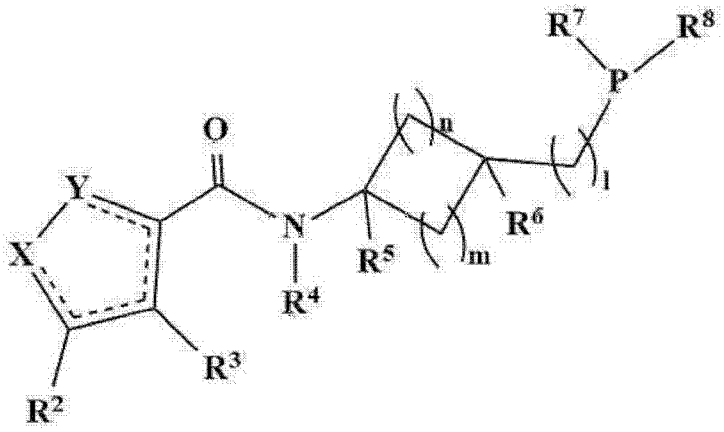
Claims

[Claim 1] A compound of formula I or a solvate, stereoisomer or pharmaceutically acceptable salt thereof:

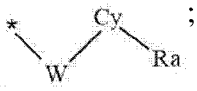
[Formula I]



in which,

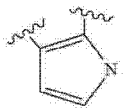
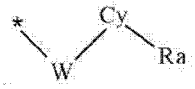
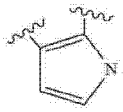
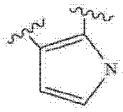
one of X and Y is S and the other is CR^1, and ---- is a single bond or a double bond, two of which are double bonds;

R^1 and R^2 are selected from the group consisting of hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl), -N(C_1-C_6 alkyl)$_2$, C_3-C_8 cycloalkyl, and C_6-C_{10} aryl, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino, and said C_3-C_8 cycloalkyl and C_6-C_{10} aryl may be each independently optionally substituted with one or more halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy or C_1-C_6 haloalkoxy; and

R^3 is  ; or

R^1 is selected from the group consisting of hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl), -N(C_1-C_6 alkyl)$_2$, C_3-C_8 cycloalkyl, and C_6-C_{10} aryl, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino, and said C_3-C_8 cycloalkyl and C_6-C_{10} aryl may be each independently optionally substituted with one or more halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy or C_1-C_6 haloalkoxy; and

R^2 and R^3 together with the carbon atom to which they are attached

, wherein  is bonded to the nitrogen atom of , and either or both of the carbon atoms of  may be optionally substituted with halogen, hydroxy, cyano, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl or C_1-C_6 haloalkoxy;

W is -$(CH_2)_o$-, -$(CH_2)_o$-C≡C-, C(O)-, -O-, -S-, -NH-, or -N(C_1-C_6 alkyl)-, wherein H of said CH_2 may be optionally substituted with one or more halogen, hydroxy, cyano, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl or C_1-C_6 haloalkoxy;

Cy is selected from the group consisting of C_6-C_{14} aryl, 4- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl, C_3-C_8 cycloalkyl and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R';

R_a is hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl), -N(C_1-C_6 alkyl)$_2$, oxo, or -V-Cy_2, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino,

wherein V is absent or -NH-, -$NHCH_2$-, -$NHCH_3$-, -CONH-, -NHCO-, -$NHSO_2$-, -S-, -SO_2-, -CH_2-, -OCH_2- or -O-,

Cy_2 is selected from the group consisting of C_6-C_{14} aryl, 4- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl, C_3-C_8 cycloalkyl and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R";

R' is each independently selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl) and -N(C_1-C_6 alkyl)$_2$, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino;

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -CO-(C_1-C_6 alkyl), -C(O)H, -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -CONH-(C_1-C_6 alkyl), -CON(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-CO-(C_1-C_6 alkyl), -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, 3- to 7-membered heterocycloalkyl, C_3-C_8 cycloalkyl, and -$(CH_2)_p$-(C_3-C_8 cycloalkyl),

wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino, and said 3- to 7-membered heterocycloalkyl and C_3-C_8 cycloalkyl may be optionally substituted with one or more halogen, hydroxy, cyano, oxo or amino;

R^4 is hydrogen, or C_1-C_6 alkyl;

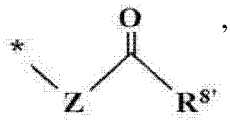
R^5, R^6 and R^7 each have the following definitions:

(i) R^5 and R^6 are H, and R^7 is absent,

(ii) R^5 and R^6 together represent $-(CH_2)_q-$, and R^7 is absent, or

(iii) R^5 is H, and R^6 and R^7 together represent $-(CH_2)_r-$; and

P is absent or $-CH_2-$, provided that if R^7 is absent, then P is also absent;

R^8 is 

, wherein Z is $-(CH_2)_s$, and $R^{8'}$ is hydrogen, hydroxy, C_1-C_6 alkyl or C_1-C_6 alkoxy;

l, m and n are each independently an integer of 0 to 2, wherein at least one of m and n is not 0, and if P and R^7 are absent, then l is 0;

o and p are each independently an integer of 0 to 3;

q and r are each independently an integer of 1 or 2; and

s is an integer of 0 to 3.

[Claim 2] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein

R^1 is hydrogen, halogen, hydroxy, cyano, amino, C_1-C_3 alkyl, C_1-C_3 alkoxy, -NH-(C_1-C_3 alkyl) or -N(C_1-C_3 alkyl)$_2$, wherein said C_1-C_3 alkyl and C_1-C_3 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino; and

R^2 is hydrogen, halogen, hydroxy, C_1-C_3 alkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkyl, C_1-C_3 haloalkoxy, C_3-C_6 cycloalkyl or phenyl, wherein said C_1-C_3 alkyl and C_1-C_3 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino.

[Claim 3] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein

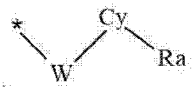
Cy is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, and 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, and may be optionally substituted with one or more R';

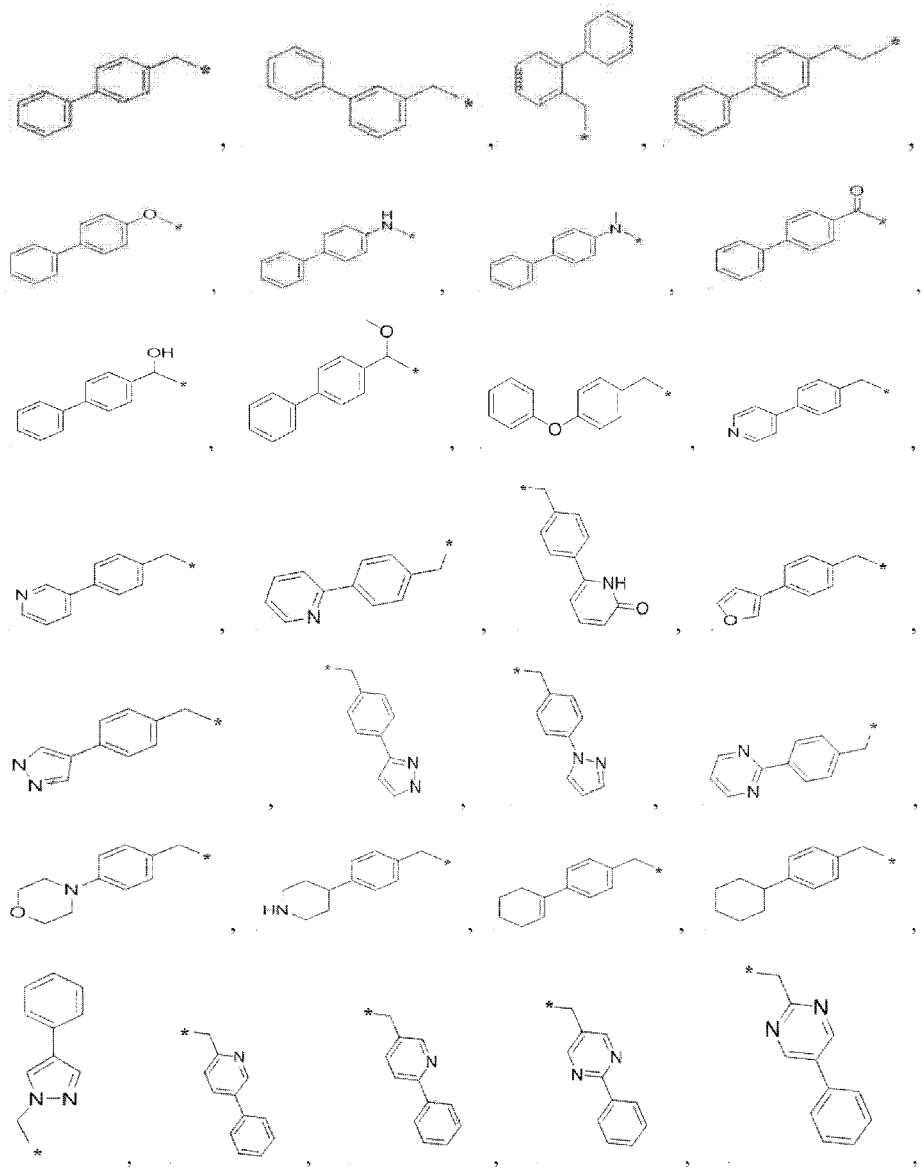
Cy_2 is selected from the group consisting of C_6-C_{10} aryl, 5- to

10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, C_3-C_8 cycloalkyl, and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R";
R' is halogen, hydroxy, cyano, amino, oxo, C_1-C_3 alkyl, C_1-C_3 haloalkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkoxy, -NH-(C_1-C_3 alkyl) or -N(C_1-C_3 alkyl)$_2$; and
R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, 3- to 5-membered heterocycloalkyl containing 1 heteroatom selected from N, O and S, C_3-C_5 cycloalkyl, and -$(CH_2)_p$-(C_3-C_5 cycloalkyl), wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino, and said 3- to 5-membered heterocycloalkyl and C_3-C_5 cycloalkyl may be optionally substituted with one or more halogen, hydroxy, cyano, oxo or amino.

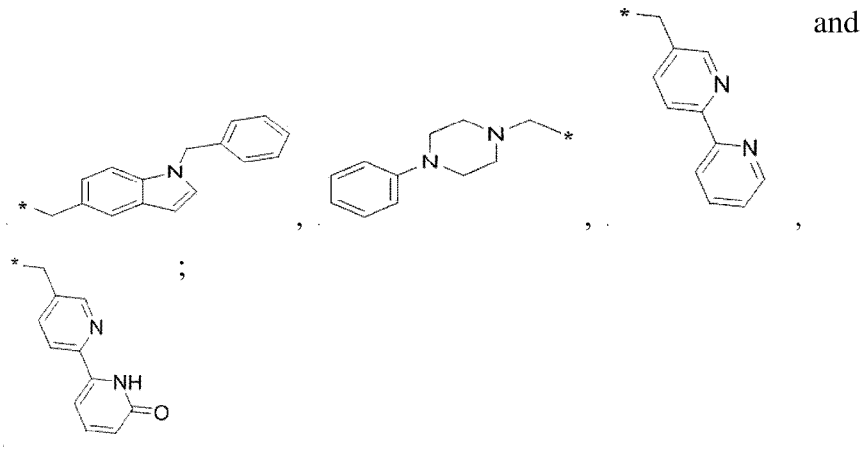
[Claim 4] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 3, wherein
Cy is phenyl; heteroaryl selected from pyrrolyl, furanyl, thiophenyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, triazolyl, oxadiazolyl, thiadiazolyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, indolyl, benzimidazolyl, benzofuranyl, benzothiazolyl, quinolinyl and isoquinolinyl; or heterocycloalkyl selected from azetidinyl, oxetanyl, pyrrolidinyl, tetrahydrofuranyl, pyrazolidinyl, imidazolidinyl, thiazolidinyl, oxazolidinyl, isoxazolidinyl, piperidinyl, piperazinyl and morpholinyl; and
Cy_2 is phenyl; heteroaryl selected from pyrrolyl, furanyl, thiophenyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, triazolyl, oxadiazolyl, thiadiazolyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, indolyl, benzimidazolyl, benzofuranyl, benzothiazolyl, quinolinyl and isoquinolinyl; heterocycloalkyl selected from azetidinyl, oxetanyl, pyrrolidinyl, tetrahydrofuranyl, pyrazolidinyl, imidazolidinyl, thiazolidinyl, oxazolidinyl, isoxazolidinyl, piperidinyl, piperazinyl and morpholinyl; cyclobutyl, cyclopentyl, cyclohexyl or cycloheptyl; or cyclobutenyl, cyclopentenyl, cyclohexenyl or cycloheptenyl.

[Claim 5] The compound of formula I or solvate, stereoisomer or pharma-

ceutically acceptable salt thereof according to claim 1, wherein R_a is -V-Cy_2, and  has a structure selected from:

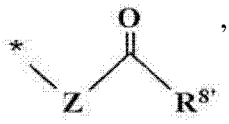


and



;

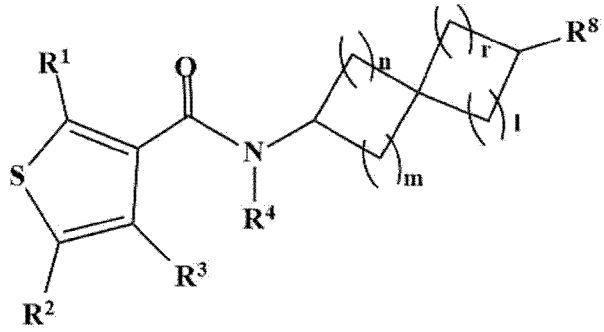
wherein Cy and Cy_2 may be each optionally substituted with R' and R".

[Claim 6] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein R^8 is , wherein Z is $-(CH_2)_s$, and $R^{8'}$ is hydroxy or C_1-C_6 alkoxy; and

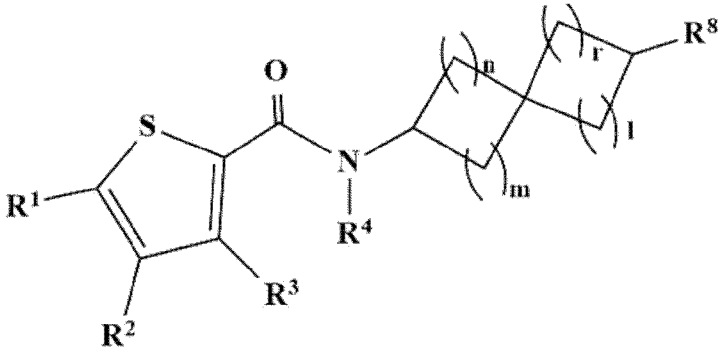
s is an integer of 0 or 1.

[Claim 7] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound has formula IA-1 or IA-2:

[Formula IA-1]

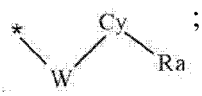


[Formula IA-2]



in which,

R^1 and R^2 are selected from the group consisting of hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl), -N(C_1-C_6 alkyl)$_2$, C_3-C_8 cycloalkyl, and C_6-C_{10} aryl, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino, and said C_3-C_8 cycloalkyl and C_6-C_{10} aryl may be each independently optionally substituted with one or more halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy or C_1-C_6 haloalkoxy;

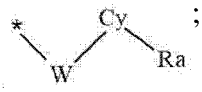
R^3 is  ; and

W, Cy, Ra, R^4, R^8, n, m, r and l are as defined in claim 1.

[Claim 8] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 7, wherein

R^1 is hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl) or -N(C_1-C_6 alkyl)$_2$, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino;

R^2 is hydrogen, halogen, hydroxy, C_1-C_3 alkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkyl, C_1-C_3 haloalkoxy, C_3-C_6 cycloalkyl or phenyl, wherein said C_1-C_3 alkyl and C_1-C_3 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino;

R^3 is  ;

W is -(CH_2)$_o$-, -C(O)-, -O-, -NH-, or -N(C_1-C_6 alkyl)-, wherein H of said CH_2 may be optionally substituted with one or more halogen, hydroxy or C_1-C_6 alkoxy;

Cy is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, and 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, and may be optionally substituted with one or more R';

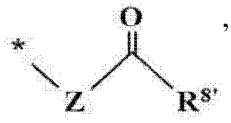
R_a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl or -V-Cy_2, wherein V is absent or -NH-, -$NHCH_2$-, -$NHCH_3$-, -S-, -SO_2-, -CH_2-, -OCH_2- or -O-, and Cy_2 is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, C_3-C_8 cycloalkyl, and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R",

R' is halogen, hydroxy, cyano, amino, oxo, C_1-C_3 alkyl, C_1-C_3 haloalkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkoxy, -NH-(C_1-C_3 alkyl) or -N(C_1-C_3 alkyl)$_2$;

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -(CH_2)$_p$-NH_2, -(CH_2)$_p$ -

NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, 3- to 5-membered heterocycloalkyl containing 1 heteroatom selected from N, O and S, C_3-C_5 cycloalkyl, and -$(CH_2)_p$-(C_3-C_5 cycloalkyl), wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino, and said 3- to 5-membered heterocycloalkyl and C_3-C_5 cycloalkyl may be optionally substituted with one or more halogen, hydroxy, cyano, oxo or amino;

R^4 is hydrogen or C_1-C_3 alkyl;

R^8 is 

, wherein Z is -$(CH_2)_s$, and $R^{8'}$ is hydroxy or C_1-C_6 alkoxy;

l, m, n and r are each independently an integer of 1 or 2;

o and p are each an integer of 0, 1 or 2; and

s is an integer of 0 or 1.

[Claim 9] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 8, wherein

R^1 is hydrogen, halogen, hydroxy, C_1-C_3 alkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkyl, or C_1-C_3 haloalkoxy;

R^2 is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl, cyclopropyl, cyclobutyl, or phenyl;

Cy is phenyl, 5- to 10-membered heteroaryl containing 1 or 2 nitrogen atoms, or 4- to 7-membered heterocycloalkyl containing 1 or 2 nitrogen atoms, and may be optionally substituted with one or more R';

R_a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl or -V-Cy_2, wherein V is absent or -CH_2- or -O-, and Cy_2 is selected from the group consisting of phenyl, 5- to 10-membered heteroaryl containing 1 or 2 heteroatoms selected from N or O, 4- or 7-membered heterocycloalkyl containing 1 or 2 heteroatoms selected from N or O, C_4-C_7 cycloalkyl and C_4-C_7 cycloalkenyl, and may be optionally substituted with one or more R";

R' is halogen, amino, C_1-C_3 alkyl or C_1-C_3 haloalkyl; and

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH; azetidinyl or

oxetanyl, optionally substituted with hydroxy or oxo; and cyclopropyl or cyclopropylmethyl, optionally substituted with hydroxy or oxo.

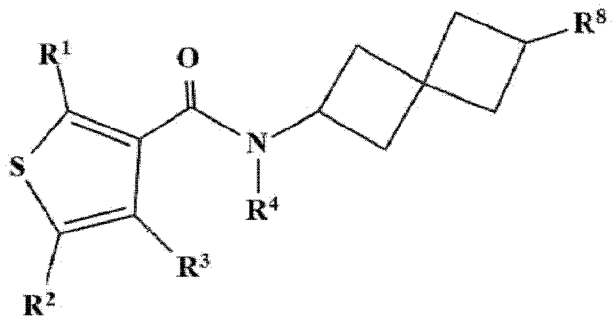
[Claim 10] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 9, wherein

Cy is phenyl, pyrazolyl, or piperazinyl; and

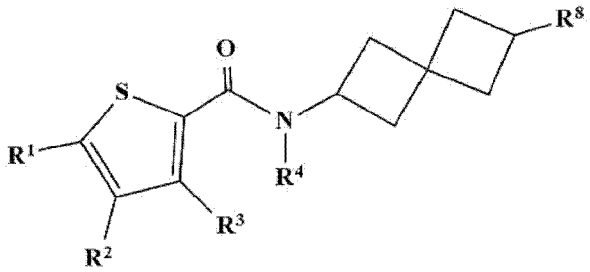
Cy_2 is phenyl, furanyl, pyrazolyl, pyridinyl, morpholinyl, piperidinyl, cyclohexyl, or cyclohexenyl.

[Claim 11] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 7, wherein the compound has formula IA-3 or IA-4:

[Formula IA-3]



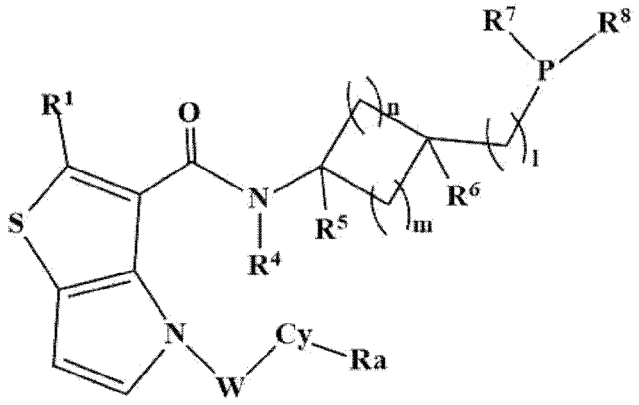
[Formula IA-4]



in which, R^1, R^2, R^3, R^4 and R^8 are as defined in claim 7.

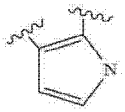
[Claim 12] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound has formula IB-1:

[Formula IB-1]



in which,

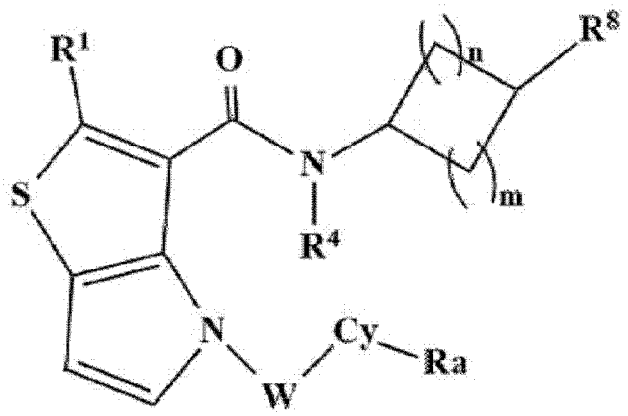
R^1 is selected from the group consisting of hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl), -N(C_1-C_6 alkyl)$_2$, C_3-C_8 cycloalkyl, and C_6-C_{10} aryl, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino, and said C_3-C_8 cycloalkyl and C_6-C_{10} aryl may be each independently optionally substituted with one or more halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy or C_1-C_6 haloalkoxy;

either or both of the carbon atoms of  may be optionally substituted with halogen, hydroxy, cyano, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl or C_1-C_6 haloalkoxy; and

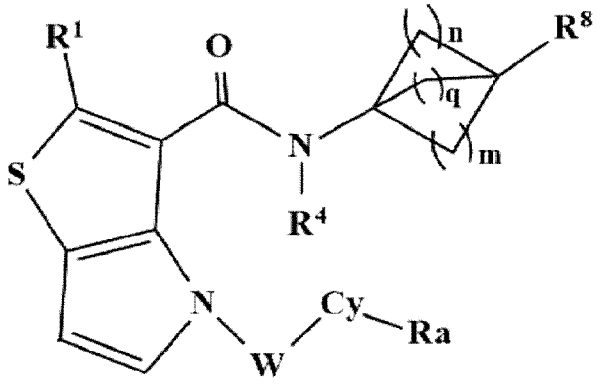
W, Cy, R_a, R^4, R^5, R^6, R^7, R^8, P, n, m and l are as defined in claim 1.

[Claim 13] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 12, wherein the compound has formula IB-2, IB-3 or IB-4:

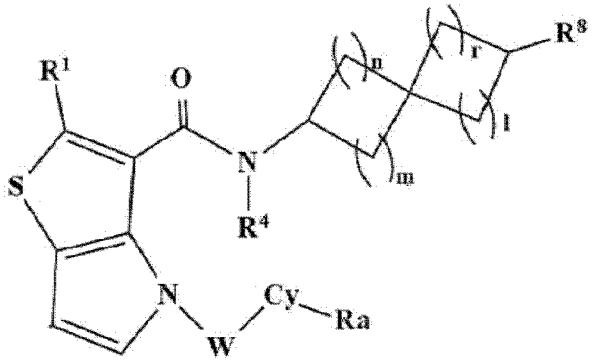
[Formula IB-2]



[Formula IB-3]

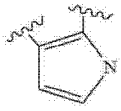


[Formula IB-4]



in which,

R^1 is hydrogen, halogen, hydroxy, cyano, amino, C_1-C_6 alkyl, C_1-C_6 alkoxy, -NH-(C_1-C_6 alkyl) or -N(C_1-C_6 alkyl)$_2$, wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be each independently optionally substituted with one or more halogen, hydroxy, cyano or amino;

either or both of the carbon atoms of  may be optionally substituted with halogen, C_1-C_3 alkyl, or C_1-C_3 haloalkyl;

W is -$(CH_2)_o$- or -$(CH_2)_o$-C≡C-, wherein H of said CH_2 may be optionally substituted with one or more halogen, hydroxy or C_1-C_6 alkoxy;

Cy is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, and 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, and may be optionally substituted with one or more R';

R_a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl or -V-Cy_2,

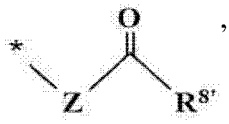
wherein V is absent or -NH-, -$NHCH_2$-, -$NHCH_3$-, -S-, -SO_2-, -CH_2-, -

OCH_2- or -O-, and Cy_2 is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, 4- to 10-membered heterocycloalkyl containing 1 to 3 heteroatoms selected from N, O and S, C_3-C_8 cycloalkyl and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R";

R' is halogen, hydroxy, cyano, amino, oxo, C_1-C_3 alkyl, C_1-C_3 haloalkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkoxy, -NH-(C_1-C_3 alkyl) or -N(C_1-C_3 alkyl)$_2$;

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, 3- to 5-membered heterocycloalkyl containing 1 heteroatom selected from N, O and S, C_3-C_5 cycloalkyl, and -$(CH_2)_p$-(C_3-C_5 cycloalkyl), wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino, and said 3- to 5-membered heterocycloalkyl and C_3-C_5 cycloalkyl may be optionally substituted with one or more halogen, hydroxy, cyano, oxo or amino;

R^4 is hydrogen or C_1-C_3 alkyl;

R^8 is 

, wherein Z is -$(CH_2)_s$, and $R^{8'}$ is hydroxy or C_1-C_6 alkoxy,

l, m and n are each independently an integer of 1 or 2;

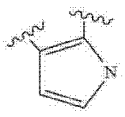
o and p are each independently an integer of 0 to 2;

q and r are each independently an integer of 1 or 2; and

s is an integer of 0 or 1.

[Claim 14] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 13, wherein

R^1 is hydrogen, halogen, hydroxy, C_1-C_3 alkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkyl, or C_1-C_3 haloalkoxy;

either or both of the carbon atom of 

may be optionally substituted with halogen, C_1-C_3 alkyl, or C_1-C_3 haloalkyl;

Cy is phenyl, or 5- to 10-membered heteroaryl containing 1 or 2

nitrogen atoms;

R_a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl or -V-Cy_2, wherein V is absent or -CH_2-, and Cy_2 is phenyl, or 5- to 10-membered heteroaryl containing 1 or 2 nitrogen atoms;

R' is halogen, amino, C_1-C_3 alkyl, or C_1-C_3 haloalkyl; and

R" is halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkoxy, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$; azetidinyl or oxetanyl, optionally substituted with hydroxy or oxo; cyclopropyl or cyclopropylmethyl, optionally substituted with hydroxy or oxo.

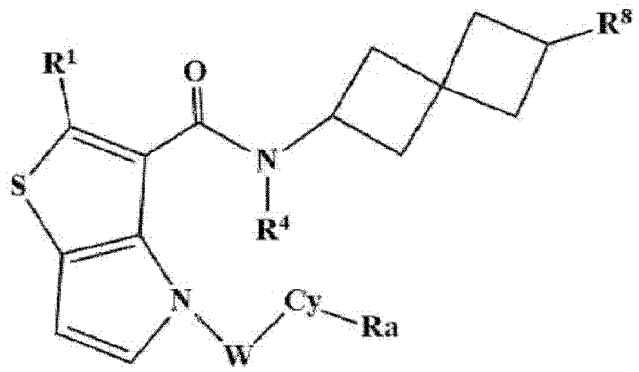
[Claim 15] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 14, wherein

Cy is selected from the group consisting of phenyl, pyridinyl, pyrimidinyl and indolyl; and

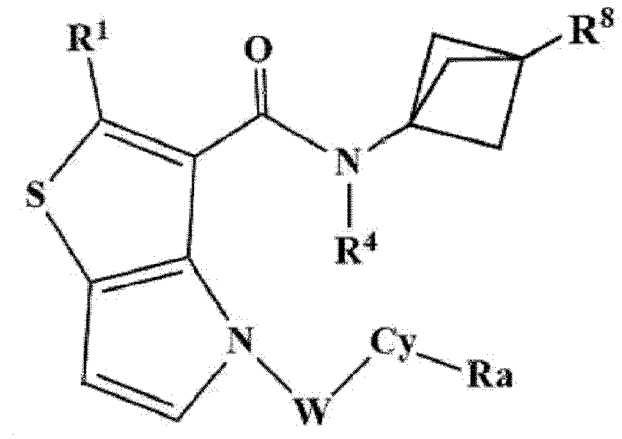
Cy_2 is selected from the group consisting of phenyl, pyrazolyl, pyridinyl and pyrimidinyl.

[Claim 16] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 12, wherein the compound has formula IB-5, IB-6, IB-7 or IB-8:

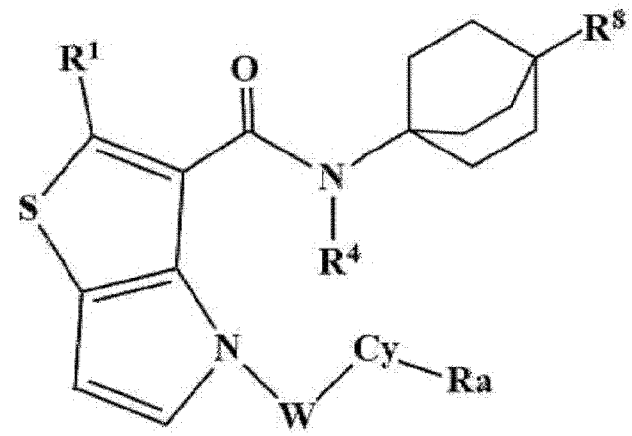
[Formula IB-5]



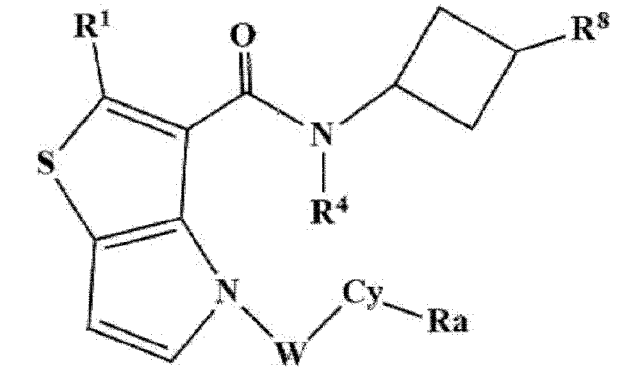
[Formula IB-6]



[Formula IB-7]

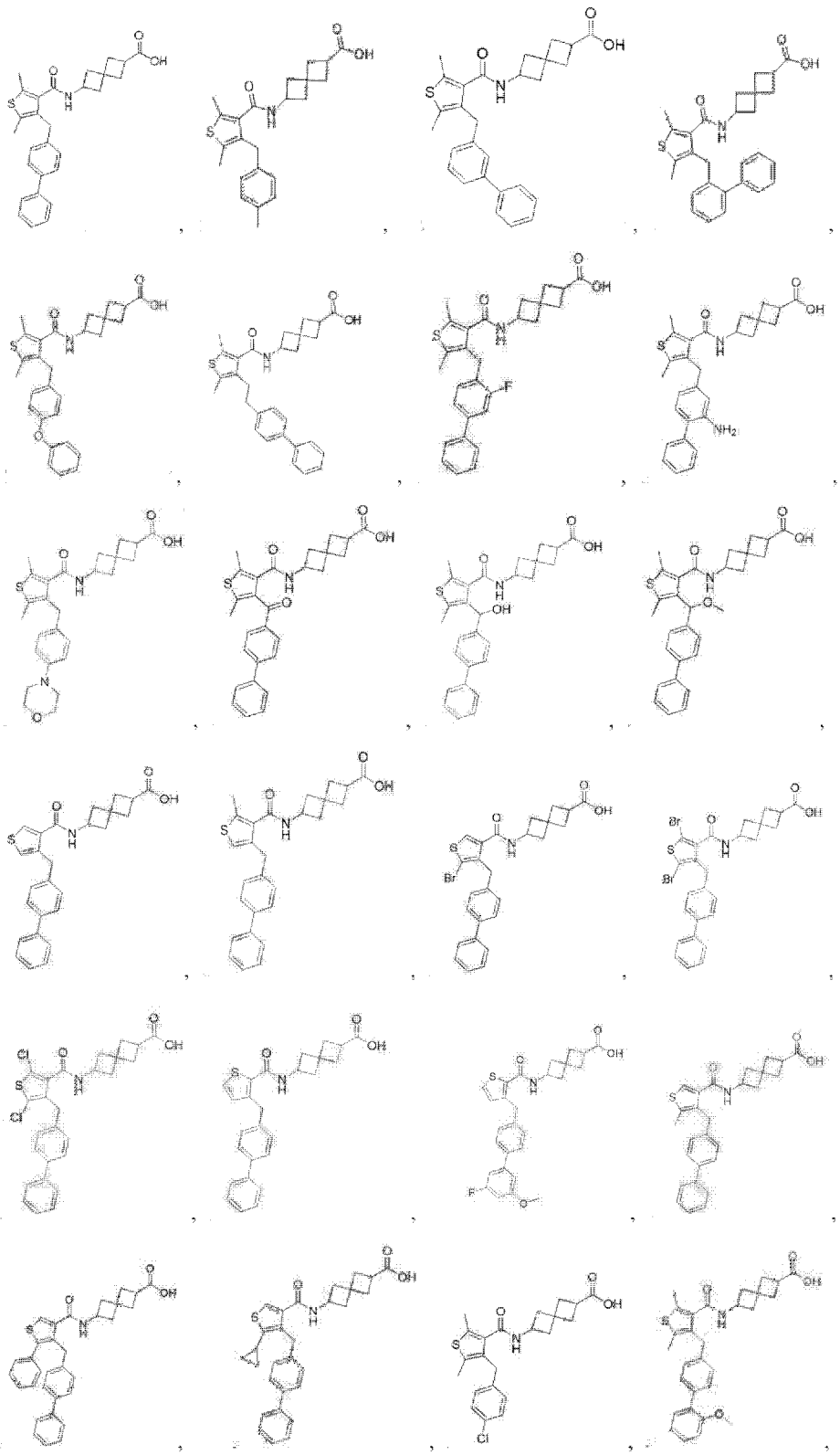


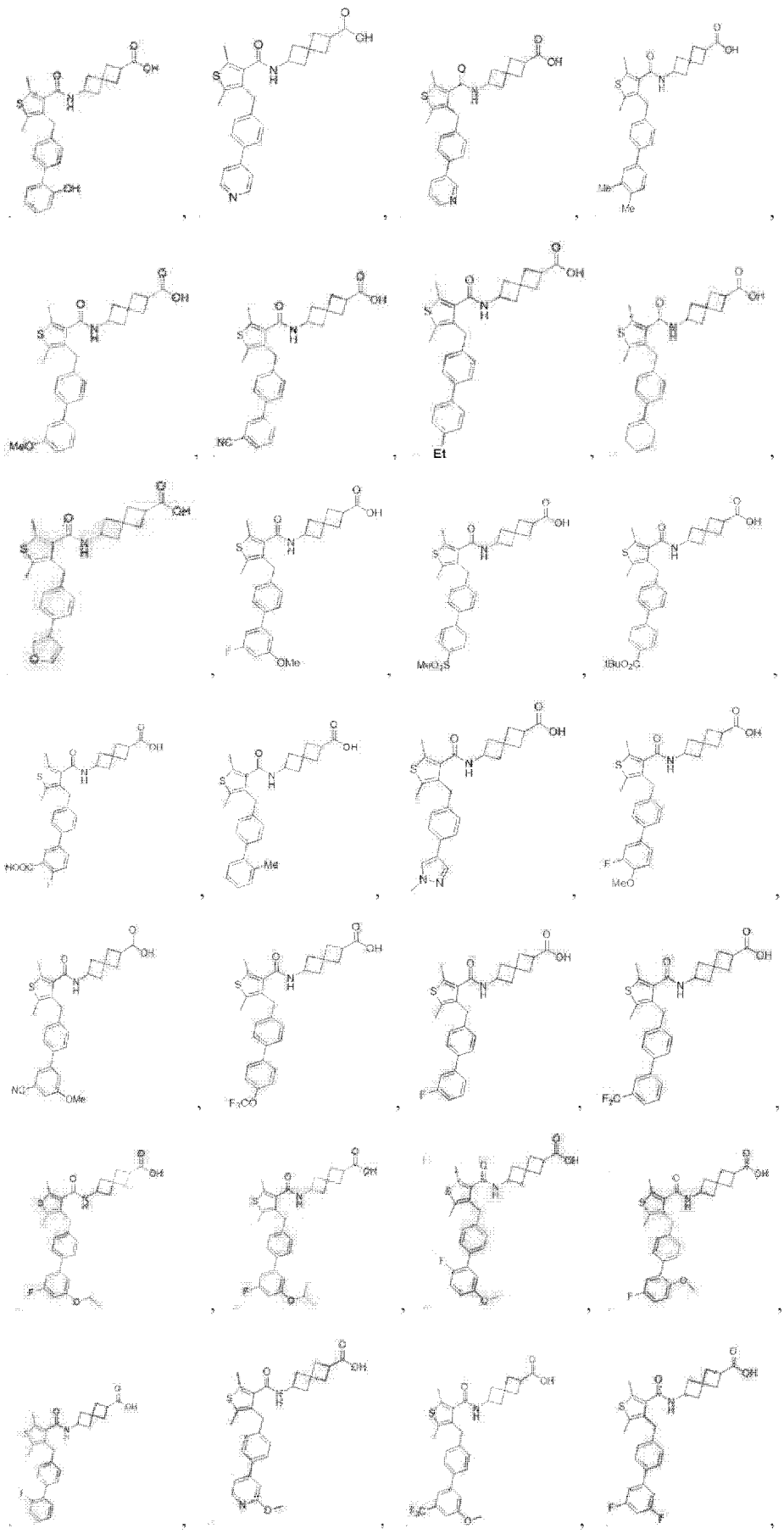
[Formula IB-8]

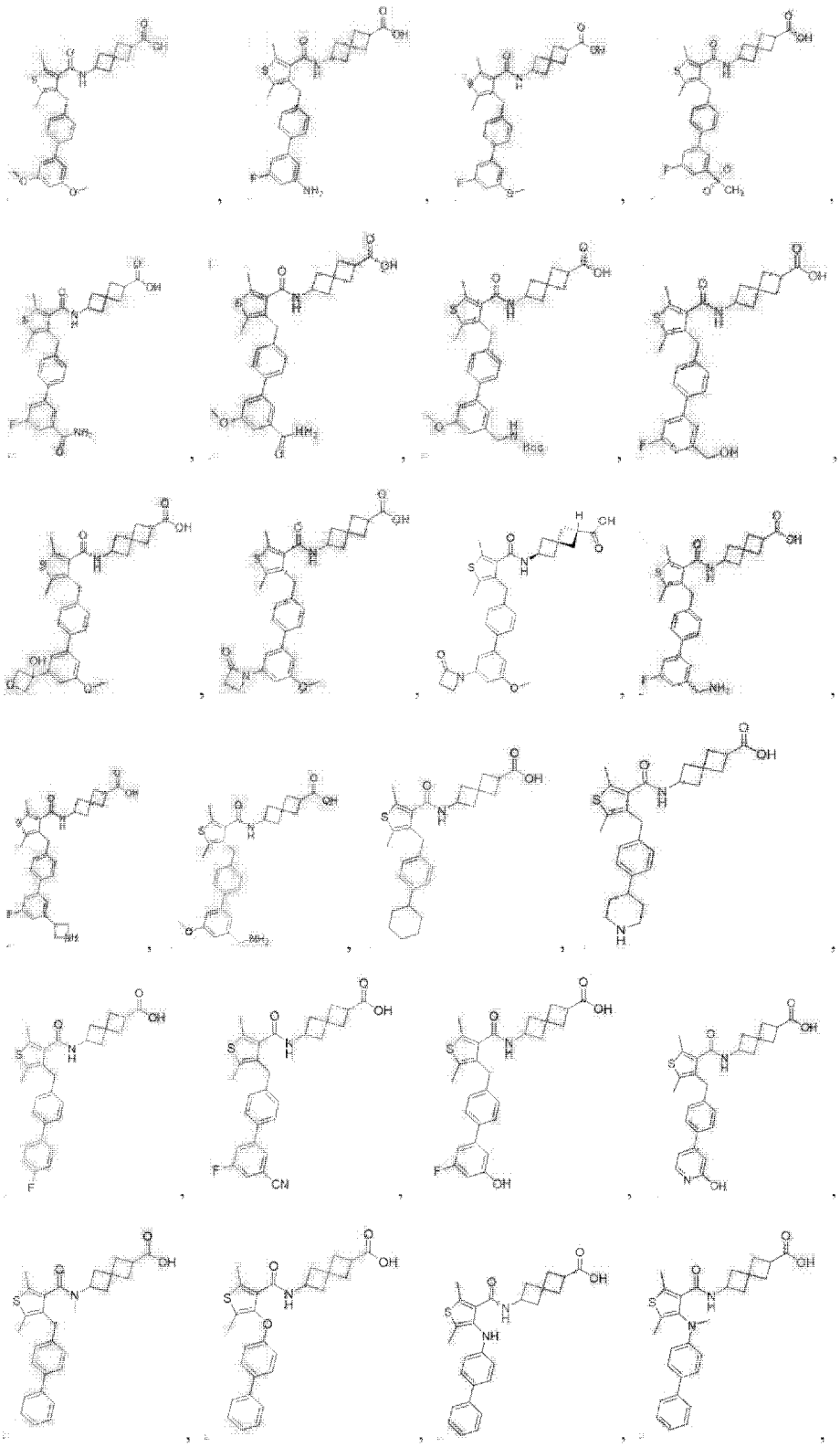


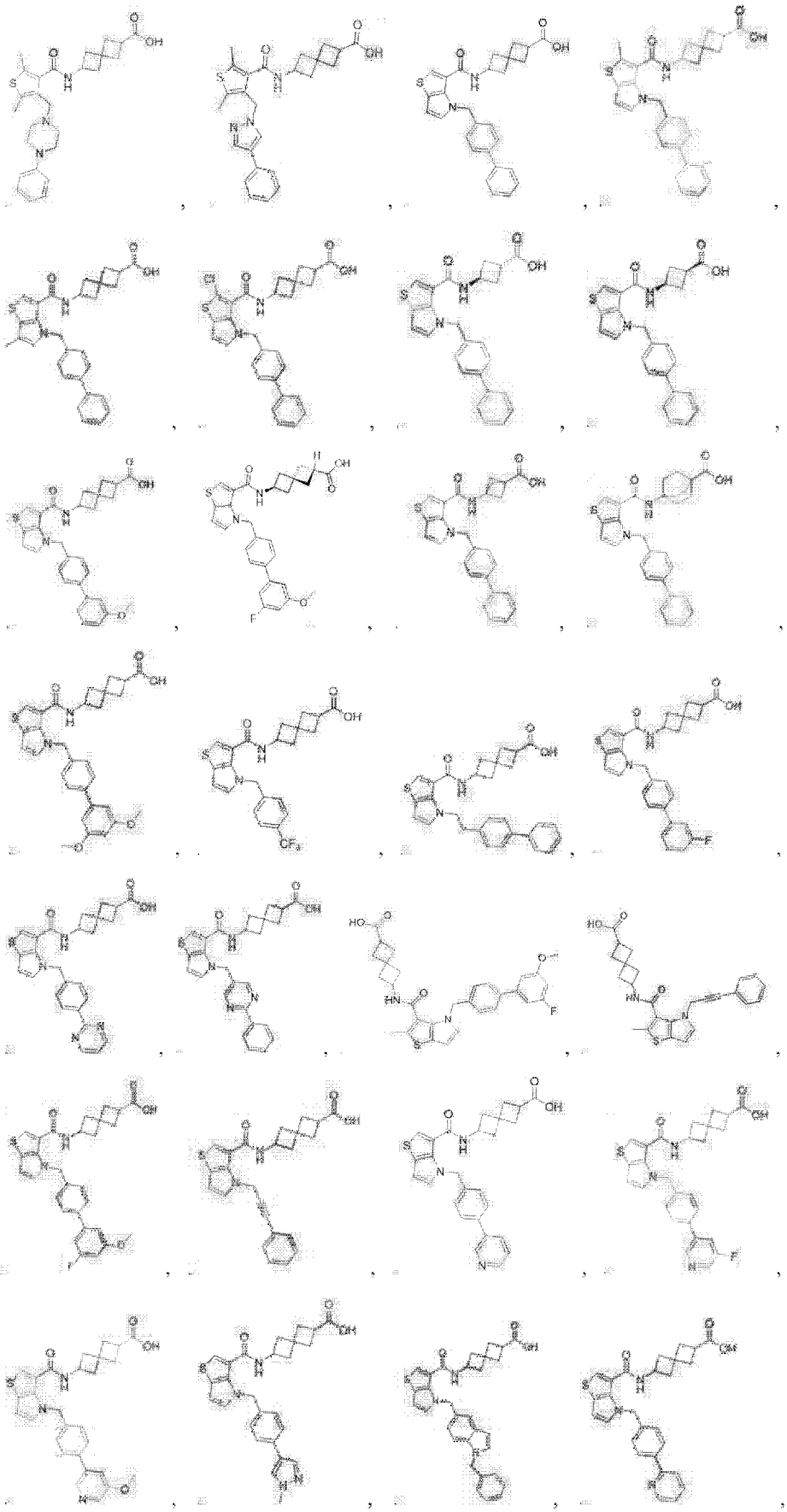
in which, R^1, W, Cy, R_a, R^4 and R^8 are as defined in claim 12.

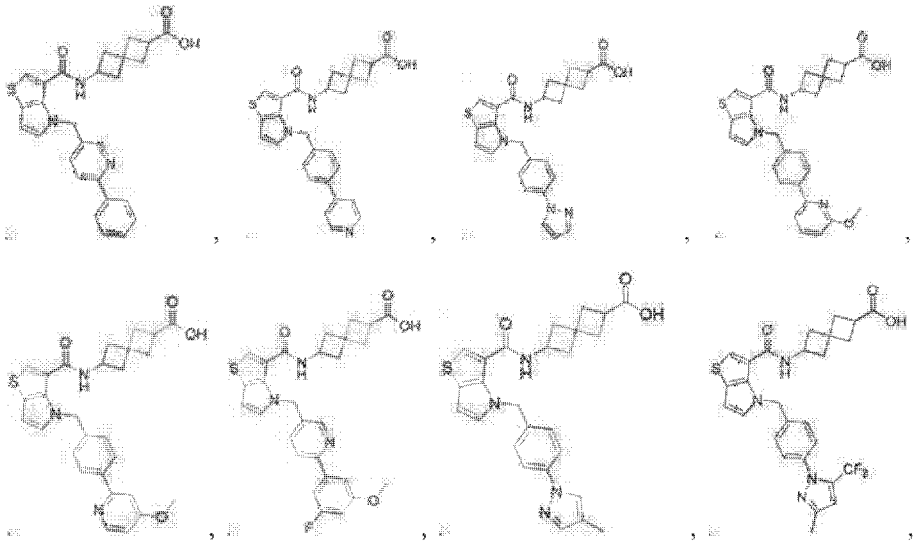
[Claim 17] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound is selected from the group consisting of the following compounds:



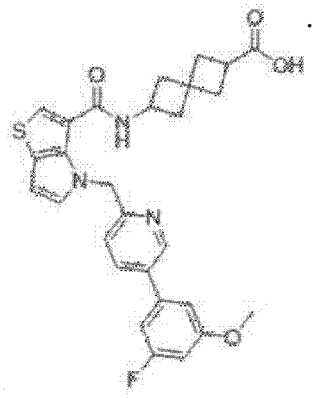




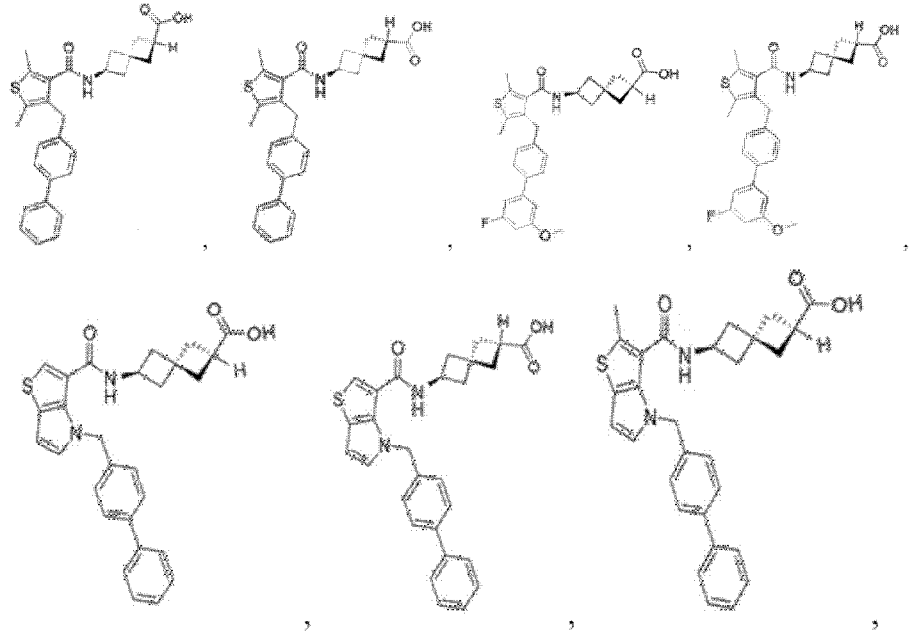


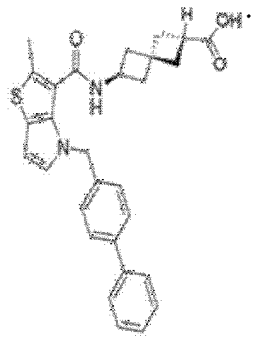


and



[Claim 18] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 17, wherein the compound is selected from the group consisting of the following compounds:



and .

[Claim 19] A pharmaceutical composition comprising the compound, solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1 to 18 as an active ingredient.

[Claim 20] The pharmaceutical composition according to claim 19, wherein the pharmaceutical composition is for the prevention or treatment of a disease associated with prostaglandin E_2 overexpression and/or prostaglandin E_2 receptor overexpression.

[Claim 21] The pharmaceutical composition according to claim 20, wherein the disease associated with prostaglandin E_2 overexpression and/or prostaglandin E_2 receptor overexpression is cancer, a neurodegenerative disease or an inflammatory disease.

[Claim 22] The pharmaceutical composition according to claim 21, wherein the cancer is selected from the group consisting of squamous cell cancer, basal cell cancer, glioblastoma, bone cancer, stomach cancer, kidney cancer, lung cancer, bladder cancer, prostate cancer, breast cancer, ovarian cancer, endometrial cancer, cervical cancer, bladder cancer, head and neck cancer, renal cell carcinoma, esophageal cancer, pancreatic cancer, brain cancer, gastrointestinal cancer, liver cancer, leukemia, lymphoma, melanoma, multiple myeloma, osteosarcoma, colorectal cancer, cholangiocarcinoma, choriocarcinoma, oral cancer, neuroblastoma, skin cancer, testis cancer, stromal tumor, germ cell tumor and thyroid cancer.

[Claim 23] The pharmaceutical composition according to claim 21, wherein the neurodegenerative disease is selected from the group consisting of epilepsy, Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis and traumatic brain injury.

[Claim 24] The pharmaceutical composition according to claim 21, wherein the inflammatory disease is selected from the group consisting of edema, allergy, asthma, conjunctivitis, periodontitis, rhinitis, otitis media, pharyngolaryngitis, tonsillitis, pneumonia, gastric ulcer, gastritis,

Crohn's disease, colitis, hemorrhoid, gout, ankylosing spondylitis, rheumatic fever, lupus, fibromyalgia, psoriatic arthritis, osteoarthritis, rheumatoid arthritis, periarthritis of shoulder, tendinitis, tenosynovitis, myositis, hepatitis, cystitis, nephritis, Sjogren's syndrome and multiple sclerosis.

[Claim 25] Use of the compound, solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1 to 18 or the pharmaceutical composition according to any one of claims 19 to 24, for the manufacture of a medicament for preventing or treating a disease associated with prostaglandin E2 overexpression and/or prostaglandin E2 receptor overexpression.