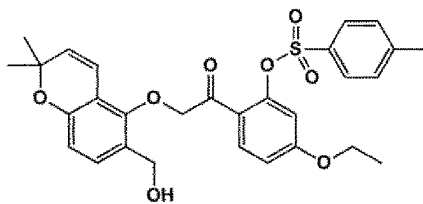


[화합물 4-38]

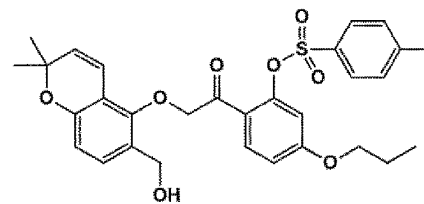


[75]

[화합물 4-39]

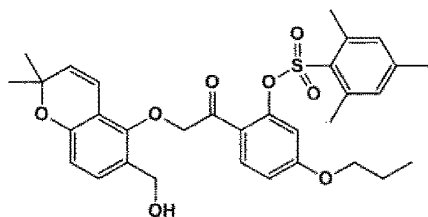


[화합물 4-40]

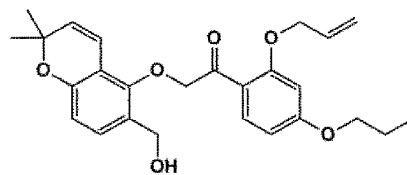


[76]

[화합물 4-41]

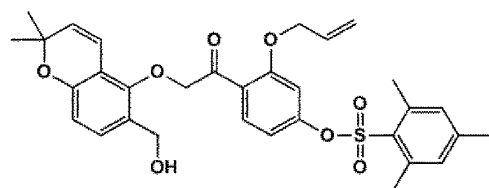


[화합물 4-42]

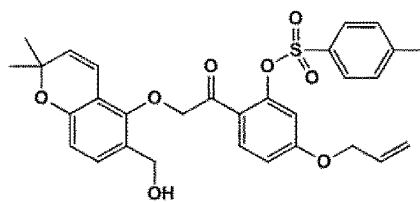


[77]

[화합물 4-43]

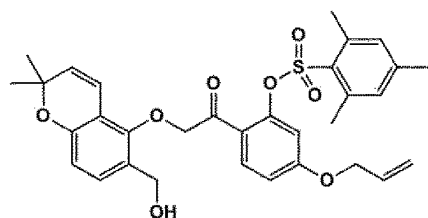


[화합물 4-44]

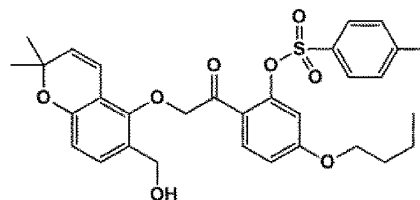


[78]

[화합물 4-45]

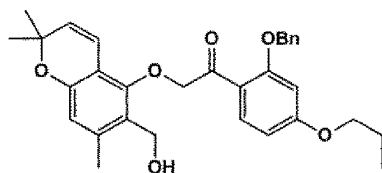


[화합물 4-46]

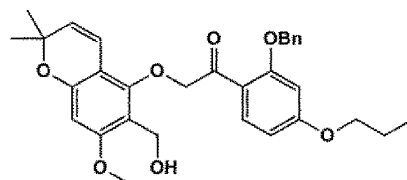


[79]

[화합물 4-47]

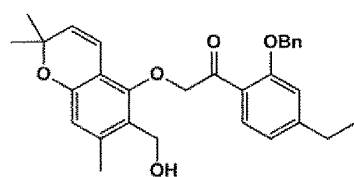


[화합물 4-48]

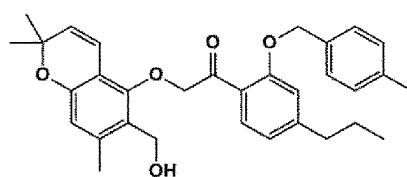


[80]

[화합물 4-49]

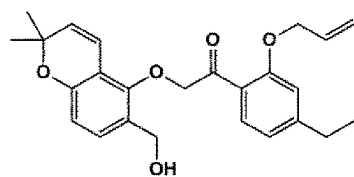


[화합물 4-50]

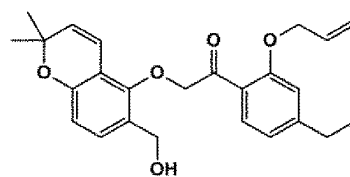


[81]

[화합물 4-51]

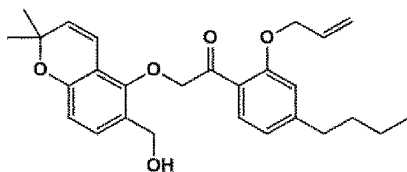


[화합물 4-52]

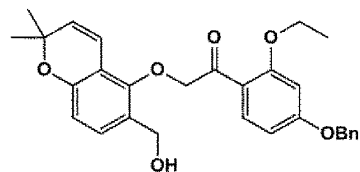


[82]

[화합물 4-53]

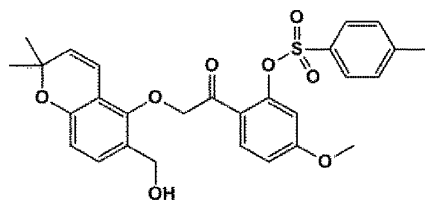


[화합물 4-54]

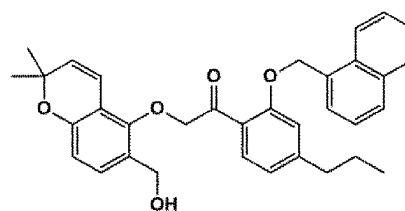


[83]

[화합물 4-55]

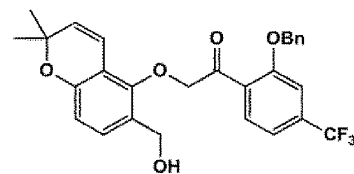


[화합물 4-56]

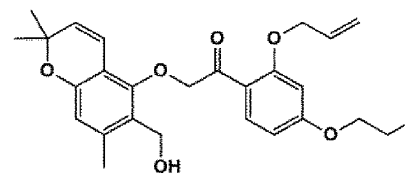


[84]

[화합물 4-57]

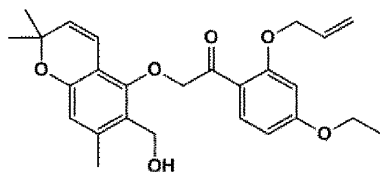


[화합물 4-58]

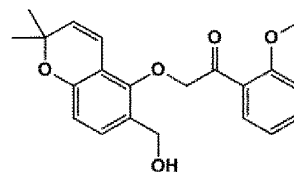


[85]

[화합물 4-59]

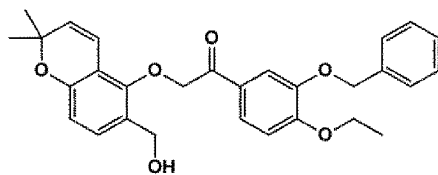


[화합물 4-60]

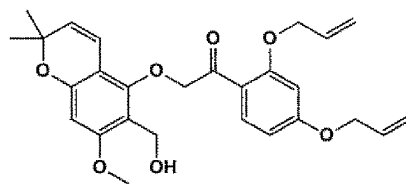


[86]

[화합물 4-61]

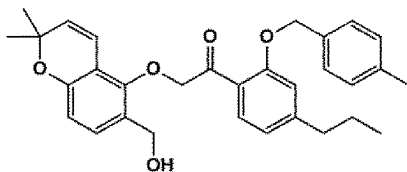


[화합물 4-62]

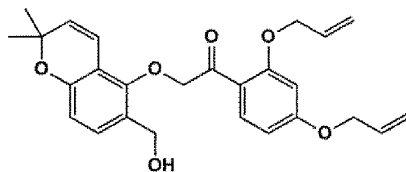


[87]

[화합물 4-63]

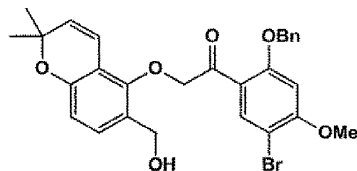


[화합물 4-64]

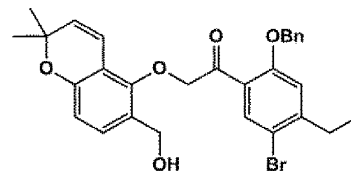


[88]

[화합물 4-65]

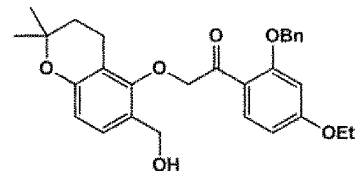


[화합물 4-66]

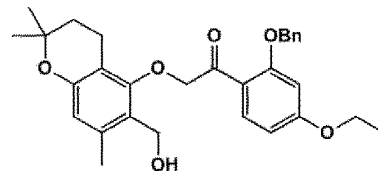


[89]

[화합물 4-67]

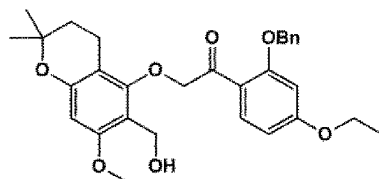


[화합물 4-68]

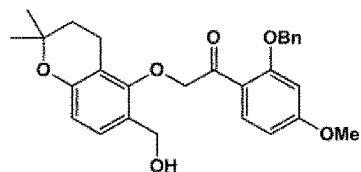


[90]

[화합물 4-69]

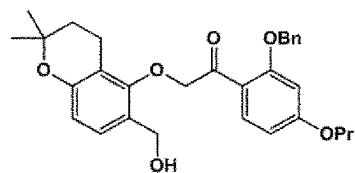


[화합물 4-70]

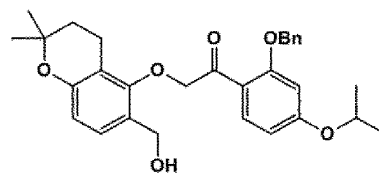


[91]

[화합물 4-71]

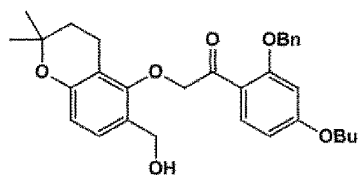


[화합물 4-72]

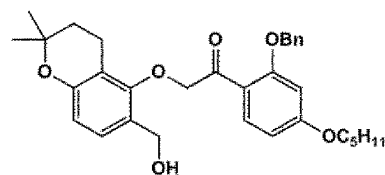


[92]

[화합물 4-73]

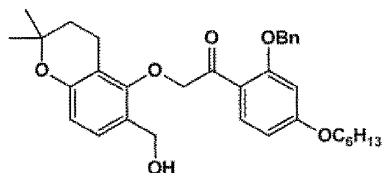


[화합물 4-74]

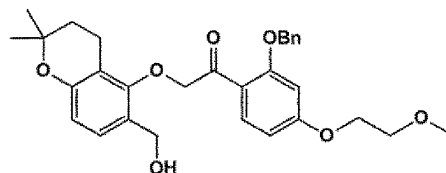


[93]

[화합물 4-75]

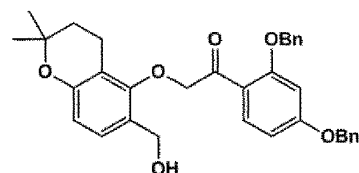


[화합물 4-76]

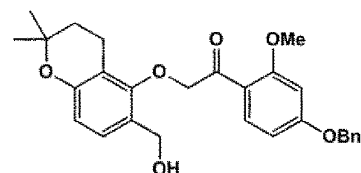


[94]

[화합물 4-77]

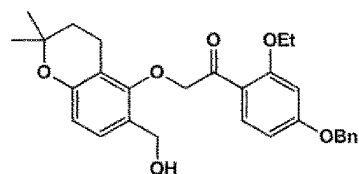


[화합물 4-78]

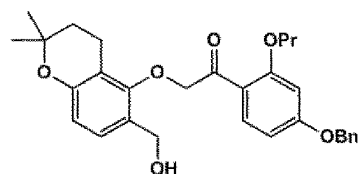


[95]

[화합물 4-79]

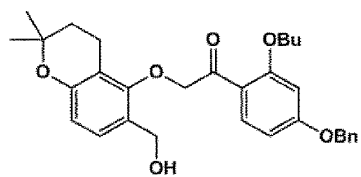


[화합물 4-80]

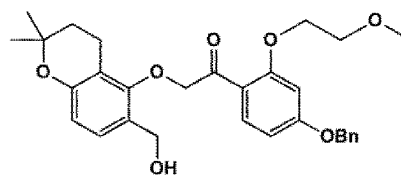


[96]

[화합물 4-81]

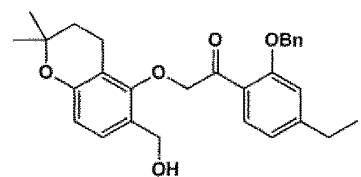


[화합물 4-82]

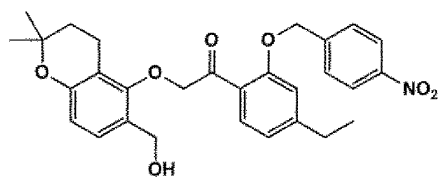


[97]

[화합물 4-83]

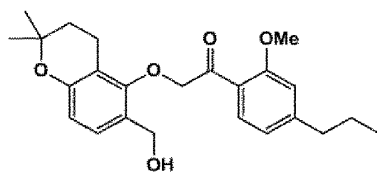


[화합물 4-84]

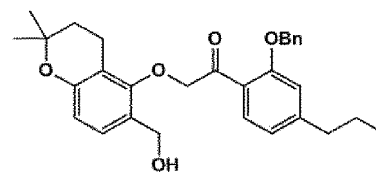


[98]

[화합물 4-85]

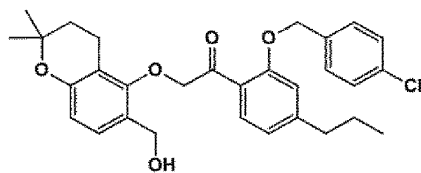


[화합물 4-86]

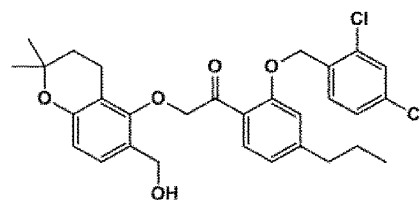


[99]

[화합물 4-87]

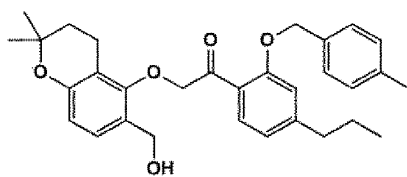


[화합물 4-88]

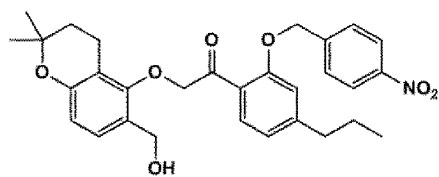


[100]

[화합물 4-89]

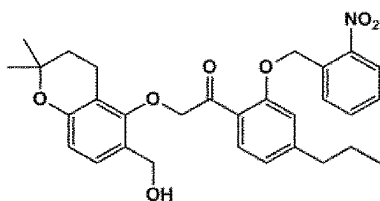


[화합물 4-90]

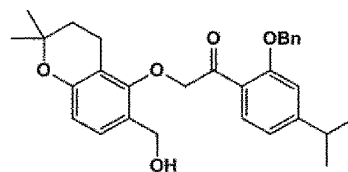


[101]

[화합물 4-91]

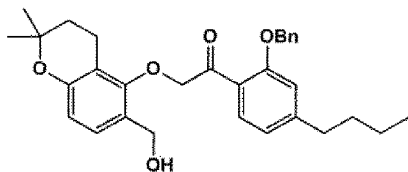


[화합물 4-92]

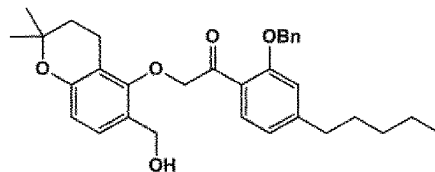


[102]

[화합물 4-93]

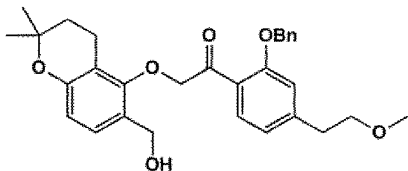


[화합물 4-94]

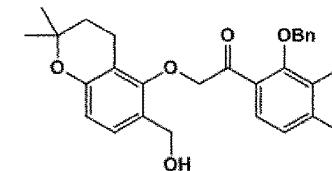


[103]

[화합물 4-95]

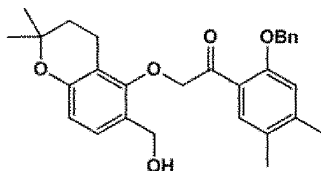


[화합물 4-96]

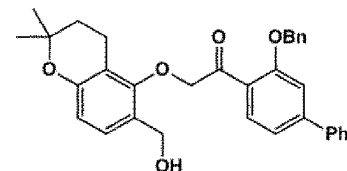


[104]

[화합물 4-97]

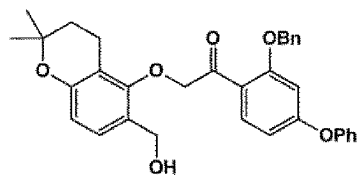


[화합물 4-98]

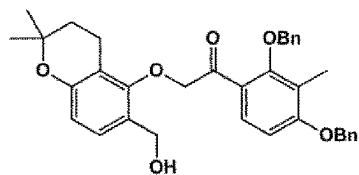


[105]

[화합물 4-99]

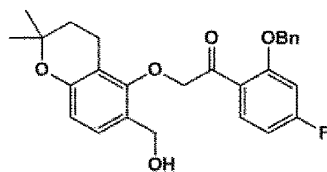


[화합물 4-100]

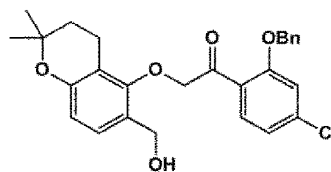


[106]

[화합물 4-101]

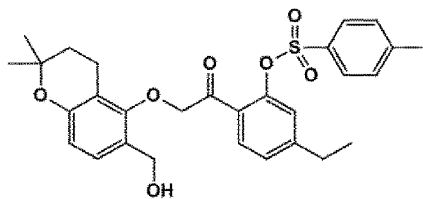


[화합물 4-102]

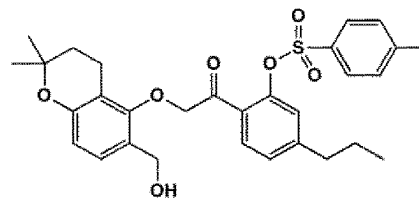


[107]

[화합물 4-103]

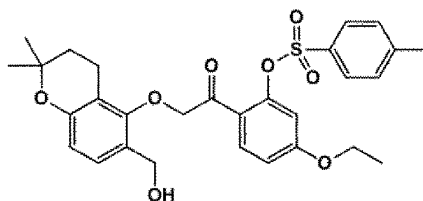


[화합물 4-104]

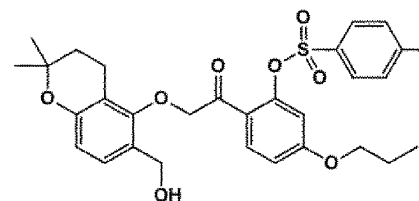


[108]

[화합물 4-105]

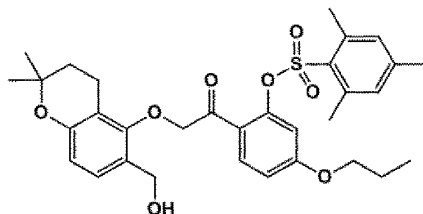


[화합물 4-106]

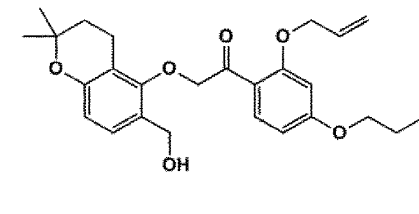


[109]

[화합물 4-107]

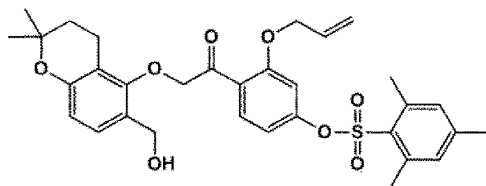


[화합물 4-108]

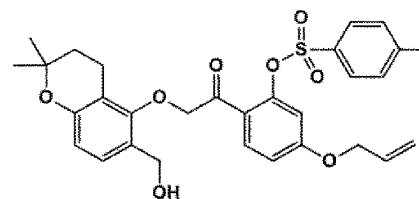


[110]

[화합물 4-109]

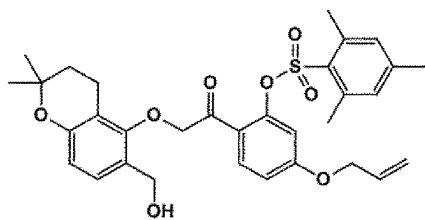


[화합물 4-110]

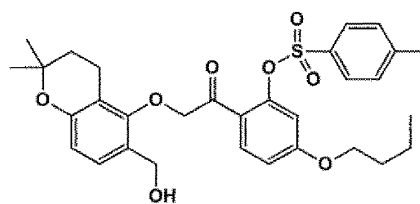


[111]

[화합물 4-111]

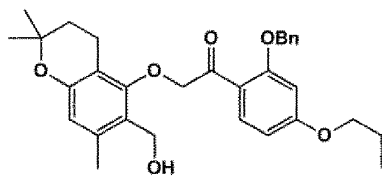


[화합물 4-112]

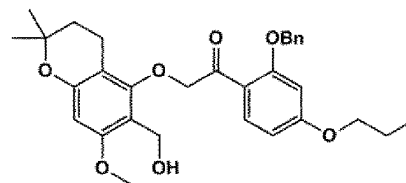


[112]

[화합물 4-113]

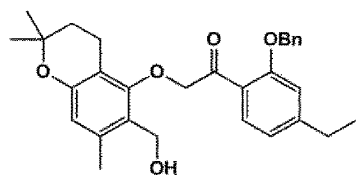


[화합물 4-114]

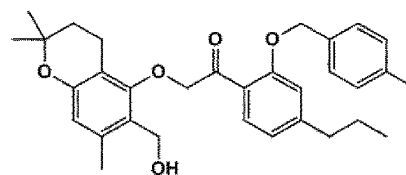


[113]

[화합물 4-115]

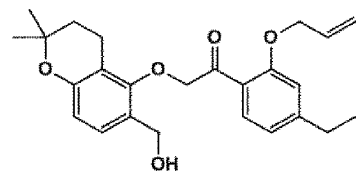


[화합물 4-116]

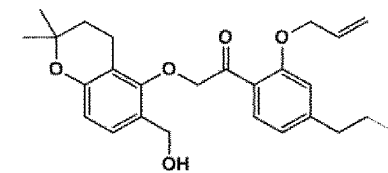


[114]

[화합물 4-117]

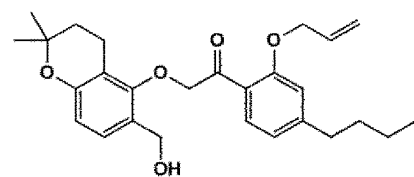


[화합물 4-118]

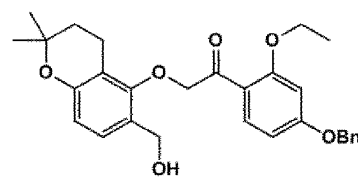


[115]

[화합물 4-119]

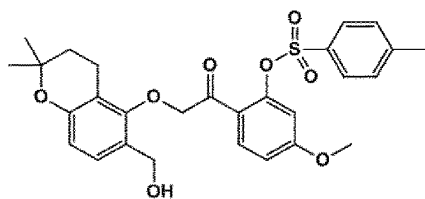


[화합물 4-120]

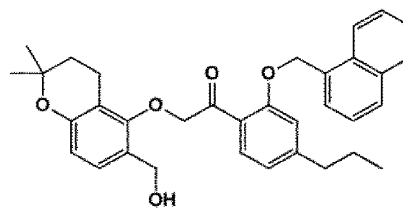


[116]

[화합물 4-121]

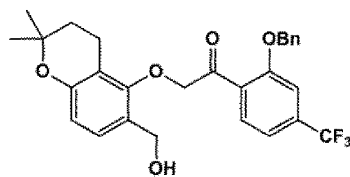


[화합물 4-122]

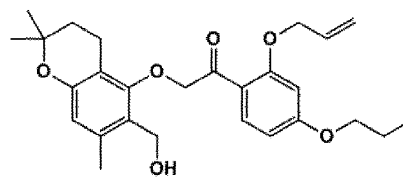


[117]

[화합물 4-123]

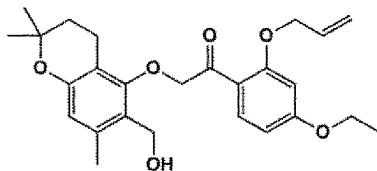


[화합물 4-124]

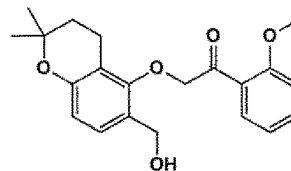


[118]

[화합물 4-125]

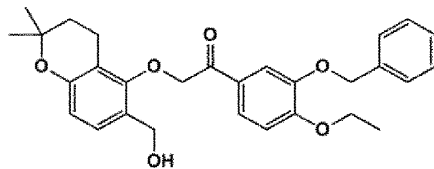


[화합물 4-126]

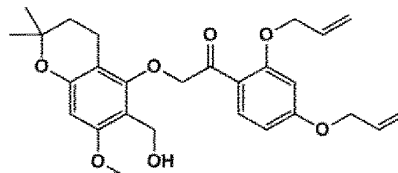


[119]

[화합물 4-127]

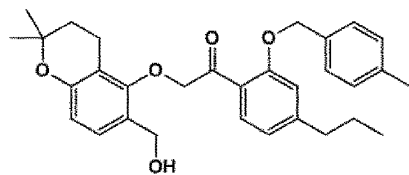


[화합물 4-128]

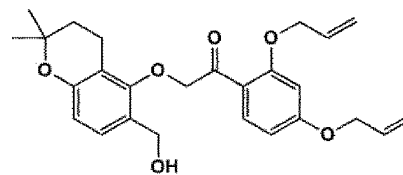


[120]

[화합물 4-129]

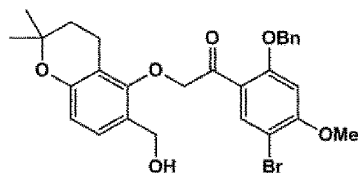


[화합물 4-130]

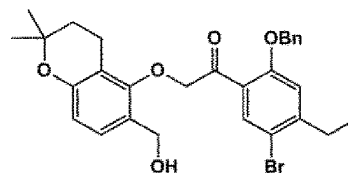


[121]

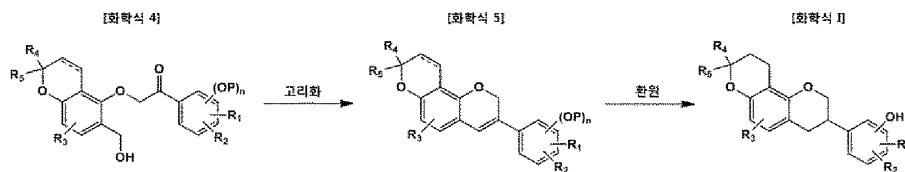
[화합물 4-131]



[화합물 4-132]

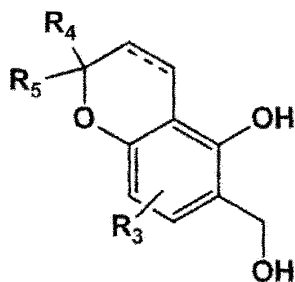


- [122] 이하, 본 발명의 일 실시상태에 따른 화학식 4의 화합물의 합성 방법을 각 단계별로 더욱 상세하게 설명하고자 한다.
- [123] 본 발명의 일 실시상태에 따른 (a) 단계는 화학식 1의 화합물의 포르밀기(-COH)를 환원시켜 화학식 2의 화합물을 제조하는 단계이다. 상기 환원은 0 °C 내지 5 °C에서 환원제로, 예를 들어, 소듐보로하이드라이드, 리튬알루미늄하이드라이드, 디이소부틸알루미늄하이드라이드 등을 이용하여 진행될 수 있다. 구체적으로, 상기 환원제는 소듐보로하이드라이드 또는 리튬알루미늄하이드라이드일 수 있다. 발명의 배경이 되는 기술에 나타난 바와 같이 특허문헌 2에서 화학식 A-3의 화합물을 화학식 A-4의 화합물로 환원하는 단계는 케톤의 카르보닐기를 환원시키지 않으면서 포르밀기만을 선택적으로 환원시켜야 함으로 극저온에서 반응 선택적인 환원제를 사용하여야 하는 문제점이 있었으나, 본 발명의 합성 방법은 화학식 1의 화합물을 먼저 환원시켜 온화한 조건에서 반응 선택적인 환원제를 사용하지 않고 화학식 4의 화합물을 용이하게 제조할 수 있다.
- [124] 본 발명의 일 실시상태에 따르면, 상기 (b) 단계는 염기 조건에서 이루어지는 것일 수 있다. 예를 들어, 상기 (b) 단계는 염기성 화합물을 사용하여 진행되는 것일 수 있다.
- [125] 본 발명의 일 실시상태에 따르면, 상기 염기 조건은 수산화나트륨(NaOH), 수산화칼륨(KOH), 탄산나트륨(Na_2CO_3), 탄산리튬(Li_2CO_3), 탄산칼륨(K_2CO_3), 탄산수소나트륨(NaHCO_3), 탄산수소칼륨(KHCO_3), 트리에틸아민 및 피리딘 중에서 선택된 1종 이상의 염기성 화합물의 첨가에 의한 것일 수 있으며, 구체적으로, 탄산칼륨이나 탄산나트륨일 수 있다.
- [126]
- [127] 본 발명의 다른 실시상태는 (i) 본 발명의 일 실시상태에 따라 제조된 화학식 4의 화합물을 고리화시켜 화학식 5의 화합물을 제조하는 단계; 및 (ii) 상기 화학식 5의 화합물을 환원시키는 단계를 포함하는 화학식 I의 3-페닐-2,3,4,8,9,10-헥사하이드로피라노[2,3-f]크로멘 유도체를 합성하는 방법을 제공한다:
- [128] [반응식 2]
- [129]



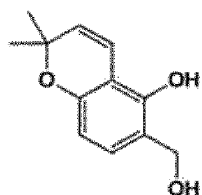
- [130] 상기 화학식들에서, 점선은 선택적 이중결합이며, R₁ 내지 R₅, P 및 n은 상기 화학식 1 내지 4에서 정의한 것과 동일하다.
- [131] 상기 화학식 4의 화합물을 화학식 5의 화합물로 고리화시키는 경우, i) 화학식 4의 화합물을 아세트니트릴에 용해시키고, 트리페닐포스포늄 브로마이드(Ph₃P·HBr)를 첨가하여 중간체를 얻고, ii) 상기 i)의 중간체를 농축시킨 후, 농축액을 용해시키고, 소듐 에톡사이드(NaOEt)를 첨가하여 고리화시킬 수 있다.
- [132] 상기 (ii) 단계는 화학식 5의 화합물에서 이중결합을 환원시키고, 보호기를 제거하여 화학식 I의 화합물을 합성하는 것일 수 있다. 상기 보호기의 제거는 이중결합을 환원시키는 반응과 동일한 Pd/C(palladium on carbon)을 촉매로 사용하는 수소첨가 반응을 통하여 진행될 수 있다.
- [133]
- [134] 본 발명의 또 다른 실시상태는 하기 화학식 2로 표시되는
6-(히드록시메틸)크로멘-5-올 유도체 또는 이의 용매화물을 제공한다:

[화학식 2]

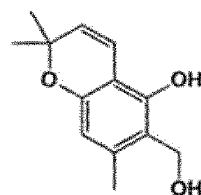


- [136] 상기 화학식 2에서,
[137] R_3 은 수소 원자; C_1-C_3 알킬기; C_1-C_3 알콕시기; 및 할로젠 원자 중 어느 하나이며;
[138] R_4 및 R_5 는 각각 독립적으로 수소 원자; 또는 C_1-C_2 알킬기 중 어느 하나이다.
[139]
[140] 상기 화학식 2로 표시되는 6-(히드록시메틸)크로멘-5-올 유도체의 예로는 하기의 화합물들이 있다.
[141]

[화합물 2-1]

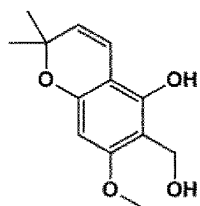


[화합물 2-2]

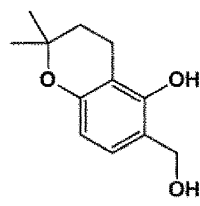


[142]

[화합물 2-3]

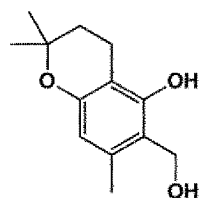


[화합물 2-4]

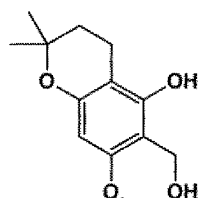


[143]

[화합물 2-5]



[화합물 2-6]



[144]

발명의 실시를 위한 형태

[145] 이하 하나 이상의 실시예를 통하여 보다 상세하게 설명한다. 그러나, 이들 실시예는 하나 이상의 구체예를 예시적으로 설명하기 위한 것으로 본 발명의 범위가 이들 실시예에 한정되는 것은 아니다.

[146]

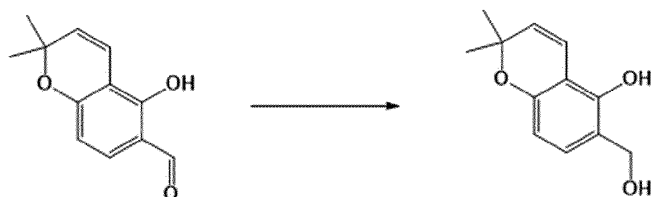
[147] 실시예 1.

2-(6-히드록시메틸)-2,2-디메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에탄논[2-(6-(hydroxymethyl)-2,2-dimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone](화합물 4-1)의 제조

[148] 1-1.

6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-올[6-(hydroxymethyl)-2,2-dimethyl-2H-chromen-5-ol]의 합성

[149]



- [150] 5-히드록시-2,2-디메틸-2H-크로멘-6-카르브알데히드[5-hydroxy-2,2-dimethyl-2H-chromene-6-carbaldehyde] 3 g(0.01469 mol)을 메탄올 60 ml에 투입하고 0 ~ 5 °C로 냉각한 후 소듐보로하이드라이드 0.28 g(0.0074 mol)를 4 회에 걸쳐 분할 투입하였다. 반응액을 상온으로 승온 후 추가로 30 분 간 교반하였다. 반응 종결 후 반응액을 농축한 다음 에틸 아세테이트 60 ml, 정제수 15 ml를 투입하여 거세게 교반하면서 초산을 천천히 투입하여 pH를 6 ~ 6.5로 조절하였다. 충분히 후 수층을 제거하고 유기층을 브라인(brine) 15 ml, 2 % 중조 수용액으로 순차적으로 세척하였다. 유기층을 무수 처리 후 여과 농축한 다음 n-헥산으로 결정화하여 2.37 g(수율 78.2 %)의 6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-올을 수득하였다. 수득한 화합물에 대한 ¹H-NMR 및 ¹³C-NMR 결과는 하기와 같다.

[151] ¹H-NMR (CDCl₃): 7.596(s, 1H), 6.715(d, 1H, J=10Hz), 6.686(d, 1H, J=10Hz),

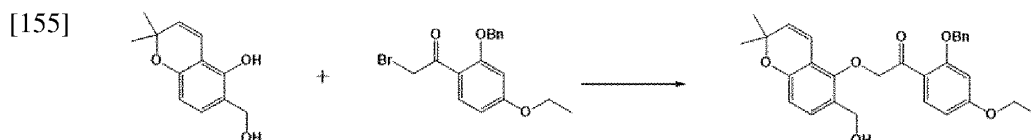
6.287(d, 1H, 8.4H), 5.587(d, 1H, J=10Hz), 4.746(s, 2H), 2.296(br, 1H), 1.412(s, 6H).

[152] ¹³C-NMR (CDCl₃): 153.842, 152.180, 129.192, 127.311, 116.803, 116.548, 110.336, 107.820, 75.957, 64.751, 27.730.

[153]

[154] **1-2.**

2-(6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-일옥시)1-1(2-(벤질옥시)-4-에톡시페닐)에타논[2-(6-(hydroxymethyl)-2,2-dimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone]의 합성



- [155] 6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-올 5 g(0.0242mol)과 1-(2-(벤질옥시)-4-에톡시페닐)-2-브로모에타논 8.47 g(0.0242mol), 그리고 탄산칼륨 7.4 g(0.0535mol)을 아세톤 50 ml에 넣고 상온에서 밤새 교반하였다. 반응 종결 후 여과하고 여액을 완전히 농축하였다. 농축액에 메틸렌클로라이드를 넣고 정제수로 세척 후 유기층을 무수 처리한 다음 농축하고 n-헥산으로 결정화하여 10.8 g(수율 93.9 %)의 2-(6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-일옥시)1-1(2-(벤질옥시)-4-에톡시페닐)에타논을 수득하였다. 수득한 화합물에 대한 ¹H-NMR 및 ¹³C-NMR 결과는 하기와 같다.

[157] $^1\text{H-NMR}$ (CDCl_3): 8.063(d, 1H, $J=8.8\text{Hz}$), 7.35~7.32(m, 5H), 7.001(d, 1H, $J=8.4\text{Hz}$), 6.585(dd, 1H, $J=8.8, 2.0\text{Hz}$), 6.532(d, 1H, $J=8.0\text{Hz}$), 6.503(d, 1H, $J=2.0\text{Hz}$), 6.383(d, 1H, $J=10\text{Hz}$), 5.464(d, 1H, $J=9.6\text{Hz}$), 5.092(s, 2H), 5.065(s, 2H), 4.522(s, 2H), 4.078(q, 2H, $J=13.6$), 3.502(br, 1H), 1.424(t, 3H, $J=6.8\text{Hz}$), 1.367(s, 6H).

[158] $^{13}\text{C-NMR}$ (CDCl_3): 194.136, 164.785, 160.506, 154.276, 153.734, 135.384, 133.298, 130.280, 129.713, 128.772, 128.570, 127.905, 126.120, 117.735, 117.273, 114.343, 112.067, 106.684, 99.536, 80.734, 75.497, 70.927, 63.988, 61.479, 27.543, 14.594.

[159]

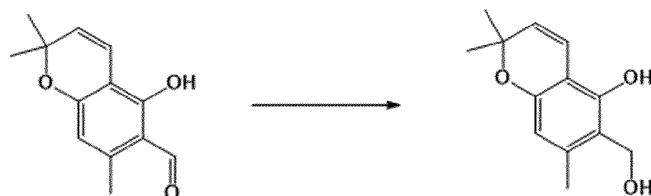
[160] 실시예 2.

2-(6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에타논[2-(6-(hydroxymethyl)-2,2,7-trimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone](화합물 4-2)의 제조

[161] 2-1.

6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-올[6-(hydroxymethyl)-2,2,7-trimethyl-2H-chromen-5-ol]의 합성

[162]



[163] 5-히드록시-2,2-디메틸-2H-크로멘-6-카르브알데히드 대신 5-히드록시-2,2,7-트리메틸-2H-크로멘-6-카르브알데히드를 사용한 것을 제외하고는 상기 실시예 1-1과 동일한 방법을 수행하여 6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-올을 수득하였다. 수득한 화합물에 대한 $^1\text{H-NMR}$ 및 $^{13}\text{C-NMR}$ 결과는 하기와 같다.

[164] $^1\text{H-NMR}$ (CDCl_3): 8.066(s, 1H), 6.648(d, 1H, $J=10\text{Hz}$), 6.167(s, 1H), 5.525(d, 1H, $J=10\text{Hz}$), 4.827(s, 2H), 2.401(br, 1H), 2.132(s, 3H), 1.399(s, 6H).

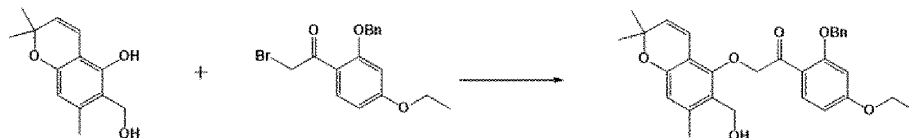
[165] $^{13}\text{C-NMR}$ (CDCl_3): 152.863, 152.580, 135.759, 128.156, 116.639, 114.949, 109.944, 108.437, 75.880, 60.798, 27.735, 19.462.

[166]

[167] 2-2.

2-(6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에타논[2-(6-(hydroxymethyl)-2,2,7-trimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone]의 합성

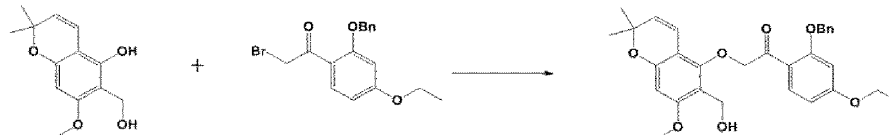
[168]



- [169] 6-(히드록시메틸)-2,2-디메틸-2H-크로멘-5-올 대신
6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-올을 사용한 것을 제외하고는
상기 실시예1-2와 동일한 방법을 수행하여
2-(6-(히드록시메틸)-2,2,7-트리메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에타논을 수득하였다. 수득한 화합물에 대한 $^1\text{H-NMR}$ 및 $^{13}\text{C-NMR}$
결과는 하기와 같다.
- [170] $^1\text{H-NMR}$ (CDCl_3): 8.047(d, 1H, $J=8.8\text{Hz}$), 7.375~7.279(m, 5H), 6.574(dd, 1H, $J=9.2, 2.4\text{Hz}$), 6.495(d, 1H, $J=2.4\text{Hz}$), 6.479(s, 1H), 6.330(d, 1H, $J=10\text{Hz}$), 5.405(d, 1H, $J=9.6\text{Hz}$), 5.120(s, 2H), 5.078(s, 2H), 4.618(d, 2H, $J=6.4\text{Hz}$), 4.126~4.044(m, 2H), 3.156(br, 1H), 2.325(s, 3H), 1.417(t, 3H, $J=7.2\text{Hz}$), 1.359(s, 6H).
- [171] $^{13}\text{C-NMR}$ (CDCl_3): 192.848, 164.723, 160.478, 154.581, 153.075, 139.010, 135.408, 133.229, 130.478, 129.135, 128.710, 128.665, 128.507, 127.920, 124.442, 117.383, 114.026, 111.674, 81.044, 75.421, 63.952, 56.773, 27.547, 19.331, 14.574.
- [172]
- [173] 실시예3.
2-(6-(히드록시메틸)-7-메톡시-2,2-디메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에타논[2-(6-(hydroxymethyl)-7-methoxy-2,2-dimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone](화합물 4-3)의 제조
- [174] 3-1.
6-(히드록시메틸)-7-메톡시-2,2-디메틸-2H-크로멘-5-올[6-(hydroxymethyl)-7-methoxy-2,2-dimethyl-2H-chromen-5-ol]의 합성
- [175]
-
- [176] 5-히드록시-2,2-디메틸-2H-크로멘-6-카르브알데히드 대신
5-히드록시-7-메톡시-2,2-디메틸-2H-크로멘-6-카르브알데히드를 사용하는 것을
제외하고는 상기 실시예1-1과 동일한 방법을 수행하여
6-(히드록시메틸)-7-메톡시-2,2-디메틸-2H-크로멘-5-올을 수득한다. 수득한
화합물에 대한 $^1\text{H-NMR}$ 및 $^{13}\text{C-NMR}$ 결과는 하기와 같다.
- [177] $^1\text{H-NMR}$ (CD_3OD): 6.741(d, 1H, $J=9.6\text{Hz}$), 5.819(s, 1H), 5.350(d, 1H, $J=9.6\text{Hz}$), 4.627(s, 2H), 3.724(s, 3H), 1.369(s, 6H).
- [178] $^{13}\text{C-NMR}$ (CD_3OD): 157.480, 154.814, 153.923, 124.960, 119.470, 107.049, 105.714, 90.203, 76.517, 58.645, 55.602, 27.885.
- [179]
- [180] 3-2.

2-(6-(히드록시메틸)-7-메톡시-2,2-디메틸-2H-크로멘-5-일옥시)-1-(2-(벤질옥시)-4-에톡시페닐)에타논[2-(6-(hydroxymethyl)-7-methoxy-2,2-dimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone]의 합성

[181]



[182]

6-(hydroxymethyl)-2,2-dimethyl-2H-chromen-5-ol 대신 6-(hydroxymethyl)-7-methoxy-2,2-dimethyl-2H-chromen-5-ol을 사용하는 것을 제외하고는 상기 실시예 1-2와 동일한 방법을 수행하여 2-(6-(hydroxymethyl)-7-methoxy-2,2-dimethyl-2H-chromen-5-yloxy)-1-(2-(benzyloxy)-4-ethoxyphenyl)ethanone를 수득한다. 수득한 화합물에 대한 $^1\text{H-NMR}$ 및 $^{13}\text{C-NMR}$ 결과는 하기와 같다.

[183]

$^1\text{H-NMR}$ (CDCl_3): 8.048(d, 1H, $J=8.8\text{Hz}$), 7.386~7.296(m, 5H), 6.567(dd, 1H, $J=8.8, 2\text{Hz}$), 6.509(s, 1H), 6.369(d, 1H, $J=10\text{Hz}$), 6.207(s, 1H), 5.348(d, 1H, $J=10\text{Hz}$), 5.120(s, 2H), 5.088(s, 2H), 4.637(d, 2H, $J=6.8\text{Hz}$), 4.060(q, 2H, $J=14, 7.2\text{Hz}$), 3.799(s, 3H), 3.032(t, 1H, $J=6.4\text{Hz}$), 1.411(t, 3H, $J=6.8\text{Hz}$), 1.366(s, 6H).

[184]

$^{13}\text{C-NMR}$ (CDCl_3): 193.599, 164.605, 160.395, 158.879, 154.891, 154.317, 135.459, 133.157, 128.641, 128.364, 127.786, 127.088, 117.880, 117.249, 114.782, 107.335, 106.616, 99.520, 95.947, 81.138, 76.028, 70.810, 63.914, 55.636, 54.542, 27.569, 14.561.

[185]

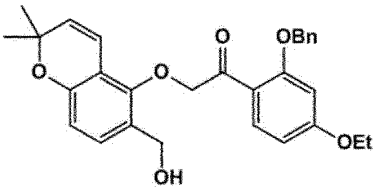
[186]

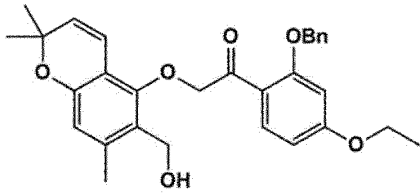
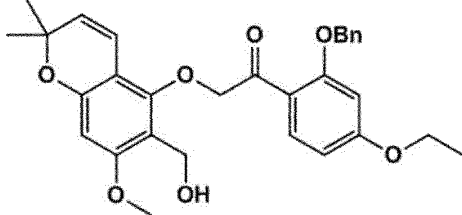
이하, 상기 실시예 1과 동일한 방법을 이용하여 하기 표 1과 같은 각종 2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체를 합성하였다.

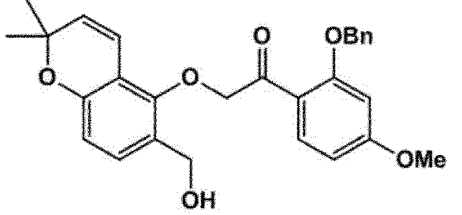
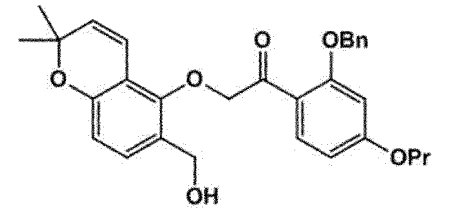
[187]

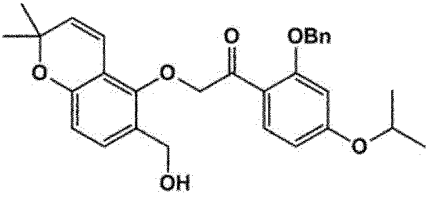
[188]

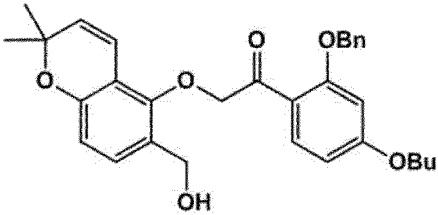
[표1]

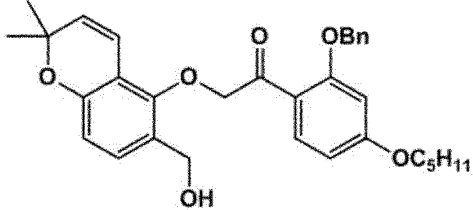
	화학구조	NMR
1	[화합물 4-1] 	¹H-NMR (CDCl₃) : 8.063(d, 1H, J=8.8Hz), 7.35~7.32(m, 5H), 7.001(d, 1H, J=8.4Hz), 6.585(dd, 1H, J=8.8, 2.0Hz), 6.532(d, 1H, J=8.0Hz), 6.503(d, 1H, J=2.0Hz), 6.383(d, 1H, J=10Hz), 5.464(d, 1H, J=9.6Hz), 5.092(s, 2H), 5.065(s, 2H), 4.522(s, 2H), 4.078(q, 2H, J=13.6), 3.502(br, 1H), 1.424(t, 3H, J=6.8Hz), 1.367(s, 6H) ¹³C-NMR (CDCl₃) : 194.136, 164.785, 160.506, 154.276, 153.734, 135.384, 133.298, 130.280, 129.713, 128.772, 128.570, 127.905, 126.120, 117.735, 117.273, 114.343, 112.067, 106.684, 99.536, 80.734, 75.497, 70.927, 63.988, 61.479, 27.543, 14.594

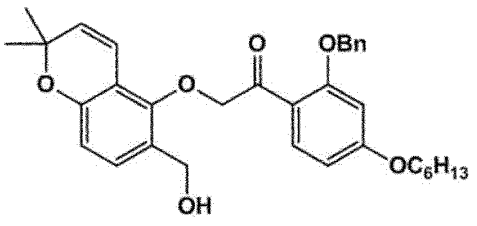
2	[화합물 4-2] 	¹H-NMR (CDCl₃) : 8.047(d, 1H, J=8.8Hz), 7.375~7.279(m, 5H), 6.574(dd, 1H, J=9.2, 2.4Hz), 6.495(d, 1H, J=2.4Hz), 6.479(s, 1H), 6.330(d, 1H, J=10Hz), 5.405(d, 1H, J=9.6Hz), 5.120(s, 2H), 5.078(s, 2H), 4.618(d, 2H, J=6.4Hz), 4.126~4.044(m, 2H), 3.156(br, 1H), 2.325(s, 3H), 1.417(t, 3H, J=7.2Hz), 1.359(s, 6H) ¹³C-NMR (CDCl₃) : 192.848, 164.723, 160.478, 154.581, 153.075, 139.010, 135.408, 133.229, 130.478, 129.135, 128.710, 128.665, 128.507, 127.920, 124.442, 117.383, 114.026, 111.674, 81.044, 75.421, 63.952, 56.773, 27.547, 19.331, 14.574
3	[화합물 4-3] 	¹H-NMR (CDCl₃) : 8.048(d, 1H, J=8.8Hz), 7.386~7.296(m, 5H), 6.567(dd, 1H, J=8.8, 2Hz), 6.509(s, 1H), 6.369(d, 1H, J=10Hz), 6.207(s, 1H), 5.348(d, 1H, J=10Hz), 5.120(s, 2H), 5.088(s, 2H), 4.637(d, 2H, J=6.8Hz), 4.060(q, 2H, J=14, 7.2Hz), 3.799(s, 3H), 3.032(t, 1H, J=6.4Hz), 1.411(t, 3H, J=6.8Hz), 1.366(s, 6H) ¹³C-NMR (CDCl₃) : 193.599, 164.605, 160.395, 158.879, 154.891, 154.317, 135.459, 133.157, 128.641, 128.364, 127.786, 127.088, 117.880, 117.249, 114.782, 107.335, 106.616, 99.520, 95.947, 81.138, 76.028, 70.810, 63.914, 55.636, 54.542, 27.569, 14.561

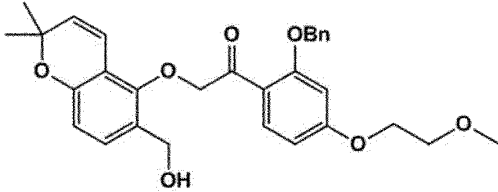
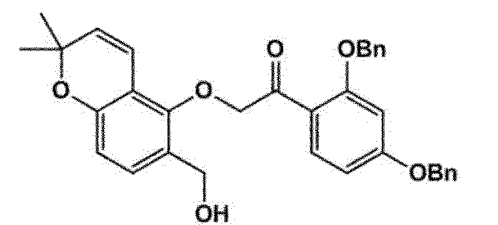
4	[화합물 4-4] 	¹H-NMR (CDCl₃) : 8.074(d, 1H, J=8.8Hz), 7.32~7.39(m, 5H), 7.010(d, 1H, J=8.0Hz), 6.599(dd, 1H, J=8.8, 2.0Hz), 6.533(d, 1H, J=8.0Hz), 6.506(d, 1H, J=2.0Hz), 6.384(d, 1H, J=10.0Hz), 5.467(d, 1H, J=10.0Hz), 5.132(s, 2H), 5.097(s, 2H), 4.523(d, 2H, J=6.4Hz), 3.844(s, 3H), 3.520(t, 1H, J=6.4Hz), 1.368(s, 6H) ¹³C-NMR (CDCl₃) : 194.139, 165.340, 160.469, 154.230, 153.719, 135.322, 133.295, 130.284, 129.700, 128.760, 128.571, 127.896, 126.099, 117.908, 117.245, 114.330, 112.064, 106.223, 99.169, 80.718, 75.488, 70.941, 61.432, 55.627, 27.528
5	[화합물 4-5] 	¹H-NMR (CDCl₃) : 8.060(d, 1H, J=8.8Hz), 7.355~7.340(m, 5H), 7.006(d, 1H, J=8Hz), 6.587(dd, 1H, J=8.8, 1.6Hz), 6.539(s, 1H), 6.514(s, 1H), 6.376(d, 1H, J=9.6Hz), 5.458(d, 1H, J=10Hz), 5.125(s, 2H), 5.091(s, 2H), 4.519(s, 2H), 3.961(t, 2H, J=6.8), 3.599(br, 1H), 1.855~1.7768(m, 2H), 1.364(s, 6H), 1.036(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 194.102, 164.977, 160.511, 154.234, 153.697, 135.367, 133.230, 130.249, 129.676, 128.736, 128.539, 127.905, 126.110, 117.653, 117.245, 114.316, 112.032, 106.766, 99.466, 80.709, 75.467, 70.922, 69.902, 61.415, 27.518, 22.342, 10.388

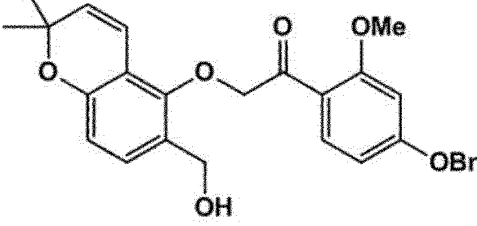
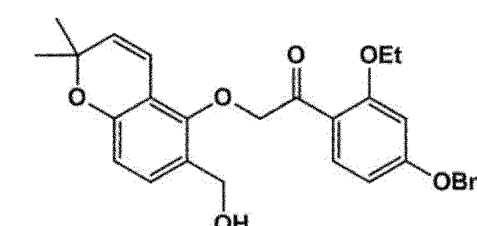
6	[화합물 4-6] 	¹H-NMR (CDCl₃) : 8.057(d, 1H, J=8.8Hz), 7.378~7.324(m, 5H), 7.008(d, 1H, J=8Hz), 6.575(dd, 1H, J=8.8, 2Hz), 6.530(d, 1H, J=8Hz), 6.484(d, 1H, J=2.4Hz), 6.380(d, 1H, J=10Hz), 5.461(d, 1H, J=9.6Hz), 5.128(s, 2H), 5.096(s, 2H), 4.645~4.585(m, 1H), 4.522(d, 2H, J=4Hz), 3.555(br, 1H), 1.366(s, 6H), 1.350(s, 3H), 1.335(s, 3H) ¹³C-NMR (CDCl₃) : 194.066, 163.881, 160.601, 154.263, 153.714, 135.417, 133.222, 130.254, 129.692, 128.751, 128.532, 127.869, 126.117, 117.443, 117.263, 114.327, 112.039, 107.420, 100.503, 80.709, 75.476, 70.903, 70.408, 61.439, 27.526, 21.860
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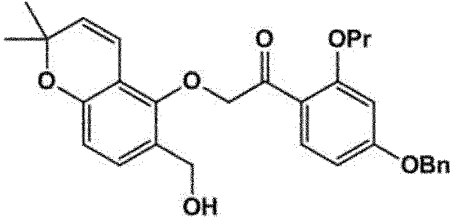
7	[화합물 4-7] 	¹H-NMR (CDCl₃) : 8.061(d, 1H, J=8.8Hz), 7.356~7.342(m, 5H), 7.006(d, 1H, J=8.4Hz), 6.571(dd, 1H, J=8.8, 1.6Hz), 6.558(d, 1H, J=14.4Hz), 6.513(d, 1H, J=4.4Hz), 6.375(d, 1H, J=10Hz), 5.458(d, 1H, J=10Hz), 5.125(s, 2H), 5.092(s, 2H), 4.519(d, 2H, J=6.4Hz), 4.004(t, 2H, J=11.2Hz), 3.537(t, 1H, J=6.4Hz), 1.803~1.749(m, 2H), 1.532~1.409(m, 2H), 1.365(s, 6H), 0.977(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 194.120, 164.999, 160.515, 154.259, 153.713, 135.375, 133.257, 130.258, 129.697, 128.751, 128.558, 127.923, 126.113, 117.645, 114.325, 112.044, 106.759, 99.471, 80.722, 75.478, 70.928, 68.142, 61.453, 31.020, 27.528, 19.109, 13.759
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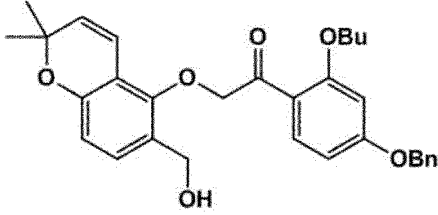
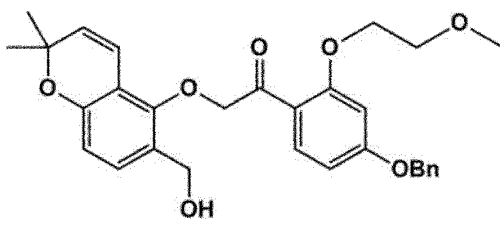
8	[화합물 4-8] 	¹H-NMR (CDCl₃) : 8.059(d, 1H, J=8.8Hz), 7.355~7.324(m, 5H), 7.006(d, 1H, J=8Hz), 6.589(dd, 1H, J=8, 2Hz), 6.529(d, 1H, J=8Hz), 6.505(d, 1H, J=2Hz), 6.375(d, 1H, J=10Hz), 5.458(d, 1H, J=10Hz), 5.125(s, 2H), 5.091(s, 2H), 4.519(s, 2H), 3.995(t, 2H, J=6.4Hz), 3.544(br, 1H), 1.805~1.752(m, 2H), 1.455~1.388(m, 4H), 1.365(s, 6H), 0.935(t, 3H, J=6.8Hz) ¹³C-NMR (CDCl₃) : 194.117, 164.992, 160.515, 154.262, 153.715, 135.379, 133.258, 130.260, 129.697, 128.752, 128.557, 127.923, 126.117, 117.651, 117.651, 114.329, 112.047, 106.760, 99.474, 80.725, 75.479, 70.931, 68.448, 61.453, 28.694, 28.109, 27.532, 22.363, 13.961
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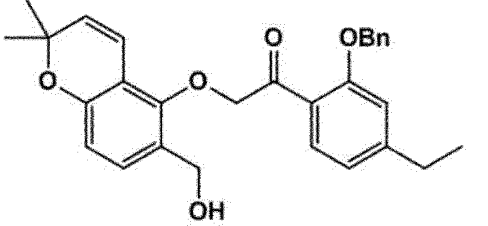
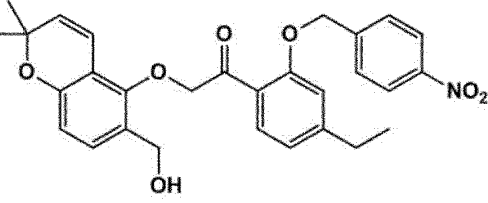
9	[화합물 4-9] 	¹H-NMR (CDCl₃) : 8.061(d, 1H, J=8.8Hz), 7.382~7.325(m, 5H), 7.007(d, 1H, J=8Hz), 6.588(dd, 1H, J=8.8, 2.4Hz), 6.530(d, 1H, J=8.4Hz), 6.506(d, 1H, J=2Hz), 6.377(d, 1H, J=10Hz), 5.459(d, 1H, J=9.6Hz), 5.126(s, 2H), 5.093(s, 2H), 4.519(d, 2H, J=6.8Hz), 3.996(t, 2H, J=6.4Hz), 3.527(t, 1H, J=6.8Hz), 1.798~1.744(m, 2H), 1.465~1.316(m, 6H), 1.366(s, 6H), 0.910(t, 3H, J=5.6Hz) ¹³C-NMR (CDCl₃) : 194.114, 164.998, 160.517, 154.252, 153.714, 135.382, 133.249, 130.257, 129.695, 128.747, 128.551, 127.917, 126.115, 117.656, 117.258, 114.327, 112.046, 106.773, 99.479, 80.720, 75.478, 70.934, 68.463, 61.438, 31.460, 28.959, 27.530, 25.569, 22.527, 13.983
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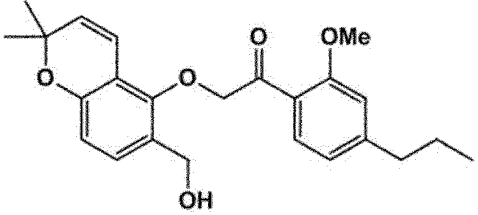
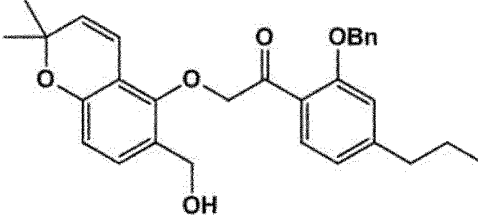
1 0	[화합물 4-10] 	¹H-NMR (CDCl₃) : 8.063(d, 1H, J=8.8Hz), 7.364~7.319(m, 5H), 7.005(d, 1H, J=8.4Hz), 6.607(dd, 1H, J=8.8, 2Hz), 6.577(d, 1H, J=2Hz), 6.529(d, 1H, J=8.4Hz), 6.379(d, 1H, J=10Hz), 5.463(d, 1H, J=10Hz), 5.125(s, 2H), 5.081(s, 2H), 4.516(s, 2H), 4.162(d, 2H, J=5.2, 3.2Hz), 3.748(d, 2H, J=5.2, 3.2Hz), 3.445(br, 1H), 3.435(s, 3H), 1.364(s, 6H) ¹³C-NMR (CDCl₃) : 194.140, 164.523, 160.419, 154.227, 153.735, 135.332, 133.278, 130.305, 129.702, 128.762, 128.569, 127.883, 126.104, 118.112, 117.241, 114.353, 112.089, 106.535, 99.968, 80.731, 75.504, 70.966, 70.662, 67.612, 61.447, 59.236, 27.546
1 1	[화합물 4-11] 	¹H-NMR (CDCl₃) : 8.074(d, 1H, J=8.8Hz), 7.411~7.340(m, 10H), 7.011(d, 1H, J=8Hz), 6.682(dd, 1H, J=8.8, 2Hz), 6.592(d, 1H, J=2Hz), 6.536(d, 1H, J=8Hz), 6.384(d, 1H, J=10Hz), 5.468(d, 1H, J=10Hz), 5.130(s, 2H), 5.106(s, 2H), 5.073(s, 2H), 4.522(d, 2H, J=5.2Hz), 3.444(br, 1H), 1.370(s, 6H) ¹³C-NMR (CDCl₃) : 194.140, 164.450, 160.458, 154.252, 153.753, 135.848, 135.315, 133.317, 130.312, 129.727, 128.782, 128.738, 128.594, 128.373, 127.903, 127.519, 126.110, 118.138, 117.261, 114.358, 112.102, 107.104, 100.031, 80.742, 75.512, 70.981, 70.381, 61.477, 27.556

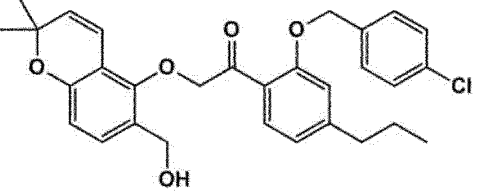
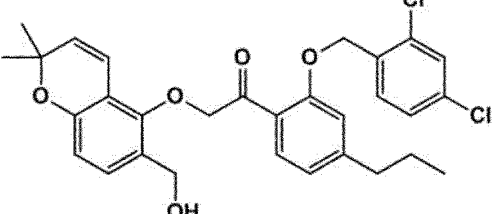
1 2	[화합물 4-12] 	¹H-NMR (CDCl₃) : 8.051(d, 1H, J=8.8Hz), 7.439~7.350(m, 5H), 7.055(d, 1H, J=8.4Hz), 6.664(dd, 1H, J=8.8, 2.4Hz), 6.614(d, 1H, J=10Hz), 6.572(d, 1H, J=10Hz), 6.515(d, 1H, J=2Hz), 5.655(d, 1H, J=9.6Hz), 5.161(s, 2H), 5.120(s, 2H), 4.168(d, 2H, J=2.8Hz), 3.830(s, 3H), 3.610(br, 1H), 1.426(s, 6H) ¹³C-NMR (CDCl₃) : 194.073, 164.558, 161.291, 154.335, 153.806, 135.859, 133.217, 130.426, 129.721, 128.712, 128.578, 127.523, 126.169, 117.842, 117.449, 114.622, 112.180, 106.662, 98.960, 80.4778, 75.628, 70.351, 61.520, 55.518, 27.555
1 3	[화합물 4-13] 	¹H-NMR (CDCl₃) : 8.055(d, 1H, J=8.8Hz), 7.425~7.345(m, 5H), 7.037(d, 1H, J=8.4Hz), 6.646(dd, 1H, J=8.8, 2Hz), 6.610(d, 1H, J=10Hz), 6.556(d, 1H, J=8Hz), 6.479(d, 1H, J=2Hz), 5.655(d, 1H, J=10Hz), 5.229(s, 2H), 5.105(s, 2H), 4.643(s, 2H), 4.127(br, 1H), 4.058(q, 2H, J=14Hz), 1.434(t, 3H, J=5.6Hz), 1.417(s, 6H) ¹³C-NMR (CDCl₃) : 194.514, 164.547, 160.795, 154.849, 153.833, 135.869, 133.204, 130.221, 129.790, 128.700, 128.328, 127.499, 126.189, 117.822, 114.303, 111.932, 106.680, 99.441, 80.741, 75.368, 70.308, 64.232, 61.752, 27.379, 14.710

1 4	[화합물 4-14] 	¹H-NMR (CDCl₃) : 8.063(d, 1H, J=8.8Hz), 7.412~7.362(m, 5H), 7.039(d, 1H, J=8.4Hz), 6.648(dd, 1H, J=8.8, 2Hz), 6.593(d, 1H, J=10Hz), 6.558(d, 1H, J=8.4Hz), 6.493(d, 1H, J=2.4Hz), 5.646(d, 1H, J=9.6Hz), 5.219(s, 2H), 5.109(s, 2H), 4.631(s, 2H), 4.2(br, 1H), 3.955(t, 2H, J=6.8Hz), 1.832~1.814(m, 2H), 1.426(s, 6H), 1.012(t, 3H, 7.6Hz) ¹³C-NMR (CDCl₃) : 194.386, 164.551, 160.892, 154.701, 153.796, 135.888, 133.258, 130.245, 129.784, 128.699, 128.546, 127.503, 126.244, 117.782, 117.662, 114.387, 112.016, 106.630, 99.476, 80.696, 75.409, 70.322, 61.716, 27.424, 22.400, 10.871
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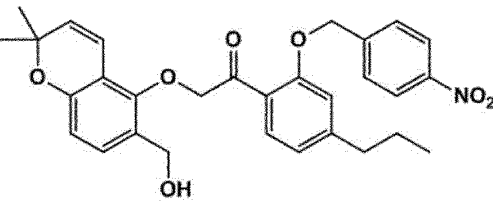
1 5	[화합물 4-15] 	¹H-NMR (CDCl₃) : 8.063(d, 1H, J=8.8Hz), 7.433~7.336(m, 5H), 7.043(d, 1H, J=8Hz), 6.648(dd, 1H, J=8.8, 2.4Hz), 6.602(d, 1H, J=10Hz), 6.559(d, 1H, J=8Hz), 6.497(d, 1H, J=2.4Hz), 5.648(d, 1H, J=9.6Hz), 5.208(s, 2H), 5.110(s, 2H), 4.629(d, 2H, J=3.6Hz), 3.990(m, 3H), 1.815~1.744(m, 2H), 1.486~1.396(m, 8H), 0.928(t, 3H, 7.2Hz) ¹³C-NMR (CDCl₃) : 194.341, 164.543, 160.890, 154.634, 153.788, 135.888, 133.253, 130.303, 129.791, 128.699, 128.327, 127.509, 126.250, 117.781, 117.605, 114.379, 112.049, 106.595, 99.491, 80.697, 75.443, 70.318, 68.405, 61.678, 30.997, 27.495, 19.337, 13.709
1 6	[화합물 4-16] 	¹H-NMR (CDCl₃) : 8.069(d, 1H, J=8.8Hz), 7.426~7.347(m, 5H), 7.062(d, 1H, J=8Hz), 6.688~6.652(m, 2H), 6.558(d, 1H, J=8.4Hz), 6.487(d, 1H, J=2.4Hz), 5.641(d, 1H, J=10Hz), 5.244(s, 2H), 5.110(s, 2H), 4.614(d, 2H, J=6.4Hz), 4.122(t, 2H, J=4.8Hz), 3.693~3.620(m, 3H), 3.228(s, 3H), 1.420(s, 6H) ¹³C-NMR (CDCl₃) : 194.068, 164.393, 160.4485, 154.308, 153.700, 135.851, 133.172, 130.359, 129.823, 128.703, 128.336, 127.495, 126.260, 118.109, 117.483, 114.640, 112.187, 107.077, 99.757, 80.789, 75.629, 70.370, 70.335, 67.570, 61.340, 58.674, 27.617

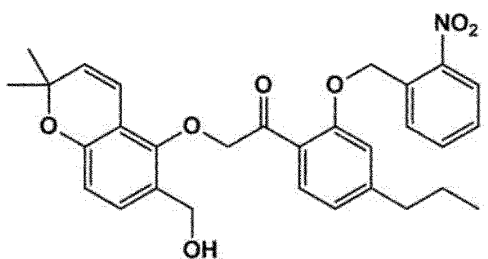
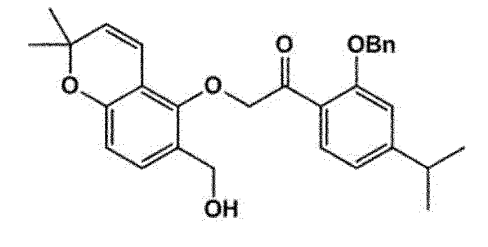
1 7	[화합물 4-17] 	¹H-NMR (CDCl₃) : 7.971(d, 1H, J=8Hz), 7.433~7.339(m, 5H), 7.011(d, 1H, J=8.4Hz), 6.924(d, 1H, J=8Hz), 6.865(s, 1H), 6.538(d, 1H, J=8.4Hz), 6.389(d, 1H, J=10Hz), 5.475(d, 1H, J=10Hz), 5.138(d, 2H, J=8Hz), 4.515(s, 2H), 3.310(br, 1H), 2.707~2.619(m, 2H), 1.369(s, 6H), 1.245(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 195.369, 158.868, 153.761, 152.515, 135.625, 131.324, 130.363, 129.697, 128.738, 128.509, 127.499, 126.083, 122.421, 121.132, 117.210, 114.408, 112.166, 112.135, 80.841, 75.540, 70.913, 61.402, 29.204, 27.859, 15.014
1 8	[화합물 4-18] 	¹H-NMR (CDCl₃) : 8.168(d, 2H, J=8.8Hz), 7.950(d, 1H, J=8Hz), 7.545(d, 2H, J=8.8Hz), 7.020(d, 1H, J=8.0Hz), 6.959(dd, 1H, J=8, 1.2Hz), 6.795(s, 1H), 6.552(d, 1H, J=8Hz), 6.428(d, 1H, J=9.6Hz), 5.509(d, 1H, J=10Hz), 5.233(s, 2H), 5.131(s, 2H), 4.532(d, 2H, J=6.4Hz), 3.134(t, 1H, J=6.4Hz), 2.671(q, 2H, J=15.2Hz), 1.344(s, 6H), 1.232(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 194.892, 158.011, 153.937, 152.558, 147.782, 142.812, 131.4406, 130.706, 129.797, 128.125, 127.519, 125.970, 123.970, 123.883, 122.518, 121.668, 116.946, 114.550, 113.201, 112.537, 112.045, 80.751, 75.627, 69.546, 61.309, 29.170, 27.497, 15.017

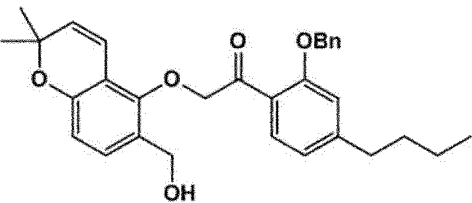
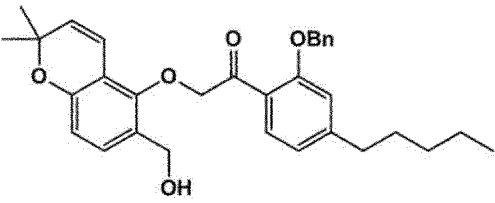
19	[화합물 4-19] 	¹H-NMR (CDCl₃) : 7.948(d, 1H, J=8Hz), 7.065(d, 1H, J=8Hz), 6.992(d, 1H, J=8Hz), 6.758(s, 1H), 6.618(d, 1H, J=10Hz), 6.580(d, 1H, J=8Hz), 5.660(d, 1H, J=10Hz), 5.194(s, 2H), 4.630(d, 2H, J=6Hz), 3.875(s, 3H), 3.431(t, 1H, J=6.4Hz), 2.624(t, 2H, J=7.6Hz), 1.692~1.617(m, 2H), 1.431(s, 6H), 0.955(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 195.352, 159.530, 154.279, 153.804, 151.120, 131.081, 130.458, 129.702, 126.156, 121.981, 121.410, 117.421, 114.635, 112.208, 111.466, 80.598, 75.635, 61.525, 55.410, 38.210, 27.544, 24.110, 13.755
20	[화합물 4-20] 	¹H-NMR (CDCl₃) : 7.967(d, 1H, J=8Hz), 7.430~7.320(m, 5H), 7.010(d, 1H, J=8Hz), 6.998(d, 1H, J=8Hz), 6.845(s, 1H), 6.538(d, 1H, J=8Hz), 6.387(d, 1H, J=10Hz), 5.473(d, 1H, J=10Hz), 5.163(s, 2H), 5.153(s, 2H), 4.514(s, 2H), 3.389(s, 1H), 2.611(t, 2H, J=7.6Hz), 1.674~1.600(m, 2H), 1.368(s, 6H), 0.934(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 195.343, 158.738, 155.662, 154.090, 153.688, 151.024, 136.179, 131.156, 130.323, 129.651, 128.691, 128.463, 127.890, 126.045, 122.282, 121.682, 117.167, 114.350, 113.694, 112.657, 112.104, 80.826, 75.495, 70.824, 61.355

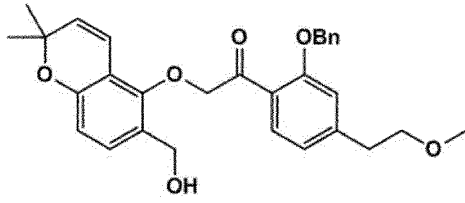
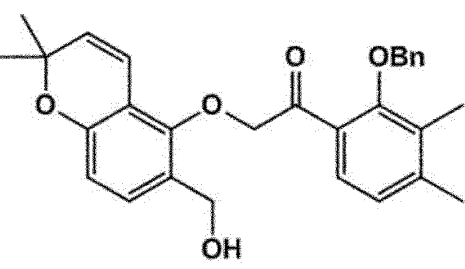
2 1	[화합물 4-21] 	¹H-NMR (CDCl₃) : 7.967(d, 1H, J=8Hz), 7.306(s, 4H), 7.025(d, 1H, J=8Hz), 6.919(dd, 1H, J=8, 1.2Hz), 6.811(s, 1H), 6.558(d, 1H, J=8.4Hz), 6.370(d, 1H, J=10Hz), 5.493(d, 1H, J=10Hz), 5.112(s, 2H), 5.082(s, 2H), 4.524(s, 2H), 3.296(br, 1H), 2.616(t, 2H, J=7.6Hz), 1.697~1.604(m, 4H), 1.377(s, 6H), 0.940(t, 3H, J=7.6Hz) -
2 2	[화합물 4-22] 	¹H-NMR (CDCl₃) : 7.961(d, 1H, J=8Hz), 7.401(d, 1H, J=2Hz), 7.366(d, 1H, J=8Hz), 7.227(d, 1H, J=2.4Hz), 7.206(d, 1H, J=2Hz), 7.026(d, 1H, J=8.4Hz), 6.933(dd, 1H, J=8, 0.8Hz), 6.804(s, 1H), 6.556(d, 1H, J=8.4Hz), 6.398(d, 1H, J=9.6Hz), 5.504(d, 1H, J=10Hz), 5.172(s, 2H), 5.123(s, 2H), 4.540(s, 2H), 3.3(br, 1H), 2.623(t, 2H, J=7.6Hz), 1.684~1.610(m, 4H), 1.382(s, 6H), 0.944(t, 3H, J=7.2Hz) -

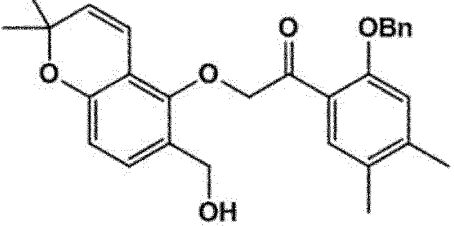
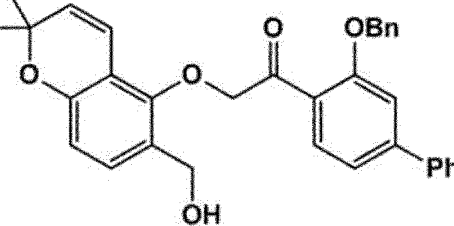
2	[화합물 4-23]	¹ H-NMR (CDCl ₃) : 7.961(d, 1H, J=8Hz), 7.245(d, 2H, J=8.8Hz), 7.113(d, 2H, J=8Hz), 7.007(d, 1H, 8.4Hz), 6.889(dd, 1H, J=8, 1.2Hz), 6.842(d, 1H, J=1.2Hz), 6.539(dd, 1H, J=8.4, 0.4Hz), 6.392(dd, 1H, J=10, 0.8Hz), 5.466(d, 1H, J=9.6Hz), 5.124(s, 2H), 5.067(s, 2H), 4.504(s, 2H), 3.3(br, 1H), 2.611(t, 2H, J=7.6Hz), 2.347(s, 2H), 1.679~1.622(m, 2H), 1.369(s, 6H), 0.938(t, 3H, J=7.2Hz)
3		¹³ C-NMR (CDCl ₃) : 195.3316, 158.874, 154.093, 153.705, 151.006, 138.261, 132.530, 131.130, 130.271, 129.607, 129.336, 128.062, 126.084, 122.313, 121.608, 117.247, 114.379, 112.676, 112.071, 80.901, 75.477, 70.780, 61.354, 38.248, 27.491, 24.037, 21.170, 13.703

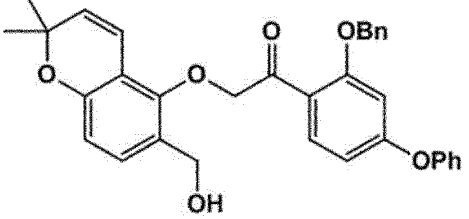
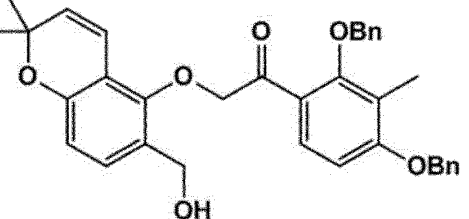
2 4	[화합물 4-24] 	¹H-NMR (CDCl₃) : 8.154(d, 2H, J=8.4Hz), 7.936(d, 1H, J=8Hz), 7.538(d, 2H, J=8.8Hz), 7.112(d, 1H, 8Hz), 6.930(d, 1H, J=8Hz), 6.773(s, 1H), 6.543(d, 1H, J=8Hz), 6.423(d, 1H, J=10Hz), 5.499(d, 1H, J=6Hz), 5.225(s, 2H), 5.129(s, 2H), 4.504(s, 2H), 3.240(br, 1H), 2.600(t, 2H, J=7.6Hz), 1.655~1.588(m, 2H), 1.337(s, 6H), 0.917(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 194.877, 157.904, 153.873, 153.719, 151.043, 147.723, 142.811, 131.228, 130.668, 129.761, 128.101, 125.952, 123.847, 122.482, 112.220, 121.974, 116.910, 114.515, 112.614, 112.494, 80.738, 75.536, 69.504, 61.207, 38.178, 27.461, 24.006, 13.641
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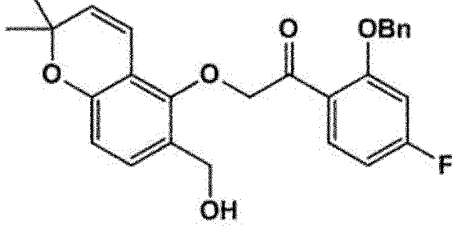
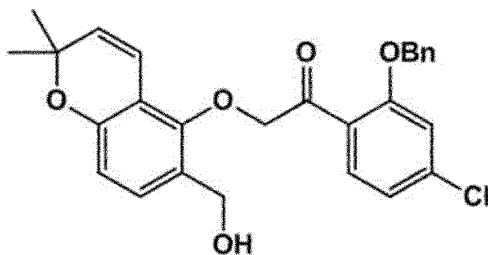
2 5	[화합물 4-25] 	¹H-NMR (CDCl₃) : 8.130(dd, 1H, J=8, 1.2Hz), 7.907(d, 1H, J=8Hz), 7.712(d, 1H, J=7.6Hz), 7.594(td, 1H, 7.6, 1.2Hz), 7.497(dd, 1H, J=8.4, 1.6Hz), 7.040(d, 1H, J=8Hz), 6.927(dd, 1H, J=8, 1.2Hz), 6.747(s, 1H), 6.555(d, 1H, J=8.4Hz), 6.485(d, 1H, J=9.6Hz), 5.561(s, 2H), 5.535(d, 1H, J=10Hz), 5.183(s, 2H), 4.576(d, 2H, J=5.6Hz), 3.205(br, 1H), 2.573(t, 2H, J=4Hz), 1.636~1.579(m, 2H), 1.359(s, 6H), 0.906(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 195.109, 157.878, 153.977, 153.791, 151.084, 147.120, 134.110, 132.256, 131.117, 130.597, 129.793, 129.029, 128.971, 126.048, 125.171, 122.525, 122.189, 117.065, 114.542, 112.975, 112.387, 80.358, 75.657, 67.659, 38.190, 27.557, 24.064, 13.653
2 6	[화합물 4-26] 	¹H-NMR (CDCl₃) : 7.980(d, 1H, J=8.4Hz), 7.388~7.322(m, 5H), 7.012(d, 1H, J=8.4Hz), 6.950(dd, 1H, J=8, 1.2Hz), 6.889(s, 1H), 6.540(d, 1H, J=8Hz), 6.393(d, 1H, J=9.6Hz), 5.478(d, 1H, J=10Hz), 5.155(s, 2H), 5.138(s, 2H), 4.519(d, 2H, J=4.8Hz), 3.381(br, 1H), 2.928(m, 1H), 1.400(s, 6H), 1.261~1.215(m, 6H) ¹³C-NMR (CDCl₃) : 195.327, 257.109, 154.077, 153.683, 131.276, 130.306, 129.642, 128.679, 128.457, 127.922, 126.031, 122.391, 119.581, 117.161, 114.329, 112.088, 80.805, 75.483, 61.319, 34.480, 27.502

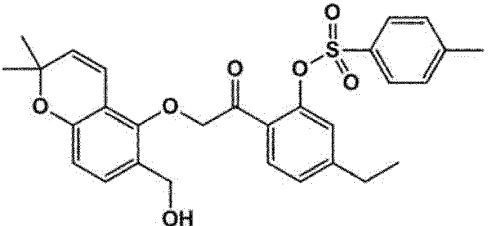
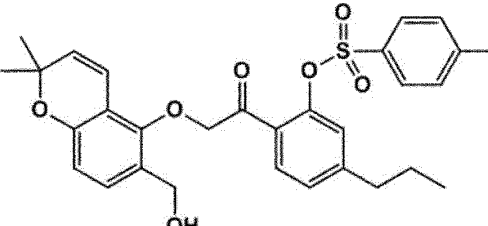
2 7	[화합물 4-27] 	¹H-NMR (CDCl₃) : 7.961(d, 1H, J=8Hz), 7.359~7.279(m, 5H), 7.011(d, 1H, J=8Hz), 6.901(d, 1H, J=8Hz), 6.842(s, 1H), 6.539(d, 1H, J=8Hz), 6.395(d, 1H, J=9.6Hz), 5.476(d, 1H, J=9.6Hz), 5.150(s, 2H), 5.126(s, 2H), 4.516(d, 2H, J=4.8Hz), 3.302(br, 1H), 2.634(t, 2H, J=7.6Hz), 1.587(m, 2H), 1.417~1.331(m, 2H), 1.370(s, 6H), 0.923(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 195.358, 158.764, 154.118, 153.717, 151.297, 135.582, 131.196, 130.340, 129.680, 128.711, 128.348, 127.909, 126.058, 122.263, 121.664, 117.189, 114.372, 112.629, 112.127, 80.842, 75.518, 70.840, 61.386, 35.941, 33.033, 27.534, 22.420, 13.857
2 8	[화합물 4-28] 	¹H-NMR (CDCl₃) : 7.968(d, 1H, J=8Hz), 7.369~7.208(m, 5H), 7.011(d, 1H, J=8.4Hz), 6.905(d, 1H, J=8Hz), 6.840(s, 1H), 6.539(d, 1H, J=8Hz), 6.356(d, 1H, J=10Hz), 5.474(d, 1H, J=9.6Hz), 5.153(s, 2H), 5.127(s, 2H), 4.516(d, 2H, J=6.4Hz), 3.298(t, 1H, J=6.8Hz), 2.625(t, 2H, J=7.6Hz), 1.626~1.592(m, 2H), 1.417~1.216(m, 10H), 0.887(t, 3H, J=6.4Hz) -

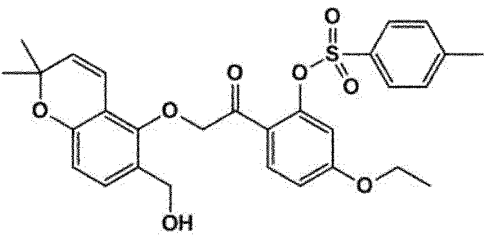
29	[화합물 4-29] 	¹H-NMR (CDCl₃) : 7.972(d, 1H, J=7.6Hz), 7.405~7.322(m, 5H), 7.012(d, 1H, J=8Hz), 6.941(d, 1H, J=8.4Hz), 6.925(s, 1H), 6.540(d, 1H, J=8.4Hz), 6.387(d, 1H, J=10Hz), 5.479(d, 1H, J=10Hz), 5.169(s, 2H), 5.146(s, 2H), 4.511(d, 2H, J=5.6Hz), 3.608(t, 2H, J=6.4Hz), 3.332(s, 3H), 3.272(br, 1H), 2.899(t, 2H, J=6.4Hz), 1.416(s, 6H) ¹³C-NMR (CDCl₃) : 195.380, 158.685, 154.084, 153.726, 147.462, 135.527, 131.269, 130.372, 129.687, 128.723, 128.506, 127.928, 126.041, 122.783, 121.901, 117.169, 114.367, 113.245, 112.154, 80.841, 75.527, 70.873, 61.375, 58.741, 36.433, 27.537
30	[화합물 4-30] 	¹H-NMR (CDCl₃) : 7.526(d, 1H, J=8Hz), 7.496~7.291(m, 5H), 7.270(d, 1H, J=8Hz), 7.016(d, 1H, J=8.4Hz), 6.546(d, 1H, 8Hz), 6.432(d, 1H, J=8Hz), 5.498(d, 1H, J=10Hz), 5.135(s, 2H), 4.820(s, 2H), 4.539(s, 2H), 3.201(br, 1H), 2.332(s, 3H), 2.236(s, 3H), 1.361(s, 6H) -

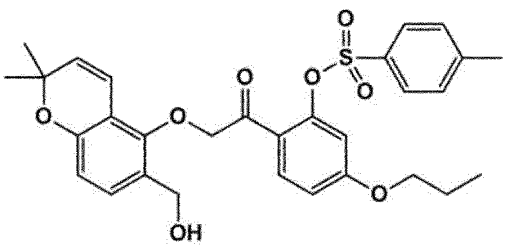
3 1	[화합물 4-31] 	¹H-NMR (CDCl₃) : 7.804(s, 1H), 7.346~7.334(m, 5H), 7.010(d, 1H, J=8.4Hz), 6.826(s, 1H), 6.536(d, 1H, J=8Hz), 6.398(d, 1H, J=10Hz), 5.472(d, 1H, J=10Hz), 5.147(s, 2H), 5.096(s, 2H), 4.517(d, 2H, J=3.6Hz), 3.327(br, 1H), 2.293(s, 3H), 2.233(s, 3H), 1.367(s, 6H) ¹³C-NMR (CDCl₃) : 195.485, 156.948, 154.1449, 153.705, 144.902, 135.781, 131.672, 130.322, 129.657, 128.695, 128.409, 127.827, 126.078, 121.959, 117.197, 114.379, 114.009, 112.105, 80.880, 75.510, 70.948, 61.410, 27.529, 20.534, 18.974
3 2	[화합물 4-32] 	¹H-NMR (CDCl₃) : 8.119(d, 1H, J=8Hz), 7.536~7.205(m, 12H), 7.031(d, 1H, J=8.4Hz), 6.560(d, 1H, J=8Hz), 6.423(d, 1H, J=9.6Hz), 5.504(d, 1H, J=9.6Hz), 5.213(s, 4H), 4.541(d, 2H, J=5.6Hz), 3.240(t, 1H, J=6.4Hz), 1.385(s, 6H) ¹³C-NMR (CDCl₃) : 195.363, 158.944, 154.081, 153.770, 148.050, 139.675, 135.426, 131.754, 130.445, 129.738, 128.969, 128.799, 128.615, 128.550, 127.963, 127.229, 126.046, 120.287, 117.167, 114.418, 112.231, 111.393, 80.924, 75.570, 71.064, 61.410, 27.570

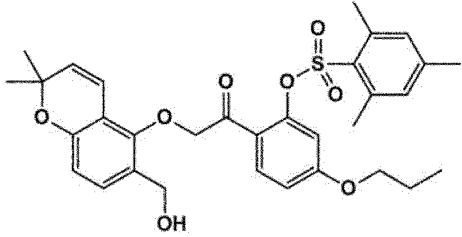
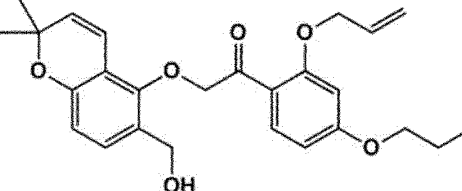
3 3	[화합물 4-33] 	¹H-NMR (CDCl₃) : 8.037(d, 1H, J=8.4Hz), 7.419~7.009(m, 11H), 6.603~6.535(m, 3H), 6.411(d, 1H, J=10Hz), 5.491(d, 1H, J=9.6Hz), 5.157(s, 2H), 5.035(s, 2H), 4.532(d, 2H, J=6.8Hz), 3.400(t, 1H, J=6.4Hz), 1.378(s, 6H) ¹³C-NMR (CDCl₃) : 194.214, 163.765, 160.375, 154.848, 154.168, 153.739, 135.098, 133.150, 130.344, 130.076, 129.724, 128.761, 128.577, 127.904, 126.0660, 124.910, 120.330, 119.189, 119.135, 144.344, 112.135, 110.042, 101.837, 80.752, 75.510, 70.976, 61.407, 27.536
3 4	[화합물 4-34] 	¹H-NMR (CDCl₃) : 7.722(d, 1H, J=8.8Hz), 7.486~7.320(m, 10H), 7.013(d, 1H, J=8.4Hz), 6.828(d, 1H, J=8.8Hz), 6.544(d, 1H, J=8.4Hz), 6.418(d, 1H, J=10Hz), 5.481(d, 1H, J=10Hz), 5.162(s, 2H), 5.142(s, 2H), 4.850(s, 2H), 3.406(t, 1H, J=6.4Hz), 2.257(s, 3H), 1.363(s, 6H) ¹³C-NMR (CDCl₃) : 196.210, 161.985, 157.971, 154.160, 153.769, 136.275, 135.967, 130.506, 129.731, 129.099, 128.678, 128.646, 128.461, 128.137, 127.892, 127.126, 126.068, 123.289, 120.738, 117.149, 114.469, 112.222, 107.937, 79.434, 75.569, 61.487, 27.538, 9.705

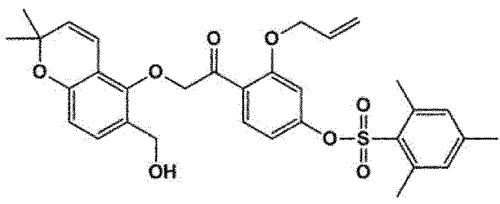
3 5	[화합물 4-35] 	¹H-NMR (CDCl₃) : 8.101(dd, 1H, J=8.8, 6.8Hz), 7.420~7.347(m, 5H), 7.036(d, 1H, J=8Hz), 6.827~6.749(m, 2H), 6.567(d, 1H, J=8Hz), 6.415(d, 2H, J=10Hz), 5.512(d, 1H, J=10Hz), 5.154(s, 2H), 5.123(s, 2H), 4.533(s, 2H), 3.2(br, 1H), 1.393(s, 6H) ¹³C-NMR (CDCl₃) : 194, 168.163, 165.619, 160.334, 160.229, 153.975, 153.772, 134.734, 133.584, 133.472, 130.501, 129.760, 128.858, 128.790, 127.915, 125.969, 121.147, 121.119, 117.070, 114.388, 112.291, 108.852, 108.637, 100.820, 100.560, 80.765, 75.579, 71.388, 27.562
3 6	[화합물 4-36] 	¹H-NMR (CDCl₃) : 7.984(d, 1H, J=8Hz), 7.371~7.320(m, 5H), 7.085~6.988(m, 3H), 6.549(d, 1H, J=8Hz), 6.380(d, 1H, J=10Hz), 5.491(d, 1H, J=9.6Hz), 5.119(s, 2H), 5.111(s, 2H), 4.501(s, 2H), 3.002(br, 1H), 1.371(s, 6H) ¹³C-NMR (CDCl₃) : 194, 159, 154.051, 153.893, 140.950, 134.766, 132.341, 130.545, 129.762, 128.855, 128.804, 127.919, 127.397, 125.938, 117.021, 114.402, 113.359, 112.341, 80.803, 75.600, 71.419, 61.322, 27.645

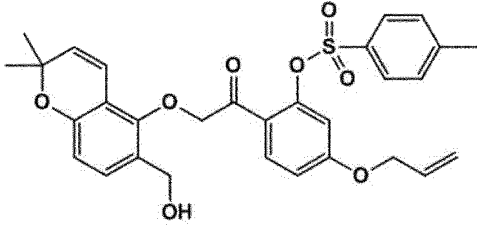
3 7	[화합물 4-37] 	¹H-NMR (CDCl₃) : 7.707(d, 1H, J=8Hz), 7.649~7.628(m, 2H), 7.314~7.187(m, 3H), 7.078(d, 1H, J=8Hz), 7.013(s, 1H), 6.601(d, 1H, J=8.4Hz), 6.544(d, 1H, J=10Hz), 5.668(d, 1H, J=10Hz), 5.065(s, 2H), 4.587(s, 2H), 3(br, 1H), 2.676~2.619(m, 2H), 2.433(s, 3H), 1.429(s, 6H), 1.179(t, 3H, J=6.4Hz) ¹³C-NMR (CDCl₃) : 194.769, 153.894, 153.594, 151.474, 147.506, 146.216, 131.482, 130.893, 130.512, 130.008, 129.892, 129.787, 128.425, 127.586, 127.036, 125.931, 122.448, 116.989, 114.608, 112.670, 79.074, 75.811, 28.594, 27.597, 21.739, 14.723
3 8	[화합물 4-38] 	¹H-NMR (CDCl₃) : 7.698(d, 1H, J=8Hz), 7.630(d, 2H, J=6.4Hz), 7.248(d, 2H, J=8Hz), 7.176(dd, 1H, J=8, 1.6Hz), 7.078(d, 1H, J=8.4Hz), 6.997(d, 1H, J=1.2Hz), 6.601(d, 1H, J=8.4Hz), 6.548(d, 1H, J=9.6Hz), 5.670(d, 1H, J=10Hz), 5.067(s, 2H), 4.589(d, 2H, J=6.4Hz), 2.949(t, 1H, J=6.4Hz), 2.581(t, 2H, J=7.6Hz), 2.431(s, 3H), 1.605~1.549(m, 2H), 1.430(s, 6H), 0.899(t, 3H, J=7.2Hz) -

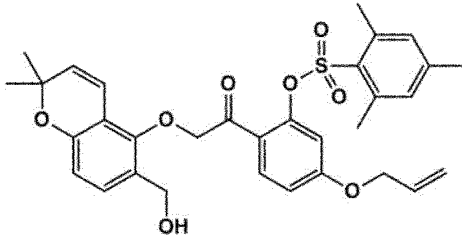
3 9	[화합물 4-39] 	¹H-NMR (CDCl₃) : 7.814(d, 1H, J=8.8Hz), 7.659(dd, 2H, J=6.8, 1.6Hz), 7.239(d, 2H, J=8Hz), 7.069(d, 1H, J=8Hz), 6.858(dd, 1H, J=8.8, 1.6Hz), 6.786(s, 1H), 6.598(d, 1H, J=8Hz), 6.544(dd, 1H, J=9.6, 0.4Hz), 5.667(d, 1H, J=10Hz), 5.013(s, 2H), 4.561(d, 2H, J=5.6Hz), 4.032(q, 2H, J=14, 7.2Hz), 3.05(br, 1H), 2.423(s, 3H), 1.431(s, 6H), 1.400(t, 3H, J=4.8Hz) ¹³C-NMR (CDCl₃) : 193.271, 163.431, 153.875, 153.718, 149.422, 146.293, 132.214, 131.584, 130.851, 130.063, 129.825, 128.329, 125.979, 121.846, 117.039, 114.607, 113.663, 112.501, 108.537, 79.121, 75.860, 64.363, 61.228, 27.604, 21.743, 14.429
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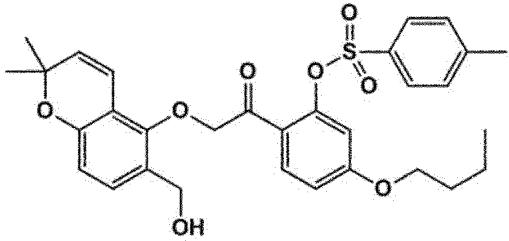
40	[화합물 4-40] 	¹H-NMR (CDCl₃) : 7.814(d, 1H, J=8.8Hz), 7.662(dd, 2H, J=6.8, 1.6Hz), 7.241(d, 2H, J=8Hz), 7.070(d, 1H, J=8.4Hz), 6.864(dd, 1H, J=8.8, 1.6Hz), 6.769(d, 1H, J=2.4Hz), 6.598(dd, 1H, J=8, 0.4Hz), 6.533(dd, 1H, J=10, 0.4Hz), 5.668(d, 1H, J=10Hz), 5.017(s, 2H), 4.563(d, 2H, J=4.4Hz), 3.905(t, 2H, J=6.8Hz), 3.079(br, 1H), 2.423(s, 3H), 1.829~1.777(m, 2H), 1.431(s, 6H), 1.027(t, 3H, J=3.6Hz) ¹³C-NMR (CDCl₃) : 193.262, 163.614, 153.859, 149.399, 146.284, 132.196, 131.800, 131.555, 130.840, 129.943, 129.814, 128.349, 125.969, 121.798, 117.035, 114.596, 113.707, 112.484, 108.528, 79.114, 75.790, 70.229, 27.719, 22.198, 21.734, 10.329
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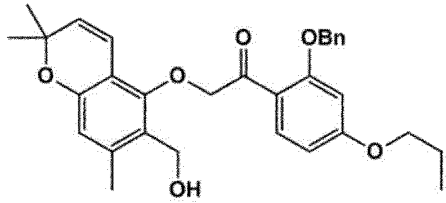
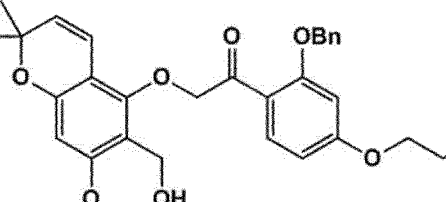
4 1	[화합물 4-41] 	¹H-NMR (CDCl₃) : 7.942(d, 1H, J=9.2Hz), 7.043(d, 1H, J=8Hz), 6.975(s, 2H), 6.852(dd, 1H, J=8.8, 2.4Hz), 6.575(d, 1H, J=7.6Hz), 6.544(s, 1H), 6.258(d, 1H, J=2.4Hz), 5.648(d, 1H, J=10Hz), 5.074(s, 2H), 4.562(s, 2H), 3.731(t, 2H, J=6.4Hz), 3.1(br, 1H), 2.517(s, 6H), 2.321(s, 3H), 1.750~1.698(m, 2H), 1.422(s, 6H), 0.970(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 193.390, 163.533, 153.843, 153.775, 149.753, 144.601, 140.337, 132.494, 131.984, 130.764, 130.708, 129.709, 125.983, 122.210, 117.178, 114.649, 113.666, 112.400, 107.455, 79.339, 75.760, 70.058, 61.285, 27.558, 22.682, 22.116, 21.142, 10.241
4 2	[화합물 4-42] 	¹H-NMR (CDCl₃) : 8.051(d, 1H, J=8.8Hz), 7.042(d, 1H, J=8.4Hz), 6.618~6.548(m, 3H), 6.415(d, 1H, J=2Hz), 6.045~6.029(m, 1H), 5.652(d, 1H, J=9.6Hz), 5.392(dd, 1H, J=17.2, 1.2Hz), 5.296(dd, 1H, J=11.2, 0.8Hz), 5.220(s, 2H), 4.634(d, 2H, J=6.8Hz), 4.584(d, 2H, J=5.6Hz), 4.009~3.953(m, 3H), 1.849~1.797(m, 2H), 1.431(s, 6H), 1.044(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 194.362, 165.011, 160.388, 154.687, 153.791, 133.236, 132.016, 130.230, 129.753, 126.206, 119.138, 117.748, 117.546, 114.381, 111.969, 106.68, 99.310, 880.667, 75.423, 69.890, 69.627, 61.722, 27.448, 22.366, 10.406

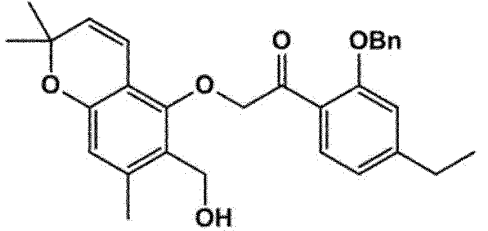
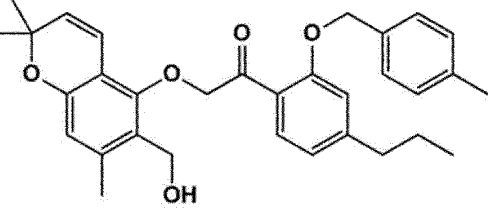
4 3	[화합물 4-43] 	¹H-NMR (CDCl₃) : 7.045(d, 1H, J=8.4Hz), 6.996(s, 2H), 6.728(d, 1H, J=2Hz), 6.578(s, 1H), 6.555(d, 1H, J=2Hz), 6.521(dd, 1H, J=8.8, 2Hz), 5.989~5.920(m, 1H), 5.649(d, 1H, J=10Hz), 5.377~5.305(m, 2H), 5.194(s, 2H), 4.610(s, 2H), 4.511(d, 2H, J=5.6Hz), 2.571(s, 6H), 2.334(s, 3H), 1.425(s, 6H) ¹³C-NMR (CDCl₃) : 194.5, 159.172, 154.216, 153.891, 144.344, 140.427, 132.524, 131.977, 131.589, 131.305, 130.549, 129.832, 125.997, 123.1110, 119.710, 117.408, 114.5507, 114.441, 112.325, 110.490, 107.381, 80.673, 75.564, 70.050, 61.556, 27.514, 22.745, 21.106
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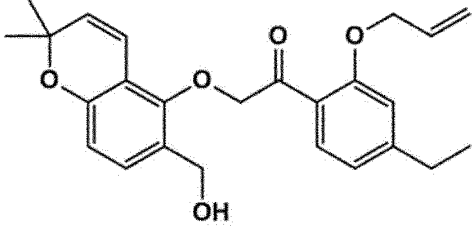
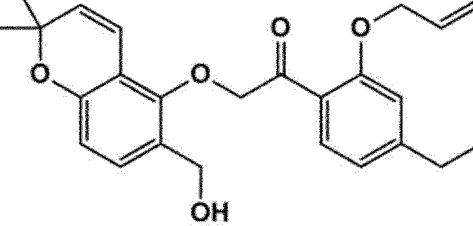
4 4	[화합물 4-44] 	¹H-NMR (CDCl₃) : 7.820(d, 1H, J=8.8Hz), 7.660(d, 1H, J=8.4Hz), 7.266~7.233(m, 2H), 7.071(d, 1H, J=8Hz), 6.888(dd, 1H, J=8.8, 2.4Hz), 6.806(d, 1H, J=2.4Hz), 6.600(dd, 1H, J=8.4, 0.4Hz), 6.532(dd, 1H, J=9.6, 0.4Hz), 6.028~5.959(m, 1H), 5.669(d, 1H, J=10Hz), 5.422~5.318(m, 2H), 5.220(s, 2H), 4.567~4.526(m, 4H), 3.05(br, 1H), 2.425(s, 3H), 1.431(s, 6H) ¹³C-NMR (CDCl₃) : 193.285, 162.930, 153.859, 153.679, 149.347, 146.328, 132.220, 131.702, 131.497, 130.862, 130.069, 129.827, 128.336, 125.948, 122.144, 118.717, 117.011, 114.595, 113.897, 112.504, 108.808, 79.126, 75.796, 69.325, 61.209, 27.586, 21.749
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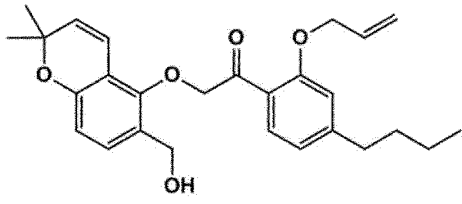
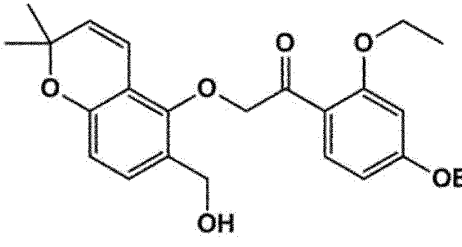
4 5	[화합물 4-45] 	¹H-NMR (CDCl₃) : 7.942(d, 1H, J=8.8Hz), 7.044(d, 1H, J=8Hz), 6.978(s, 2H), 6.876(dd, 1H, J=8.8, 2Hz), 6.586~6.545(m, 2H), 6.293(d, 1H, J=2.4Hz), 5.938~5.869(m, 1H), 5.647(d, 1H, J=10Hz), 5.327~5.263(m, 2H), 5.156(s, 2H), 4.563(d, 2H, J=2.4Hz), 4.376(d, 2H, J=5.6Hz), 3.092(br, 1H), 2.529(s, 6H), 2.334(s, 3H), 1.421(s, 6H) ¹³C-NMR (CDCl₃) : 193.422, 162.870, 153.852, 153.741, 149.669, 144.634, 140.332, 132.506, 131.890, 131.706, 130.732, 129.724, 125.976, 122.650, 118.556, 117.161, 114.656, 113.799, 112.430, 107.894, 79.336, 75.767, 69.176, 61.267, 29.330, 22.669, 21.150
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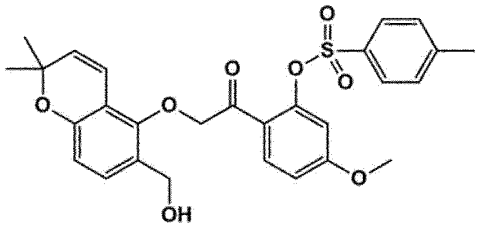
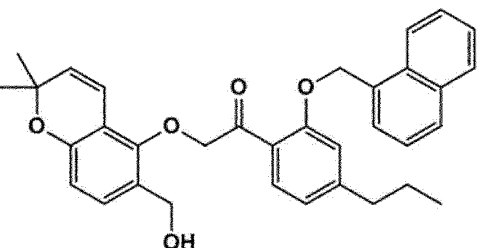
4 6	[화합물 4-46] 	¹H-NMR (CDCl₃) : 7.814(d, 1H, J=8.8Hz), 7.665(dd, 1H, J=8.4, 2Hz), 7.266(s, 1H), 7.240(d, 1H, J=8Hz), 7.068(d, 1H, J=8.4Hz), 6.858(dd, 1H, J=8.8, 2.4Hz), 6.758(d, 1H, J=2Hz), 6.596(dd, 1H, J=8.4, 0.4Hz), 6.533(d, 1H, J=10Hz), 5.665(d, 1H, J=10Hz), 5.016(s, 2H), 4.561(s, 2H), 3.942(t, 2H, J=6.8Hz), 3.095(br, 1H), 2.421(s, 3H), 1.792~1.722(m, 2H), 1.499~1.392(m, 8H), 0.975(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 193.251, 163.619, 153.863, 153.709, 149.408, 146.273, 132.191, 131.595, 130.836, 130.042, 129.810, 128.355, 125.981, 121.812, 117.040, 113.709, 112.487, 108.519, 79.115, 75.788, 68.483, 61.206, 30.829, 27.594, 21.729, 19.098, 13.711
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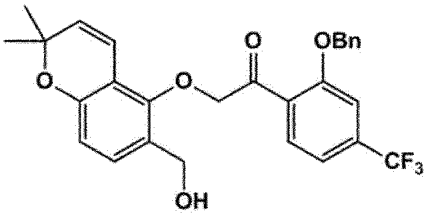
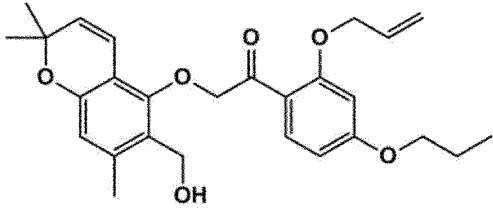
4 7	[화합물 4-47] 	¹ H-NMR (CDCl ₃) : 8.047(d, 1H, J=8.8Hz), 7.3884~7.324(m, 5H), 6.581(dd, 1H, J=8.8, 2Hz), 6.507(s, 1H), 6.502(s, 1H), 6.422(d, 1H, J=8Hz), 5.401(d, 1H, J=10Hz), 5.116(s, 2H), 5.090(s, 2H), 4.615(s, 2H), 3.959(t, 2H, J=6.8Hz), 3.2(br, 1H), 2.325(s, 3H), 1.836~1.784(m, 2H), 1.355(s, 6H), 1.036(t, 3H, J=7.6Hz)
		¹³ C-NMR (CDCl ₃) : 194.185, 164.941, 160.501, 154.568, 153.073, 139.013, 135.410, 133.214, 129.135, 128.709, 128.515, 127.952, 124.437, 117.703, 117.378, 114.027, 111.673, 106.724, 99.451, 81.045, 75.422, 70.892, 69.899, 56.764, 27.548, 22.352, 19.333, 10.396
4 8	[화합물 4-48] 	¹ H-NMR (CDCl ₃) : 8.048(d, 1H, J=8.8Hz), 7.388~7.297(m, 5H), 6.574(dd, 1H, J=8.8, 2.4Hz), 6.490(d, 1H, J=2Hz), 6.363(d, 1H, J=9.6Hz), 6.206(s, 1H), 5.345(d, 1H, J=9.6Hz), 5.118(s, 2H), 5.090(s, 2H), 4.636(d, 2H, J=5.2Hz), 3.948(t, 2H, J=6.4Hz), 3.782(s, 3H), 3.054(br, 1H), 1.811~1.758(m, 2H), 1.365(s, 6H), 1.030(t, 3H, J=7.6Hz)
		¹³ C-NMR (CDCl ₃) : 193.584, 164.806, 160.403, 158.863, 154.891, 154.301, 135.452, 133.104, 128.805, 128.345, 127.798, 127.061, 117.821, 117.232, 114.778, 107.315, 106.702, 81.117, 75.999, 70.82, 69.844, 55.614, 54.511, 27.550, 22.321, 14.122

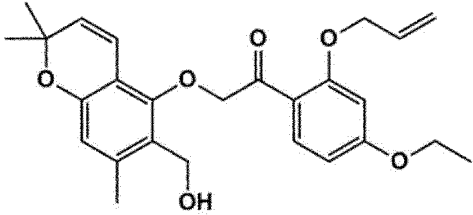
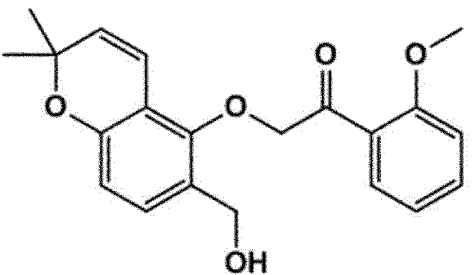
49	[화합물 4-49] 	¹H-NMR (CDCl₃) : 7.952(d, 1H, J=8Hz), 7.380~7.314(m, 5H), 6.901(d, 1H, J=8Hz), 6.855(s, 1H), 6.434(s, 1H), 6.334(d, 1H, J=9.6Hz), 5.410(d, 1H, J=10Hz), 5.138(s, 2H), 5.117(s, 2H), 4.605(d, 2H, J=3.2Hz), 3.050(br, 1H), 2.656(q, 2H, J=15.2, 7.6Hz), 2.318(s, 3H), 1.353(s, 6H), 1.234(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 195.367, 158.811, 154.415, 153.049, 152.438, 139.003, 135.578, 131.209, 129.179, 128.630, 128.397, 127.907, 124.342, 122.280, 121.000, 120.907, 117.261, 114.061, 112.049, 111.687, 81.134, 75.415, 70.779, 56.687, 29.130, 27.516, 19.278, 14.979
50	[화합물 4-50] 	¹H-NMR (CDCl₃) : 7.948(d, 1H, J=8Hz), 7.245(d, 2H, J=3.2Hz), 7.113(d, 2H, 7.6Hz), 6.877(d, 1H, J=8.4Hz), 6.835(s, 1H), 6.437(s, 1H), 6.340(d, 1H, J=10Hz), 5.406(d, 1H, J=9.6Hz), 5.119(s, 2H), 5.064(s, 2H), 4.606(s, 2H), 3.0(br, 1H), 2.603(t, 2H, J=7.6Hz), 2.347(s, 3H), 2.324(s, 3H), 1.673~1.586(m, 2H), 1.338(s, 6H), 0.933(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 195.369, 158.846, 154.454, 153.083, 150.926, 138.996, 138.227, 132.552, 131.100, 129.287, 129.145, 128.073, 127.683, 124.369, 122.347, 121.558, 117.353, 114.054, 112.648, 81.231, 75.425, 70.715, 56.739, 38.2321, 27.525, 24.023, 21.149, 19.307, 13.696

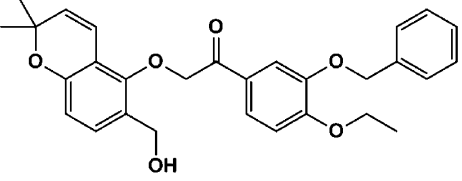
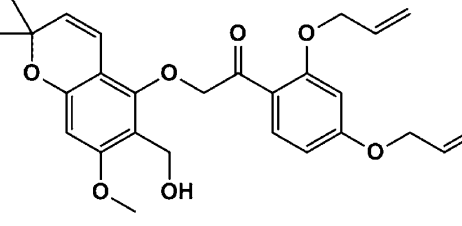
5 1	[화합물 4-51] 	¹H-NMR (CDCl₃) : 7.956(d, 1H, J=8Hz), 7.048(d, 1H, J=8.4Hz), 6.907(dd, 1H, J=8.8, 0.8Hz), 6.765(s, 1H), 6.615~6.554(m, 2H), 6.073~6.004(m, 1H), 5.650(d, 1H, J=10Hz), 5.389(dd, 1H, J=17.2, 1.2Hz), 5.291(dd, 1H, J=2.4, 1.2Hz), 5.244(s, 2H), 4.629~4.615(m, 4H), 3.8(br, 1H), 2.662(t, 2H, J=7.6Hz), 1.426(s, 6H), 1.245(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 195.629, 158.718, 154.543, 153.826, 152.559, 132.231, 131.297, 130.317, 129.774, 126.151, 122.200, 121.036, 118.989, 117.658, 114.410, 112.076, 111.980, 80.768, 75.469, 69.552, 61.660, 29.197, 27.470, 15.023
5 2	[화합물 4-52] 	¹H-NMR (CDCl₃) : 7.948(d, 1H, J=8Hz), 7.047(d, 1H, J=8.4Hz), 6.884(dd, 1H, J=8, 1.2Hz), 6.745(s, 1H), 6.601(d, 1H, J=10Hz), 6.562(d, 1H, J=8.4Hz), 6.069~6.000(m, 1H), 5.650(d, 1H, J=9.6Hz), 5.408~5.217(m, 2H), 5.244(s, 2H), 4.641~4.606(m, 4H), 3.800(br, 1H), 2.605(t, 2H, J=7.6Hz), 1.677~1.602(m, 2H), 1.429(s, 6H), 0.943(t, 3H, J=5.6Hz) ¹³C-NMR (CDCl₃) : 195.608, 158.610, 154.521, 153.801, 151.042, 132.214, 131.152, 130.305, 129.747, 126.158, 122.208, 121.623, 118.961, 117.643, 114.406, 112.557, 112.062, 80.760, 75.455, 69.533, 61.637, 38.252, 27.459, 24.051, 13.713

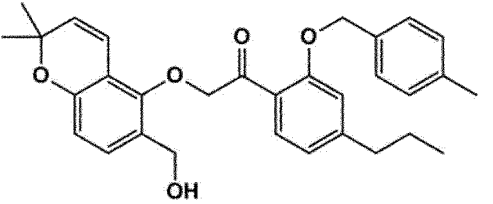
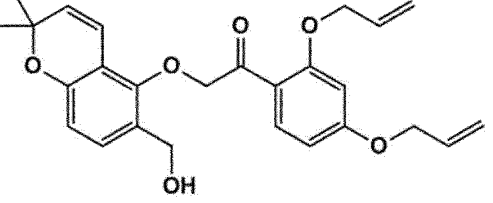
5 3	[화합물 4-53] 	¹H-NMR (CDCl₃) : 7.947(d, 1H, J=8Hz), 7.048(d, 1H, J=8Hz), 6.888(d, 1H, J=8Hz), 6.744(s, 1H), 6.613~6.553(m, 2H), 6.045~6.002(m, 1H), 6.649(d, 1H, J=10Hz), 5.387(dd, 1H, J=17.2, 1.2Hz), 5.288(d, 1H, J=10.4Hz), 5.242(s, 2H), 4.634~4.607(m, 4H), 2.646~2.608(m, 3H), 1.637~1.561(m, 2H), 1.430(s, 6H), 1.399~1.257(m, 2H), 0.929(t, 3H, J=7.2Hz) ¹³C-NMR (CDCl₃) : 195.613, 158.641, 154.545, 153.837, 151.300, 132.246, 131.194, 130.316, 129.780, 126.166, 122.222, 121.610, 118.970, 117.665, 114.427, 112.520, 112.091, 80.770, 75.476, 69.558, 61.660, 35.965, 33.050, 27.485, 22.293, 13.853
5 4	[화합물 4-54] 	¹H-NMR (CDCl₃) : 8.050(dd, 1H, J=8.8, 1.2Hz), 7.427~7.338(m, 5H), 7.042(dd, 1H, J=8, 0.8Hz), 6.650~6.549(m, 3H), 6.474(s, 1H), 5.665(d, 1H, J=8.4Hz), 5.219(s, 2H), 5.108(s, 2H), 4.653~4.607(m, 3H), 4.241(br, 1H), 1.427(s, 6H), 1.357(s, 3H), 1.342(s, 3H) ¹³C-NMR (CDCl₃) : 194.745, 164.444, 159.670, 154.967, 153.851, 135.907, 133.374, 130.156, 129.853, 128.717, 128.330, 127.485, 126.201, 118.540, 117.989, 114.223, 111.883, 106.602, 100.247, 80.878, 75.310, 70.847, 70.327, 61.766, 27.321, 21.994

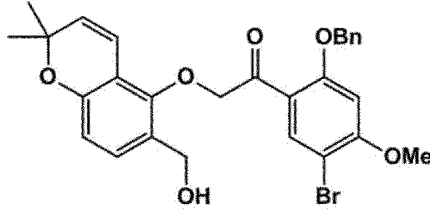
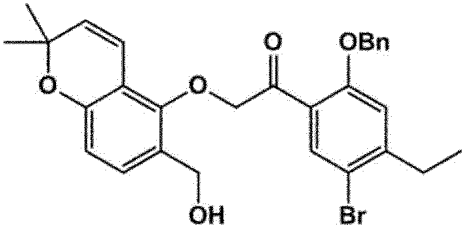
5 5	[화합물 4-55] 	¹H-NMR (CDCl₃) : 7.824(d, 1H, J=8.8Hz), 7.663(d, 1H, J=8.4Hz), 7.272(s, 1H), 7.243(d, 1H, J=8Hz), 7.069(d, 1H, J=8Hz), 6.868(dd, 1H, J=8.8, 2.4Hz), 6.751(d, 1H, J=2.4Hz), 6.593(d, 1H, J=8.4Hz), 6.536(d, 1H, J=9.6Hz), 5.664(d, 1H, J=10Hz), 5.026(s, 2H), 4.562(s, 2H), 3.798(s, 3H), 3.15(br, 1H), 2.418(s, 3H), 1.427(s, 6H) ¹³C-NMR (CDCl₃) : 194, 163.926, 153.806, 153.609, 149.353, 146.301, 132.214, 131.516, 130.816, 130.029, 129.774, 128.309, 125.937, 122.075, 116.978, 114.564, 113.116, 112.464, 108.177, 79.077, 75.759, 61.093, 55.809, 27.550, 21.698
5 6	[화합물 4-56] 	¹H-NMR (CDCl₃) : 8.009(d, 1H, J=8Hz), 7.946(d, 1H, J=8Hz), 7.874(d, 1H, J=7.6Hz), 7.508~7.424(m, 4H), 7.016(s, 1H), 6.951(dd, 1H, J=8.4, 0.8Hz), 6.870(d, 1H, J=8Hz), 6.438(d, 1H, J=8.4Hz), 5.903(d, 1H, J=9.6Hz), 5.528(s, 2H), 5.155(d, 1H, J=10Hz), 4.883(s, 2H), 4.258(d, 2H, J=4.8Hz), 3.049(br, 1H), 2.672(t, 2H, J=7.6Hz), 1.733~1.676(m, 2H), 1.279(s, 6H), 0.983(t, 3H, J=7.2Hz) -

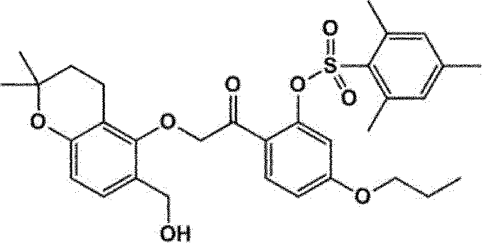
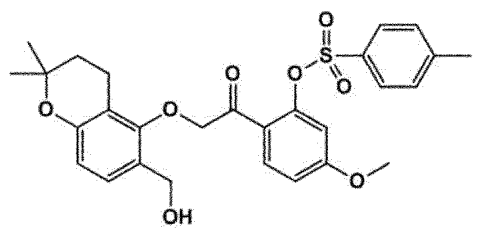
5 7	[화합물 4-57] 	¹H-NMR (CDCl₃) : 7.691(d, 1H, J=7.6Hz), 7.416~7.358(m, 5H), 7.267(d, 1H, J=9.2Hz), 7.156(s, 1H), 6.983(d, 1H, J=8.4Hz), 6.526(d, 1H, J=8Hz), 6.383(d, 1H, J=9.6Hz), 5.524(d, 1H, J=6.4Hz), 5.485(d, 1H, J=10Hz), 5.116(q, 2H, J=16, 11.2Hz), 4.619(d, 1H, J=11.6Hz), 4.464(d, 1H, J=11.6Hz), 4.233(dd, 1H, J=10., 2.4Hz), 3.859(q, 1H, J=10, 8.4Hz), 1.374(s, 3H), 1.356(s, 3H) -
5 8	[화합물 4-58] 	¹H-NMR (CDCl₃) : 8.028(d, 1H, J=8.8Hz), 6.584~6.557(m, 2H), 6.538~6.408(m, 2H), 6.071~6.002(m, 1H), 5.580(d, 1H, J=10Hz), 5.388(dd, 1H, J=17.2, 1.2Hz), 5.295(dd, 1H, J=10.8, 1.2Hz), 5.207(s, 2H), 4.723(d, 2H, J=3.6Hz), 4.583(d, 2H, J=5.6Hz), 3.963(t, 2H, J=6.8Hz), 3.669(br, 1H), 2.348(s, 3H), 1.844~1.792(m, 2H), 1.412(s, 6H), 1.040(t, 3H, J=7.6Hz) ¹³C-NMR (CDCl₃) : 194.441, 164.916, 160.332, 154.940, 153.077, 138.949, 133.145, 132.049, 129.089, 124.555, 119.021, 117.799, 117.648, 113.959, 111.768, 106.661, 99.312, 80.855, 75.354, 69.856, 69.581, 56.850, 27.465, 22.346, 19.329, 10.378

59	[화합물 4-59] 	¹H-NMR (CDCl₃) : 8.033(d, 1H, J=8Hz), 6.581~6.537(m, 2H), 6.458(s, 1H), 6.405(d, 1H, J=2Hz), 6.068~5.999(m, 1H), 5.583(d, 1H, J=10Hz), 5.389(dd, 1H, J=18.8, 1.2Hz), 5.296(dd, 1H, J=10.4, 1.2Hz), 5.208(s, 2H), 4.724(s, 2H), 4.579(d, 2H, J=5.6Hz), 4.079(q, 2H, J=14, 7.2Hz), 3.683(br, 1H), 2.350(s, 3H), 1.447~1.413(m, 9H) ¹³C-NMR (CDCl₃) : 194.467, 164.720, 160.332, 154.965, 153.107, 138.981, 133.213, 132.068, 129.121, 124.580, 119.055, 117.816, 117.761, 113.998, 111.799, 106.589, 99.403, 80.876, 75.388, 69.597, 63.949, 56.901, 27.497, 19.426, 14.592
60	[화합물 4-60] 	¹H-NMR (CDCl₃) : 7.997(dd, 1H, J=7.6, 1.6Hz), 7.529(t, 1H, J=8Hz), 7.088~7.004(m, 2H), 9.970(d, 1H, J=8.4Hz), 6.614(d, 1H, J=10Hz), 6.582(d, 1H, J=8.4Hz), 6.659(d, 1H, J=10Hz), 5.206(s, 2H), 4.606(s, 2H), 3.880(s, 3H), 3.306(br, 1H), 1.249(s, 6H) -

6 1	[화합물 4-61] 	$^1\text{H-NMR}$ (CDCl_3) : 7.576(s, 1H), 7.504~7.324(m, 5H), 7.297(d, 1H, $J=6.8\text{Hz}$), 7.065(d, 1H, $J=8\text{Hz}$), 6.876(d, 1H, $J=8.4\text{Hz}$), 6.596(s, 1H), 6.574(s, 1H), 5.658(d, 1H, $J=10\text{Hz}$), 5.210(s, 2H), 5.174(s, 2H), 4.607(d, 2H, $J=6\text{Hz}$), 4.161(q, 2H, $J=14$, 6.8Hz), 3.165(t, 1H $J=6\text{Hz}$), 1.486(t, 3H, $J=6.8\text{Hz}$), 1.425(s, 6H) $^{13}\text{C-NMR}$ (CDCl_3) : 193.041, 154.272, 153.906, 153.863, 148.440, 136.577, 130.902, 129.974, 128.511, 127.951, 127.345, 127.013, 125.968, 122.799, 116.971, 114.608, 113.354, 112.637, 111.670, 76.409, 75.779, 71.131, 64.582, 61.237, 27.637, 14.590
6 2	[화합물 4-62] 	$^1\text{H-NMR}$ (CDCl_3) : 8.038(d, 1H, $J=8.8$), 6.588(dd, 1H, $J=8.8$, 2.4Hz), 6.551(dd, 1H, $J=9.6$, 0.4Hz), 6.443(d, 1H, $J=2\text{Hz}$), 6.231(s, 1H), 6.068~5.988(m, 2H), 5.489(d, 1H, $J=10\text{Hz}$), 5.442~5.269(m, 4H), 5.193(s, 2H), 4.734(s, 2H), 4.593~4.572(m, 4H), 3.805(s, 3H), 3.3(br, 1H), 1.421(s, 6H) $^{13}\text{C-NMR}$ (CDCl_3) : 193.834, 164.157, 160.240, 158.901, 155.163, 154.371, 133.163, 132.272, 132.061, 127.111, 118.970, 118.374, 118.132, 117.611, 114.862, 107.431, 106.790, 99.730, 95.984, 80.951, 76.020, 69.617, 69.048, 55.676, 54.620, 27.525

6 3	[화합물 4-63] 	¹H-NMR (CDCl₃) : 7.964(d, 1H, J=7.6Hz), 7.249(d, 1H, J=9.6Hz), 7.118(d, 2H, J=8Hz), 7.010(d, 1H, J=8Hz), 6.895(d, 1H, J=8Hz), 6.842(s, 1H), 6.541(d, 1H, J=8Hz), 6.391(d, 1H, J=10Hz), 5.468(d, 1H, J=9.6Hz), 5.125(s, 2H), 5.070(s, 2H), 4.505(d, 2H, J=6.4Hz), 3.243(t, 1H, J=6.4Hz), 2.614(t, 2H, J=7.6Hz), 2.351(s, 3H), 1.681~1.603(m, 2H), 1.371(s, 6H), 0.941(t, 3H, J=7.6Hz) -
6 4	[화합물 4-64] 	¹H-NMR (CDCl₃) : 8.048(d, 1H, J=8Hz), 7.042(d, 1H, J=8.4Hz), 6.614~6.548(m, 3H), 6.449(d, 1H, J=2Hz), 6.067~5.995(m, 2H), 5.651(d, 1H, J=10Hz), 5.444~5.285(m, 4H), 5.216(s, 2H), 4.631(d, 2H, J=6.4Hz), 4.596~4.571(m, 4H), 3.964(t, 1H, J=6.8Hz), 1.430(s, 6H) ¹³C-NMR (CDCl₃) : 194.330, 164.317, 160.321, 154.619, 153.784, 133.201, 132.202, 131.945, 130.248, 129.739, 126.183, 119.170, 118.384, 117.872, 117.699, 114.379, 111.991, 106.869, 99.644, 80.651, 75.428, 69.640, 69.049, 61.670, 27.446

6 5	[화합물 4-65] 	¹H-NMR (CDCl₃) : 8.226(s, 1H), 7.356~7.340(m, 5H), 7.004(d, 1H, J=8Hz), 6.535(d, 1H, J=8.4Hz), 6.466(s, 1H), 6.391(d, 1H, J=10Hz), 5.589(d, 1H, J=10Hz), 5.140(s, 2H), 5.090(s, 2H), 4.503(s, 2H), 3.880(s, 3H), 3.304(br, 1H), 1.369(s, 6H) ¹³C-NMR (CDCl₃) : 192.960, 160.781, 159.785, 154.001, 153.726, 135.344, 134.899, 130.429, 129.713, 128.860, 128.773, 127.840, 126.024, 118.387, 117.098, 114.380, 112.214, 103.874, 96.809, 80.664, 75.542, 71.436, 61.290, 56.447, 27.550
6 6	[화합물 4-66] 	¹H-NMR (CDCl₃) : 8.153(s, 1H), 7.899~7.305(m, 5H), 7.101(d, 1H, J=8.4Hz), 6.902(s, 1H), 6.537(d, 1H, J=8.4Hz), 6.385(d, 1H, J=9.6Hz), 5.487(d, 1H, J=10Hz), 5.111(s, 4H), 4.479(s, 2H), 3.15(br, 1H), 2.741(q, 2H), 1.366(s, 6H), 1.213(t, 3H) ¹³C-NMR (CDCl₃) : 194.067, 157.790, 153.830, 153.714, 150.582, 135.130, 134.619, 130.479, 129.690, 128.744, 128.611, 127.874, 125.907, 123.793, 116.989, 115.933, 114.364, 113.804, 112.275, 80.706, 75.554, 71.223, 61.183, 29.899, 27.539, 13.716

6 7	[화합물 4-107] 	¹H-NMR (CDCl₃) : 7.979(d, 1H, J=8.8Hz), 7.022~6.970(m, 2H), 6.852(d, 1H, J=6.8Hz), 6.569(d, 1H, J=8.4Hz), 6.179(s, 1H), 5.183(s, 2H), 4.547(s, 2H), 3.704(t, 2H, J=6.8Hz), 3.1(br, 1H), 2.783(t, 2H, J=6.4Hz), 2.521(s, 6H), 2.325(s, 3H), 1.772~1.681(m, 4H), 1.325(s, 6H), 0.960(t, 3H, J=6.4Hz) ¹³C-NMR (CDCl₃) : 193.349, 163.498, 156.236, 154.929, 149.805, 144.620, 140.311, 132.573, 131.963, 130.804, 127.966, 124.781, 122.253, 114.952, 113.711, 113.148, 107.229, 77.984, 73.991, 70.016, 32.154, 26.639, 22.598, 22.074, 17.789, 10.197
6 8	[화합물 4-121] 	¹H-NMR (CDCl₃) : 7.875(d, 1H, J=8.8Hz), 7.640(d, 2H, J=8.4Hz), 7.223(d, 2H, J=8Hz), 7.042(d, 1H, J=8.4Hz), 6.890(d, 1H, J=2.8Hz), 6.703(s, 1H), 6.627(d, 1H, J=8.4Hz), 5.046(s, 2H), 4.546(s, 2H), 3.794(s, 3H), 3.1(br, 1H), 2.749(t, 2H, J=6.8Hz), 2.415(s, 3H), 1.741(t, 2H, J=6.4Hz), 1.332(s, 6H) ¹³C-NMR (CDCl₃) : 193.321, 163.945, 156.181, 154.994, 149.466, 147.364, 146.315, 132.356, 131.660, 130.052, 128.307, 128.143, 124.754, 122.182, 114.848, 113.260, 113.172, 108.098, 77.774, 74.030, 61.494, 55.824, 32.133, 26.675, 21.734, 17.811

[189]

[190] 상기 실시예에 개시된 방법을 이용하면,

2-((6-(히드록시메틸)크로멘-5-일)옥시)-1-페닐에타논 유도체를 온화한 조건에서 간단하고, 상업적으로 용이하게 경제적으로 제조할 수 있다.

[191]

[192] 이제까지 본 발명에 대하여 그 바람직한 실시예들을 중심으로 살펴보았다. 본 발명이 속하는 기술 분야에서 통상의 지식을 가지는 자는 본 발명이 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 변형된 형태로 구현될 수 있음을 이해할 수 있을 것이다. 그러므로 개시된 실시예들은 한정적인 관점이 아니라 설명적인 관점에서 고려되어야 한다. 본 발명의 범위는 전술한 설명이 아니라 특허청구범위에 나타나 있으며, 그와 동등한 범위 내에 있는 모든 차이점은 본 발명에 포함된 것으로 해석되어야 할 것이다.