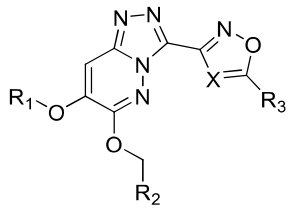
Claims

1. A compound represented by formula II, a *cis-trans* isomer thereof, an enantiomer thereof, a diastereomer thereof, a racemate thereof, a solvate thereof, a hydrate thereof or a pharmaceutically acceptable salt thereof ;



II

wherein, X is N or CH;

R_3 is independently C_{1-6} alkyl or C_{1-6} alkoxy (C_{1-6} alkyl), and C_{1-6} alkyl is optionally substituted by 1-4 hydroxyl;

R_1 is C_{1-6} alkyl;

R_2 is heterocyclyl, phenyl or heteroaryl, and R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, -C(O)R, -NHR, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-C(O)NR_4R_5$, -COOH, $-SO_2-C_{1-6}$ alkyl and $-SO_2NR_6R_7$;

R is independently H, C_{1-6} alkyl, C_{2-6} alkenyl, C_{3-6} cycloalkyl, C_{3-6} cycloalkenyl, heterocyclyl, aryl or heteroaryl, and R is optionally substituted by 1-3 R';

R' is independently halogen, cyano, hydroxyl, C_{3-6} cycloalkyl, C_{1-6} alkylamino, C_{1-6} alkyl, (C_{1-6}) alkoxy, C_{1-3} alkyl substituted by cyano or halogen, C_{1-6} alkylsulfuryl, heterocyclyl, heteroaryl, 5- to 10-membered heteroaryl substituted by 1-3 R'^{-1}, $-(C=O)NR_8R_9$, C_{3-6} cycloalkyl substituted by 1-3 cyano, $-(C=O)R'^{-2}$, C_{6-18} aryl or 3- to 9-membered heterocyclyl substituted by 1-3 R'^{-3}, $-SO_2R_{10}$;

R'^{-1} is independently C_{1-6} alkyl;

R_8 and R_9 are independently H or C_{1-6} alkyl, or R_8 and R_9 together with the nitrogen atom to which they are attached form a 5- or 6-membered heterocyclyl, and the heteroatom is selected from one or more of N, S and O, and the number of the heteroatom is 1, 2 or 3;

R'^{-2} is C_{3-6} cycloalkyl or C_{1-6} alkyl;

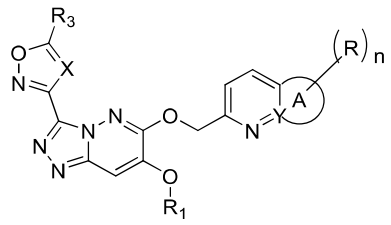
R'^{-3} is independently C_{1-6} alkyl;

R_{10} is C_{1-6} alkyl;

R_4 and R_5 are independently H, C_{1-6} alkyl or C_{3-6} cycloalkyl, or R_4 and R_5 together with the nitrogen atom to which they are attached form a 5- or 6-membered heterocycloalkyl, and the heteroatom is selected from one or more of N, S and O, and the number of the heteroatom is 1, 2 or 3; each of R_4 and R_5 is optionally substituted by 1-5 substituents independently selected from: amino, halogen, hydroxyl, C_{1-6} alkyl and C_{1-6} alkoxy;

and, R_6 and R_7 are independently C_{1-6} alkyl.

2. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 1, wherein, the formula II is represented by formula III:



III

wherein, Y is C or N; A is a 5- to 6-membered heterocyclic ring, a 5- to 6-membered heteroaromatic ring or absent, and the heteroatoms in the 5- to 6-membered heterocyclic ring and the 5- to 6-membered heteroaromatic ring are independently N, and the number of the heteroatoms is 1 or 2; and n is any integer from 0 to 4.

3. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically

acceptable salt thereof as claimed in claim 1, wherein,

R_2 is phenyl or heteroaryl; and R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, -C(O)R, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-C(O)NR_4R_5$, -COOH, $-SO_2-C_{1-6}$ alkyl and $-SO_2NR_6R_7$;

wherein, the -R is $-C_{1-6}$ alkyl, $-C_{2-6}$ alkenyl, $-C_{3-6}$ cycloalkyl, -heterocyclyl, -aryl or -heteroaryl; the -OR is $-O-C_{1-6}$ alkyl or -O-heterocyclyl; the -C(O)R is $-C(O)-C_{1-6}$ alkyl, $-C(O)-C_{2-6}$ alkenyl, $-C(O)-C_{3-6}$ cycloalkyl or -C(O)-aryl.

4. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in any one of claims 1 to 3, wherein,

R_2 is phenyl or heteroaryl, and the heteroaryl is a 5- to 6-membered monocyclic heteroaryl or a 9- to 10-membered bicyclic heteroaryl, and the 9- to 10-membered bicyclic heteroaryl is a bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heteroaryl;

R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-SO_2-C_{1-6}$ alkyl and $-SO_2NR_6R_7$; the -R is $-C_{1-6}$ alkyl, $-C_{2-6}$ alkenyl, $-C_{3-6}$ cycloalkyl, -heterocyclyl, -aryl or -heteroaryl; the -OR is $-O-C_{1-6}$ alkyl or -heterocyclyl; the -C(O)R is $-C(O)-C_{1-6}$ alkyl, $-C(O)-C_{2-6}$ alkenyl, $-C(O)-C_{3-6}$ cycloalkyl or -C(O)-aryl.

5. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in any one of claims 1 to 3, wherein, R_3 is C_{1-6} alkyl;

R_1 is C_{1-6} alkyl;

R_2 is a 9- to 10-membered bicyclic heteroaryl, and the 9- to 10-membered bicyclic heteroaryl is a bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heteroaryl;

and, R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-SO_2-C_{1-6}$ alkyl and $-SO_2NR_6R_7$; the -R is $-C_{1-6}$ alkyl, $-C_{2-6}$ alkenyl, $-C_{3-6}$ cycloalkyl, -heterocyclyl, -aryl or -heteroaryl; the -OR is $-O-C_{1-6}$ alkyl or -heterocyclyl; the -C(O)R is $-C(O)-C_{1-6}$ alkyl, $-C(O)-C_{2-6}$ alkenyl, $-C(O)-C_{3-6}$ cycloalkyl or -C(O)-aryl.

6. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in any one of claims 1 to 3, wherein,

R_1 is C_{1-6} alkyl;

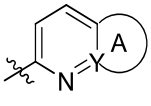
R_3 is C_{1-6} alkyl;

and, R_2 is heteroaryl; the heteroaryl is a 5- to 10-membered heteroaryl, wherein the heteroatom is N, and the number of the heteroatom is 1, 2 or 3; R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of cyano, -R or -OR; R is independently C_{1-6} alkyl or heterocyclyl, and R is optionally substituted by 1-3 R'; R' is independently halogen, hydroxyl, a 3- to 9-membered heterocyclyl substituted by 1-3 R'^{-3}, a 5- to 10-membered heteroaryl substituted by R'^{-1} or (C_{1-6}) alkoxy.

7. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 6, wherein,

R_1 is C_{1-6} alkyl;

R_3 is C_{1-6} alkyl;

R_2 is 

; Y is C or N; A is a 5- to 6-membered heterocyclic ring, and the heteroatom in the 5- to 6-membered heterocyclic ring is N, and the number of the heteroatom is 1 or 2; R_2 is optionally substituted by 1-4 substituents selected from the group consisting of C_{1-6} alkyl or heterocyclyl;

R' is independently hydroxyl or the 5- to 10-membered heteroaryl substituted by 1-3 R'^{-1};

and, when R_2 is optionally substituted by 1-4 C_{1-6} alkyl or heterocyclyl, the position of the substitution is on a heteroatom of an A ring.

8. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 1, wherein,

R_3 is selected from C_{1-6} alkyl and C_{1-6} alkoxy (C_{1-6} alkyl), and C_{1-6} alkyl is optionally substituted by 1-4 hydroxyl;

R_1 is C_{1-6} alkyl;

R_2 is heterocyclyl, phenyl or heteroaryl; each of which is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, -C(O)R, -NHR, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-C(O)NR_4R_5$, -COOH and $-SO_2-C_{1-6}$ alkyl;

R is selected from H, C_{1-6} alkyl, C_{2-6} alkenyl, C_{3-6} cycloalkyl, heterocyclyl and aryl, and heteroaryl, and each of which is optionally substituted by 1-3 R';

R' is selected from halogen, cyano, hydroxyl, C_{3-6} cycloalkyl, C_{1-6} alkylamino, C_{1-6} alkyl, (C_{1-6}) alkoxy, C_{1-3} alkyl substituted by cyano or halogen, C_{1-6} alkylsulfuryl, heterocyclyl or heteroaryl;

and, R_4 or R_5 is independently H or C_{1-6} alkyl, and the C_{1-6} alkyl is optionally substituted by 1-5 substituents, the substituents are independently selected from amino, halogen, hydroxyl, C_{1-6} alkyl or C_{1-6} alkoxy.

9. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 1, wherein, the compound by formula II satisfies one of the following conditions:

(1) R_3 is independently C_{1-6} alkyl or C_{1-6} alkoxy (C_{1-6}) alkyl; C_{1-6} alkyl is optionally substituted by 1-4 hydroxyl;

(2) R_1 is C_{1-6} alkyl;

(3) R_2 is phenyl or heteroaryl; the heteroaryl is a 5- to 10-membered heteroaryl, the heteroatoms in the 5- to 10-membered heteroaryl are nitrogen and/or oxygen, and the number of the heteroatoms is 1-4;

and (4) the R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of halogen, cyano, oxo, -R, -OR, -NHR, C_{3-6} cycloalkenyl, $-NR_4R_5$, $-SO_2-C_{1-6}$ alkyl and $-SO_2NR_6R_7$.

10. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 9, wherein, the compound by formula II satisfies one of the following conditions:

(1) R_2 is phenyl or heteroaryl; the heteroaryl is a 5- to 6-membered monocyclic heteroaryl or a 9- to 10-membered bicyclic heteroaryl;

and (2) the R_2 is optionally substituted by 1-4 substituents independently selected from the group consisting of cyano, -R and -OR.

11. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the

diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 10, wherein, the 9- to 10-membered bicyclic heteroaryl is a bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heteroaryl, or, a bicyclic heteroaryl of the 5- to 6-membered heteroaryl-fused a 5- to 6-membered heterocyclyl.

12. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, or the pharmaceutically acceptable salt thereof as claimed in any one of claims 1 to 11, wherein, the compound by formula II satisfies one of the following conditions:

(1) when the R_3 is multiple, the R_3 is the same or different;

(2) the number of the R_3 is 1 or 2;

(3) when the R_3 is C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(4) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkoxy is methoxy, ethoxy, *n*-propoxy, isopropoxy, *n*-butoxy, isobutoxy, *sec*-butoxy or *tert*-butoxy;

(5) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(6) when the R_3 is C_{1-6} alkyl substituted by 1-4 substituents, the number of the substituents is 1, 2, 3 or 4;

(7) when the R_3 is C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(8) when the R_1 is C_{1-6} alkyl, the C_{1-6} alkyl is, methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(9) when the R_2 is heteroaryl, the heteroaryl is a 5- to 10-membered heteroaryl, and the heteroatoms are nitrogen and/or oxygen, and the number of the heteroatoms is 1-4;

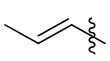
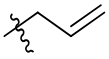
(10) the R_2 is substituted by 1-4 substituents, the number of the substituents is 1, 2, 3 or 4;

(11) when the R_2 is substituted by halogen, the halogen is fluorine, chlorine, bromine or iodine;

(12) when R_2 is substituted by C_{3-6} cycloalkenyl, the C_{3-6} cycloalkenyl is cyclopropenyl, cyclobutenyl, cyclopentenyl or cyclohexenyl;

(13) when the R_2 is substituted by $-SO_2-C_{1-6}$ alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(14) when the R is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(15) when the R is independently C_{2-6} alkenyl, the C_{2-6} alkenyl is ethenyl, ,  or ;

(16) when the R is independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl;

(17) when the R is independently heterocyclyl, the heterocyclyl is a 3- to 10-membered heterocyclyl, wherein the heteroatoms are nitrogen and/or oxygen, and the number of the heteroatoms is 1, 2 or 3;

(18) when the R is C_{3-6} cycloalkenyl, the C_{3-6} cycloalkenyl is cyclohexenyl, cyclopropenyl or cyclobutenyl;

(19) when the R is aryl, the aryl is C_{6-14} aryl,;

(20) when the R is heteroaryl, the heteroaryl is the 5- to 10-membered heteroaryl, wherein the heteroatom is nitrogen and/or oxygen, and the number of the heteroatom is 1, 2 or 3;

(21) when the R' is independently halogen, the halogen is fluorine, chlorine, bromine or iodine;

(22) when the R' is independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl;

(23) when the R' is independently C_{1-6} alkylamino, the C_{1-6} alkylamino is C_{1-3} alkylamino;

(24) when the R' is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl,

isobutyl, *sec*-butyl or *tert*-butyl;

(25) when the R' is independently C_{1-6} alkoxy, the C_{1-6} alkoxy is methoxy, ethoxy, *n*-propoxy, isopropoxy, *n*-butoxy, isobutoxy, *sec*-butoxy or *tert*-butoxy;

(26) when the R' is independently C_{1-3} alkyl substituted by cyano or halogen, the C_{1-3} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(27) when the R' is independently heterocyclyl, the heterocyclyl is a 3- to 6-membered monocyclic heterocyclyl, and the heteroatom is nitrogen and/or oxygen, and the number of the heteroatom is 1 or 2;

(28) when the R' is independently heteroaryl, the heteroaryl is a 5- to 10-membered heteroaryl, wherein the heteroatom is nitrogen and/or oxygen, and the number of the heteroatom is 1, 2 or 3;

(29) when the R' is independently a 5- to 10-membered heteroaryl substituted by 1-3 R'^{-1}, the heteroaryl is a 5- to 6-membered heteroaryl, and the heteroatoms are nitrogen and/or oxygen, and the number of the heteroatom is 1, 2 or 3;

(30) when the R'^{-1} is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(31) when the R' is independently C_{3-6} cycloalkyl substituted by 1-3 cyano, the C_{3-6} cycloalkyl is a 5-membered bicyclic bridged cycloalkyl;

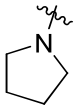
(32) when the R' is independently C_{6-14} aryl, the C_{6-14} aryl is phenyl, naphthyl, phenanthryl or anthranyl,;

(33) when the R' is independently a 3- to 6-membered heterocyclyl substituted by 1-3 R'^{-3}, the 3- to 6-membered heterocyclyl is a 4- to 6-membered monoheterocyclyl, and the heteroatoms are nitrogen and/or oxygen, and the number of the heteroatoms is 1 or 2,;

(34) when the R'^{-3} is independently C_{1-6} alkyl, the C_{1-6} alkyl is, methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(35) when the R_8 and R_9 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl,

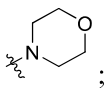
n-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(36) when the R_8 and R_9 together with the nitrogen atom to which they are attached form a 5- or 6-membered heterocyclyl, the 5- or 6-membered heterocyclyl is ;

(37) when the R_{10} is C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(38) when the R_4 and R_5 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(39) when the R_4 and R_5 are independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl;

(40) when the R_4 and R_5 together with the nitrogen atom to which they are attached form a 5- or 6-membered heterocycloalkyl, the 5- or 6-membered heterocycloalkyl is ;

(41) when the R_4 and R_5 are independently substituted by 1-5 substituents, and the substituents are independently halogen, the halogen is fluorine, chlorine, bromine or iodine;

(42) when the R_4 and R_5 are independently substituted by 1-5 substituents, the number of the substituents is 1 or 2 or 3;

(43) when the R_6 and R_7 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl;

(44) when the R_2 is substituted by 1-4 substituents, and the substituents are -R, the -R is -C_{1-6} alkyl, -C_{2-6} alkenyl, -C_{3-6} cycloalkyl, -heterocyclyl, -aryl or -heteroaryl;

(45) when the R_2 is substituted by 1-4 substituents, and the substituents are -OR, the -OR is -O-C_{1-6} alkyl or -O-heterocyclyl;

and (46) when the R_2 is substituted by 1-4 substituents, and the substituents are -C(O)R, the -C(O)R is -

C(O)-C_{1-6} alkyl, -C(O)-C_{2-6} alkenyl, -C(O)-C_{3-6} cycloalkyl or -C(O)-aryl.

13. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, or the pharmaceutically acceptable salt thereof as claimed in claims 12, wherein, the compound by formula II satisfies one of the following conditions:

(1) when the R_3 is C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

(2) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkoxy is methoxy, ethoxy, *n*-propoxy or isopropoxy;

(3) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, or isopropyl;

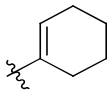
(4) when the R_3 is C_{1-6} alkyl substituted by 1-4 substituents, the number of the substituents is 1 or 2;

(5) when the R_3 is C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(6) when the R_2 is heteroaryl, the heteroaryl is a 5- to 6-membered monocyclic heteroaryl or a 9- to 10-membered bicyclic heteroaryl;

(7) whne the R_2 is substituted by 1-4 substituents, the number of the substituents is 1 or 2;

(8) when the R_2 is substituted by halogen, the halogen is fluorine or chlorine;

(9) when R_2 is substituted by C3-6cycloalkenyl, the C3-6cycloalkenyl is  ;

(10) when the R_2 is substituted by -SO_2-C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, or isopropyl;

(11) when the R is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, isopropyl or *tert*-butyl;

(12) when the R is independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclobutyl or cyclopropyl;

(13) when the R is independently heterocyclyl, the heterocyclyl is a 5- to 6-membered monoheterocyclyl or a 7- to 8-membered heterospirocyclyl, wherein the heteroatoms are independently nitrogen and/or oxygen, and the number of the heteroatoms is 1 or 2;

(14) when the R is C_{3-6} cycloalkenyl, the C_{3-6} cycloalkenyl is ;

(15) when the R is aryl, the aryl is phenyl, naphthyl, phenanthryl or anthranyl;

(16) when the R is heteroaryl, the heteroaryl is a 5-membered monocyclic heteroaryl, wherein the heteroatom is nitrogen and/or oxygen, and the number of the heteroatom is 2 or 3;

(17) when the R' is independently halogen, the halogen is fluorine;

(18) when the R' is independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclopropyl;

(19) when the R' is independently C_{1-6} alkylamino, the C_{1-6} alkylamino is ethylamino;

(20) when the R' is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(21) when the R' is independently C_{1-6} alkoxy, the C_{1-6} alkoxy is methoxy, ethoxy, *n*-propoxy or isopropoxy;

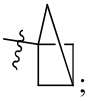
(22) when the R' is independently C_{1-3} alkyl substituted by cyano or halogen, the C_{1-3} alkyl is methyl;

(23) when the R' is independently heterocyclyl, the heterocyclyl is a tetrahydrofuranyl, oxetanyl, azetidinyl, morpholinyl or piperazinyl;

(24) when the R' is independently heteroaryl, the heteroaryl is a 5-membered monocyclic heteroaryl, wherein the heteroatom is nitrogen and/or oxygen, and the number of the heteroatom is 1, 2 or 3;

(25) when the R' is independently a 5- to 10-membered heteroaryl substituted by 1-3 R'^{-1}, the heteroaryl is an oxadiazolyl or oxadiazolyl;

(26) when the R'^{-1} is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(27) when the R' is independently C_{3-6} cycloalkyl substituted by 1-3 cyano, the C_{3-6} cycloalkyl is ;

(28) when the R' is independently C_{6-14} aryl, the C_{6-14} aryl is phenyl;

(29) when the R' is independently a 3- to 6-membered heterocyclyl substituted by 1-3 R'^{-3}, the 3- to 6-membered heterocyclyl is a piperazinyl or oxetanyl;

(30) when the R'^{-3} is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(31) when the R_8 and R_9 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl;

(32) when the R_{10} is C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl, or isopropyl;

(33) when the R_4 and R_5 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl or *n*-propyl;

(34) when the R_4 and R_5 are independently C_{3-6} cycloalkyl, the C_{3-6} cycloalkyl is cyclohexyl;

(35) when the R_4 and R_5 are independently substituted by 1-5 substituents, and the substituents are independently halogen, the halogen is fluorine;

(36) when the R_6 and R_7 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, *n*-propyl or isopropyl.

14. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, or the pharmaceutically acceptable salt thereof as claimed in claims 13, wherein, the compound by formula II satisfies one of the following conditions:

(1) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkoxy is methoxy;

(2) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

(3) when the R_3 is C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

(4) when the R_2 is heteroaryl, the heteroaryl is a 5- to 6-membered monocyclic heteroaryl, a 9- to 10-membered bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heteroaryl, () a 9- to 10-membered bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heterocyclyl;

(5) when the R_2 is substituted by $-SO_2-C_{1-6}$ alkyl, the C_{1-6} alkyl is methyl and ethyl;

(6) when the R is independently heterocyclyl, the heterocyclyl is morpholinyl, pyrrolidinyl, azetidinyl, oxetanyl, piperidinyl, tetrahydropyranyl, tetrahydrofuranyl or 2-oxo-[3,3]heptyl;

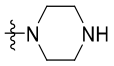
(7) when the R is C_{6-14} aryl, the C_{6-14} aryl is phenyl;

(8) when the R is heteroaryl, the heteroaryl is pyrimidinyl, oxadiazolyl or isoxazolyl;

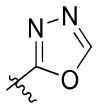
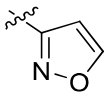
(9) when the R' is independently C_{1-6} alkylamino, the C_{1-6} alkylamino is -NHEt;

(10) when the R' is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

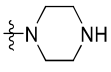
(11) when the R' is independently C_{1-6} alkoxy, the C_{1-6} alkoxy is methoxy;

(12) when the R' is independently heterocyclyl, the heterocyclyl is , , ,  or ;

(13) when the R' is independently heteroaryl, the heteroaryl is pyrimidinyl, oxadiazolyl or isoxazolyl;

(14) when the R' is independently a 5- to 10-membered heteroaryl substituted by 1-3 R'^{-1}, the heteroaryl is  or ;

(15) when the R'^{-1} is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

(16) when the R' is independently a 3- to 6-membered heterocyclyl substituted by 1-3 R'^{-3}, the 3- to 6-membered heterocyclyl is  or ;

(17) when the R'^{-3} is independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

(18) when the R_8 and R_9 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

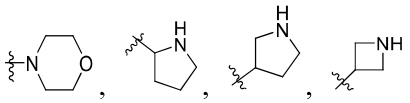
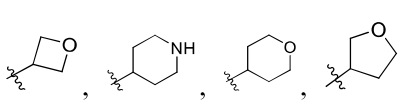
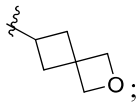
(19) when the R_{10} is C_{1-6} alkyl, the C_{1-6} alkyl is methyl;

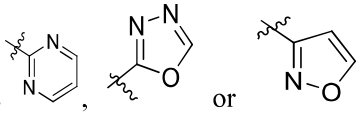
(20) when the R_4 and R_5 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl, ethyl, or *n*-propyl;

and (21) when the R_6 and R_7 are independently C_{1-6} alkyl, the C_{1-6} alkyl is methyl.

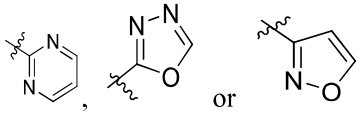
15. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, or the pharmaceutically acceptable salt thereof as claimed in claims 14, wherein, the compound by formula II satisfies one of the following conditions:

(1) when the R_2 is heteroaryl, the heteroaryl is triazolyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, pyrazolopyridyl, pyrrolopyridyl, pyridopyrrolonyl, naphthyridinyl, quinolyl, imidazopyridyl, dioxinopyridyl, pyridooxazinyl, pyrazolopyrimidinyl, pyridopyrazolyl, pyridopyrrolyl, pyridopyrazolyl, pyridonyl, pyridoimidazolyl, pyridotriazolyl, pyridonyl, pyridotriazolyl, pyridazinonyl, heteronaphthyl, naphthyridinonyl, imidazopyridazinyl, indolyl, diazanaphthyl, tetrahydronaphthyridinyl or naphthyridinyl;

(2) when the R is independently heterocyclyl, the heterocyclyl is ,  or ;

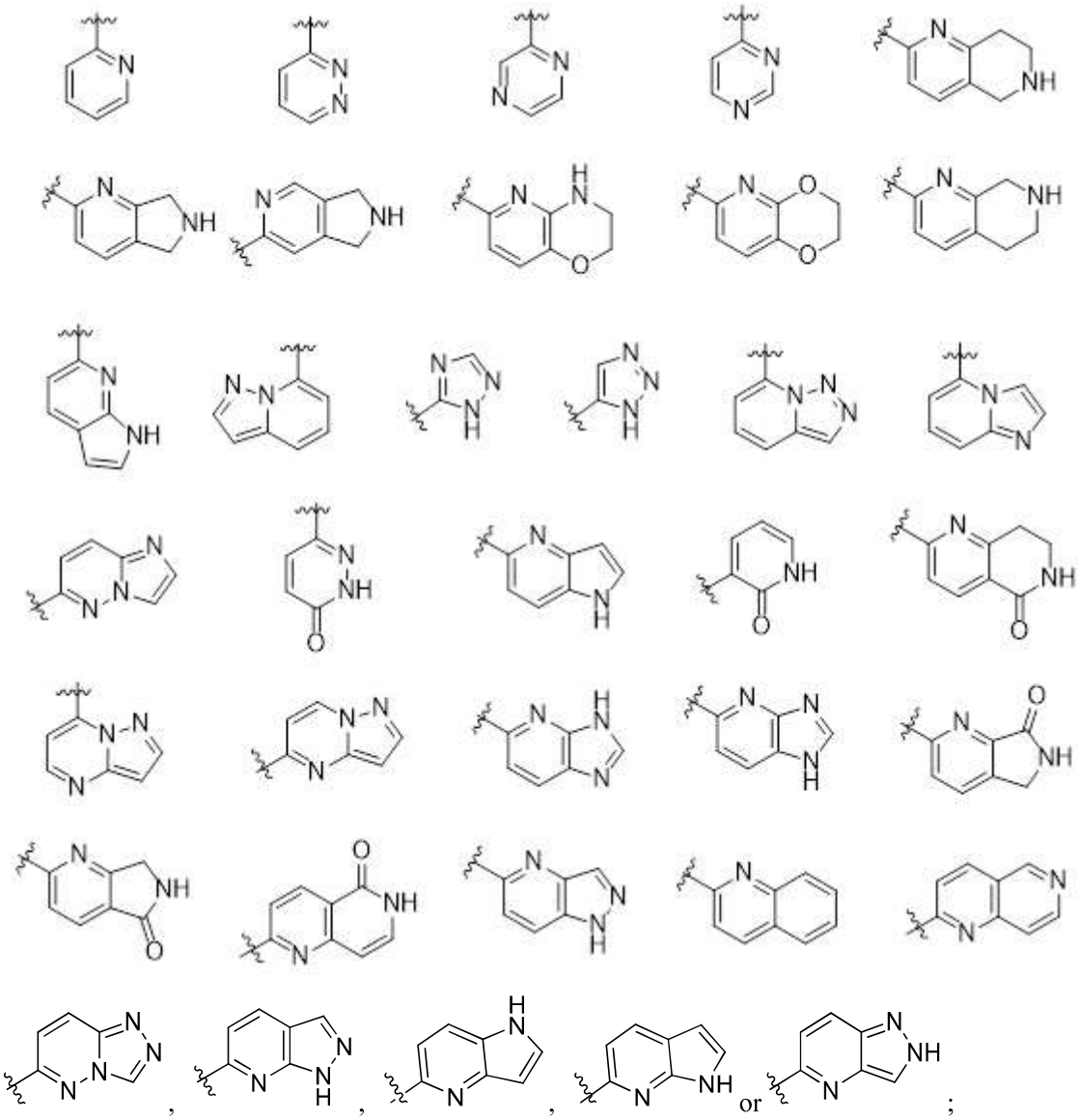
(3) when the R is heteroaryl, the heteroaryl is ;

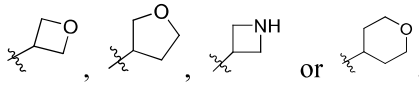
(4) when the R' is independently heterocyclyl, the heterocyclyl is ;

and (5) when the R' is independently heteroaryl, the heteroaryl is .

16. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, or the pharmaceutically acceptable salt thereof as claimed in claims 15, wherein, the compound by formula II satisfies one of the following conditions:

(1) when the R_2 is heteroaryl, the heteroaryl is



and (2) when the R is independently heterocyclyl, the heterocyclyl is .

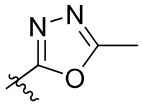
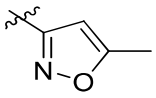
17. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, the pharmaceutically acceptable salt thereof as claimed in claim 8, wherein, the compound by formula II satisfies one of the following conditions:

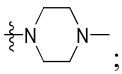
(1) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkoxy C_{1-6} alkyl is C_{1-3} alkoxy C_{1-3} alkyl;

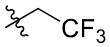
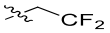
(2) when the R_3 is C_{1-6} alkyl substituted by hydroxyl, the R_3 is ;

(3) when the R_2 is substituted by 2, 3 or 4 substituents, the substituents are the same or different;

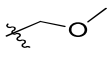
(4) when the R_2 is heteroaryl, the heteroaryl is a 9- to 10-membered bicyclic heteroaryl of a 5- to 6-membered heteroaryl-fused a 5- to 6-membered heterocyclyl, the substitution position of the substituent is on the heteroatom in the 5- to 6-membered heterocyclyl;

(5) when the R' is independently a 5- to 10-membered heteroaryl substituted by R'^{-1}, the 5- to 10-membered heteroaryl substituted by R'^{-1} is  or ;

(6) when the R' is independently a heterocyclyl, the heterocyclyl is a 3- to 6-membered heterocyclyl substituted by 1-3 R'^{-3}, the 3- to 6-membered heterocyclyl substituted by 1-3 R'^{-3} is  or ;

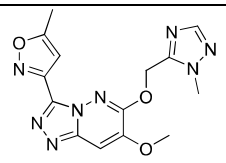
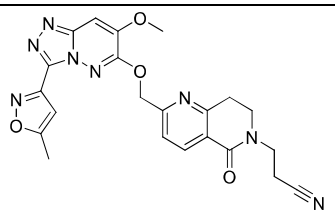
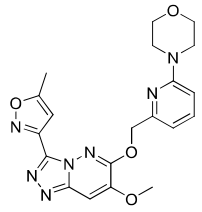
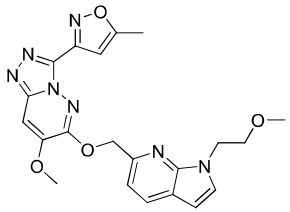
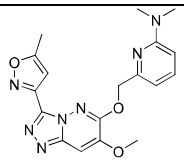
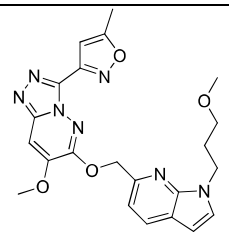
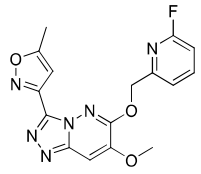
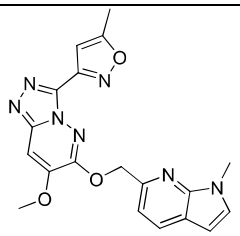
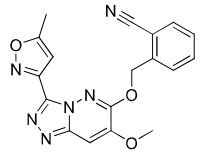
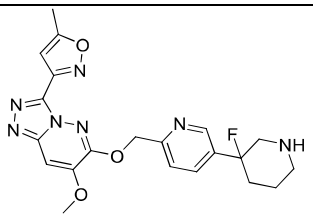
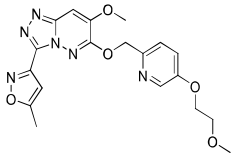
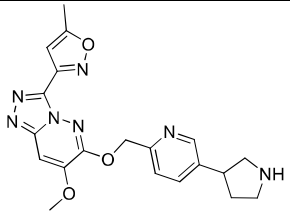
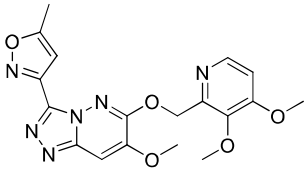
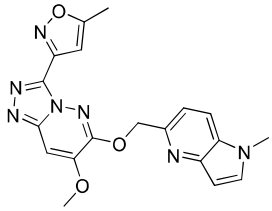
and (7) when the R_4 and R_5 are independently substituted by 1-5 substituents, the R_4 and R_5 are independently  or .

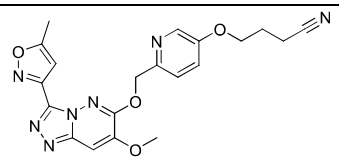
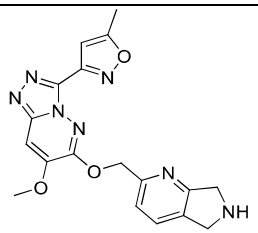
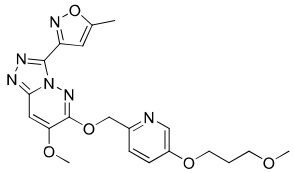
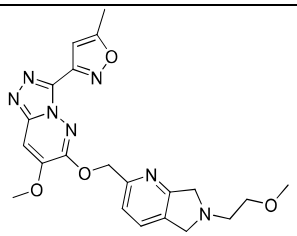
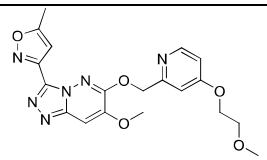
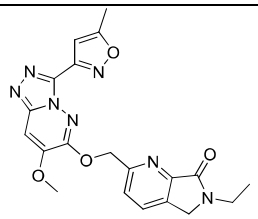
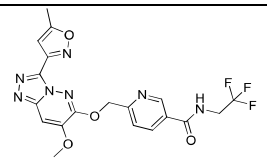
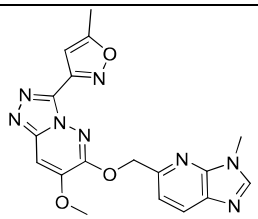
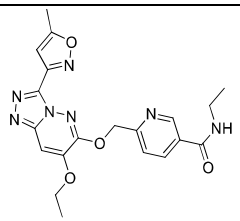
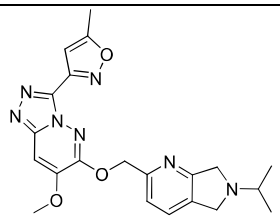
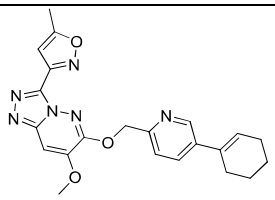
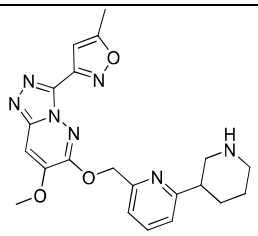
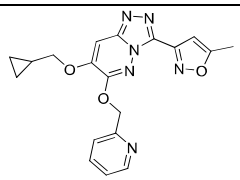
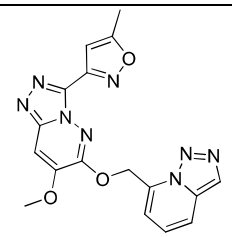
18. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof, the pharmaceutically acceptable salt thereof as claimed in claim 17, wherein, the compound by formula II satisfies the following condition:

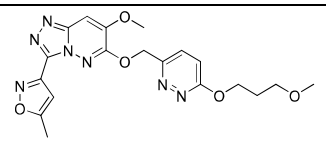
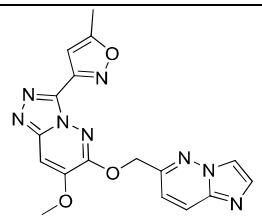
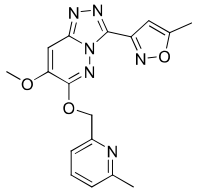
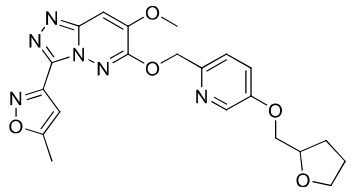
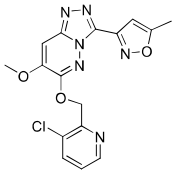
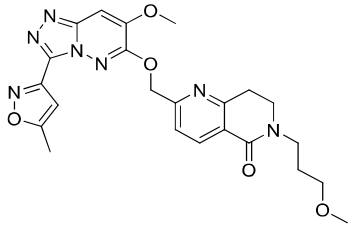
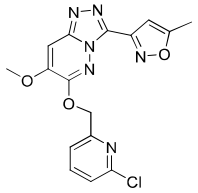
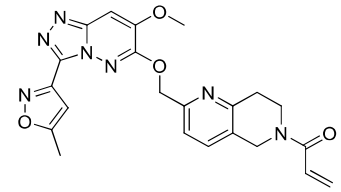
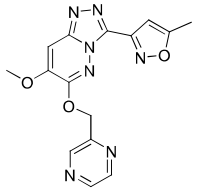
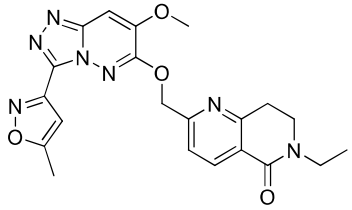
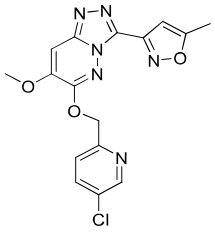
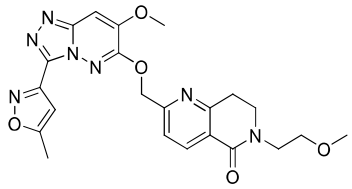
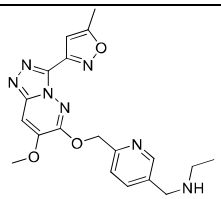
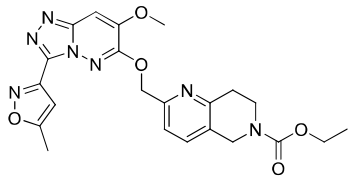
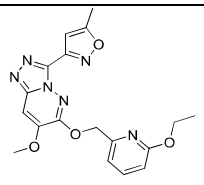
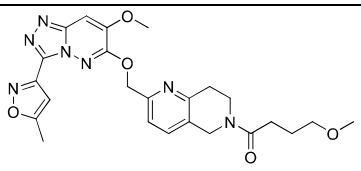
(1) when the R_3 is C_{1-6} alkoxy C_{1-6} alkyl, the C_{1-6} alkoxy C_{1-6} alkyl is .

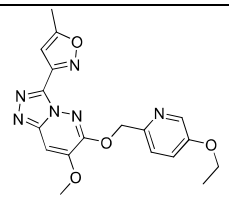
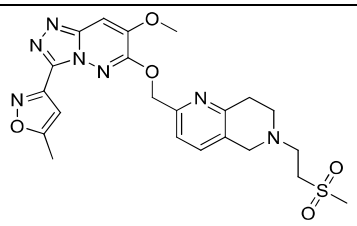
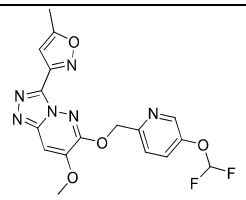
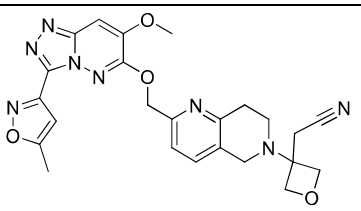
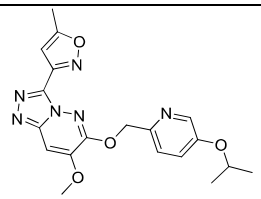
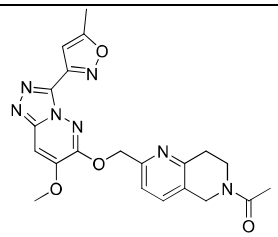
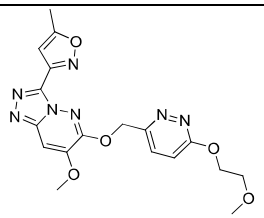
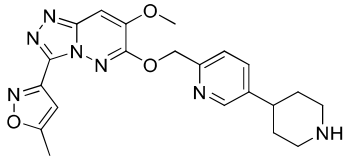
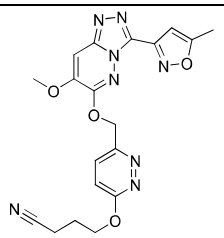
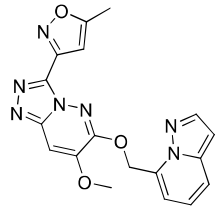
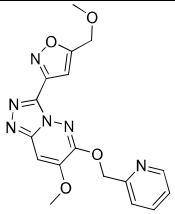
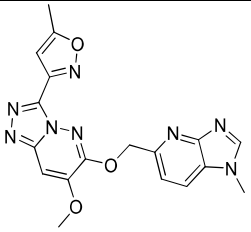
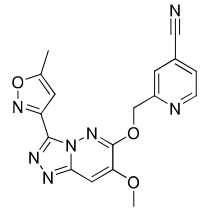
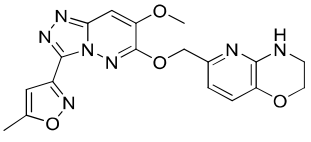
19. The compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as claimed in claim 1, wherein, the compound II is any of the following compounds:

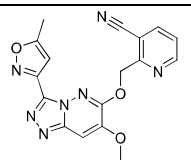
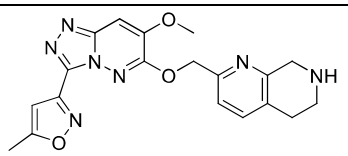
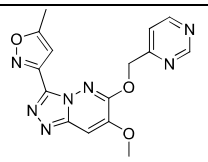
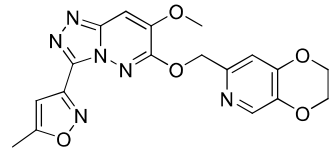
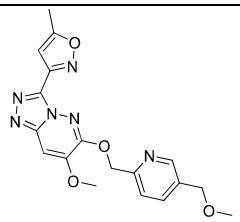
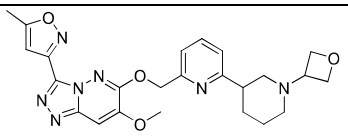
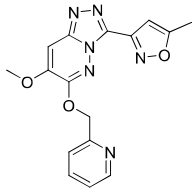
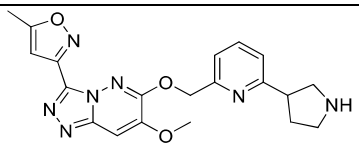
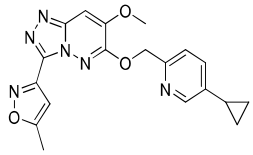
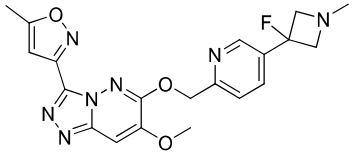
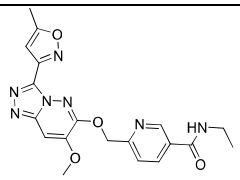
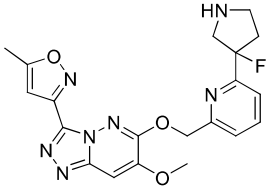
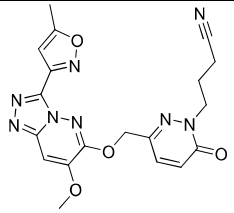
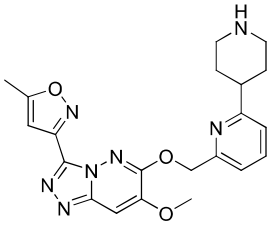
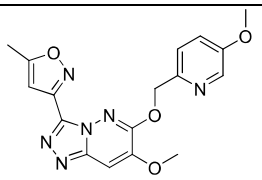
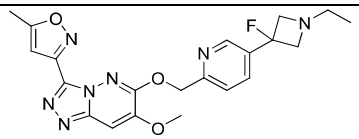
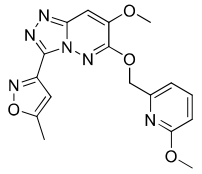
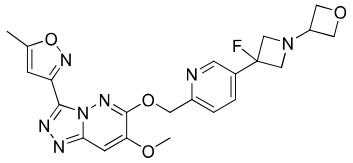
Embodiment	Structure	Embodiment	Structure

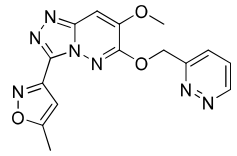
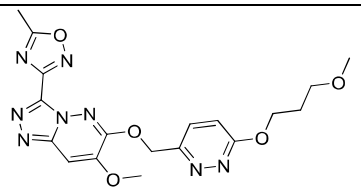
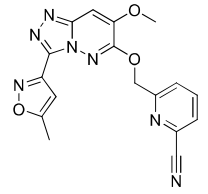
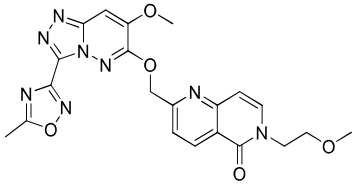
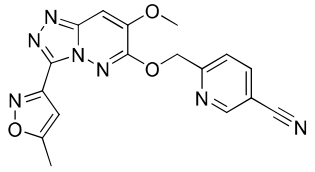
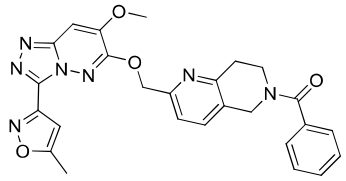
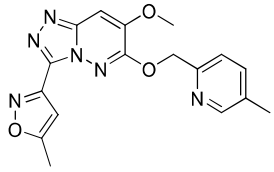
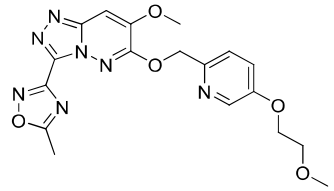
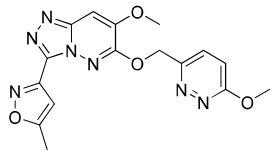
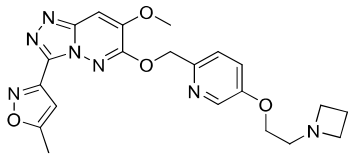
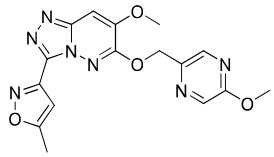
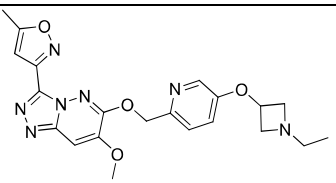
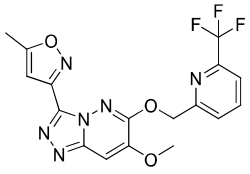
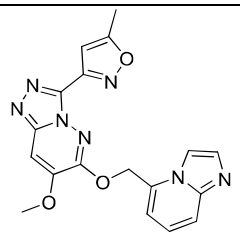
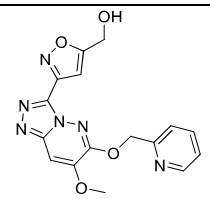
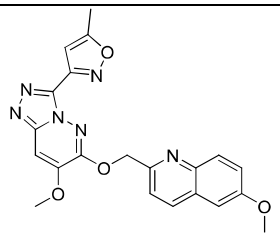
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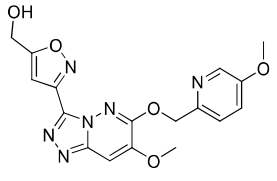
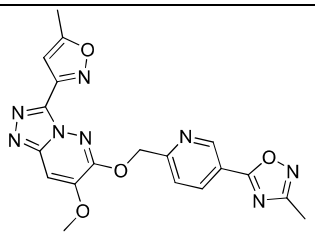
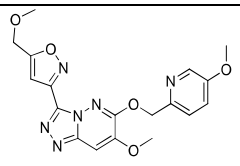
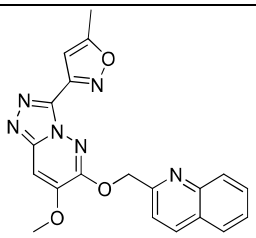
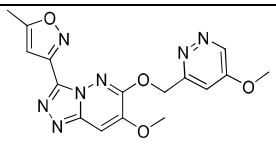
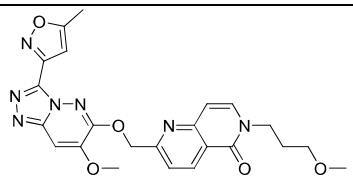
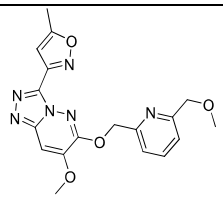
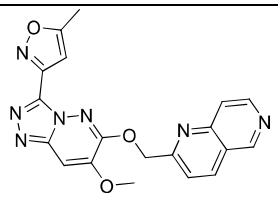
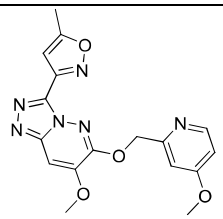
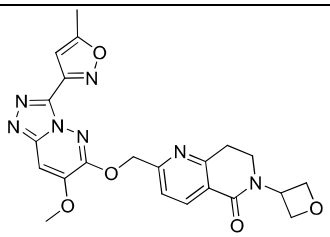
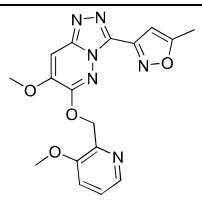
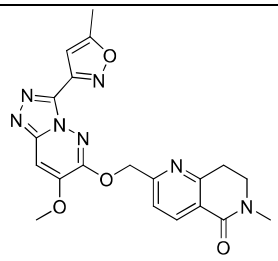
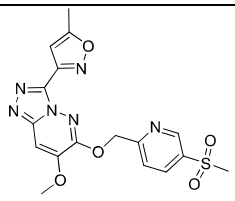
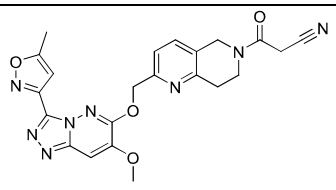
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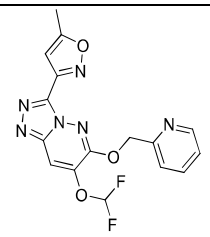
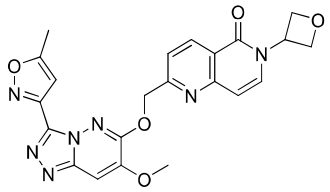
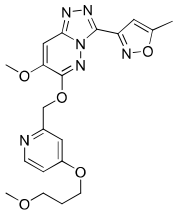
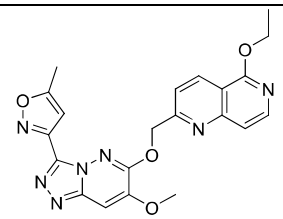
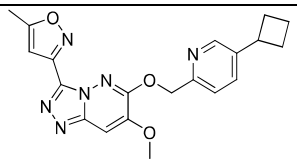
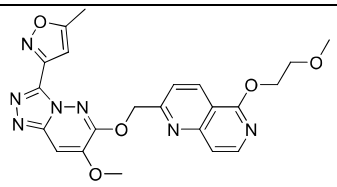
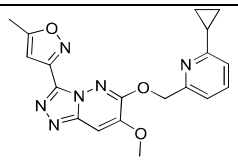
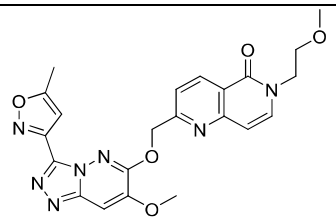
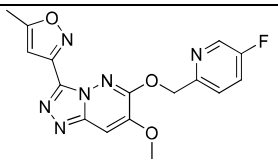
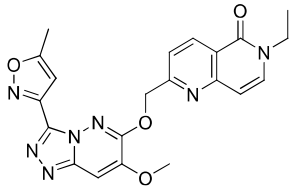
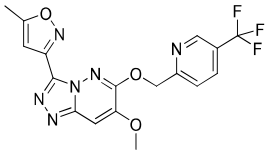
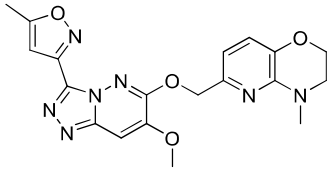
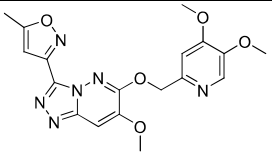
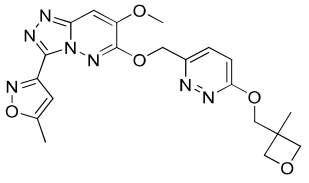
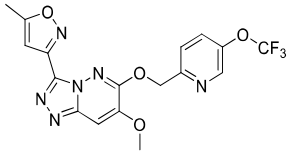
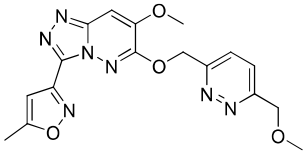
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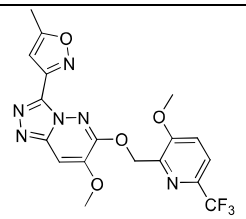
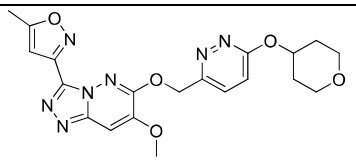
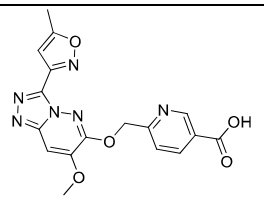
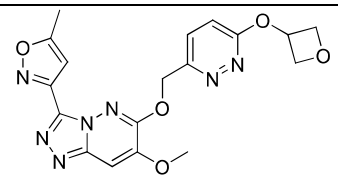
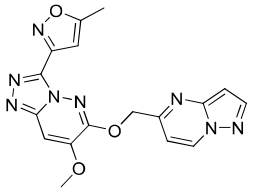
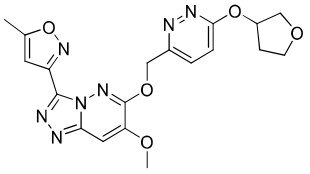
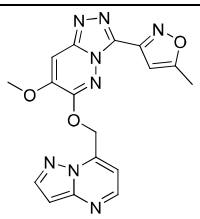
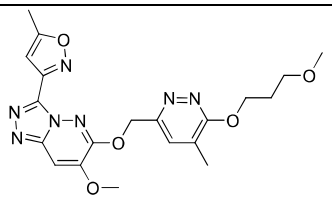
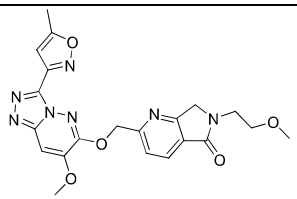
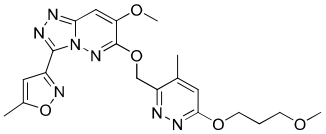
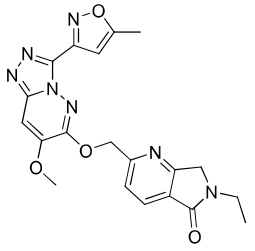
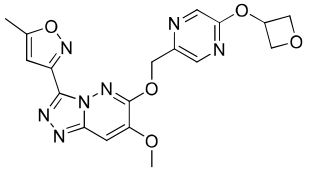
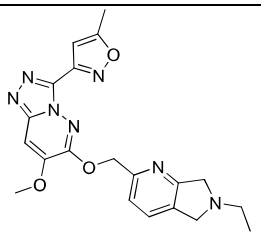
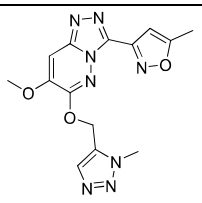
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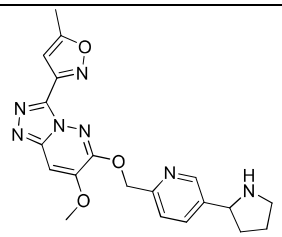
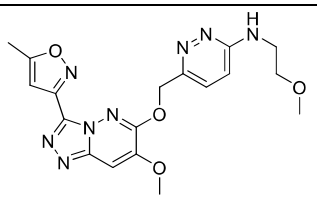
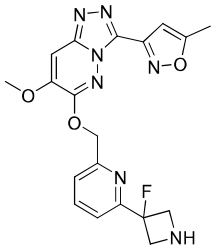
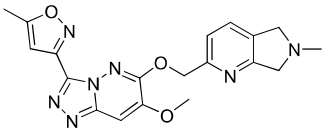
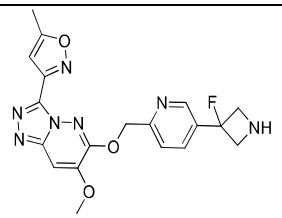
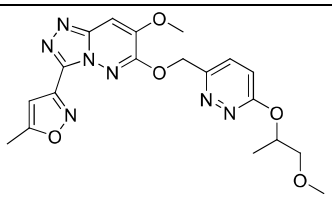
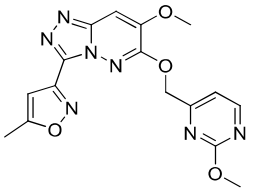
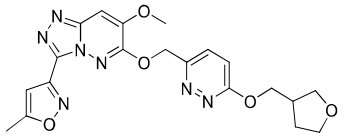
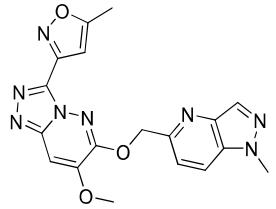
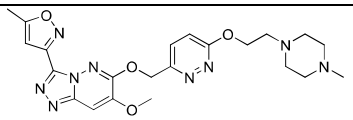
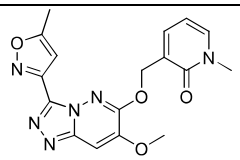
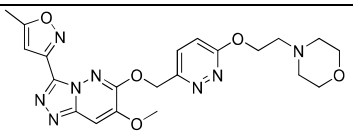
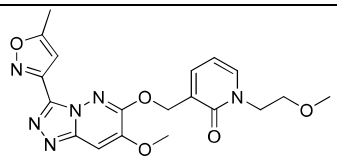
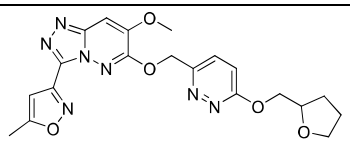
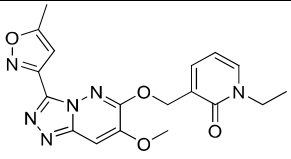
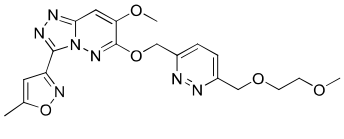
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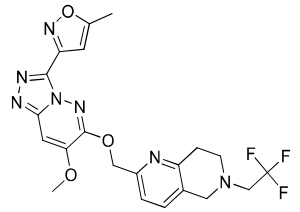
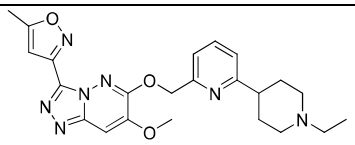
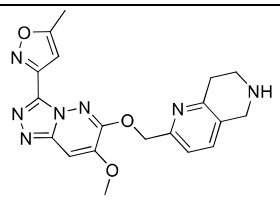
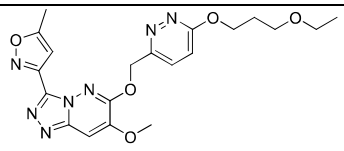
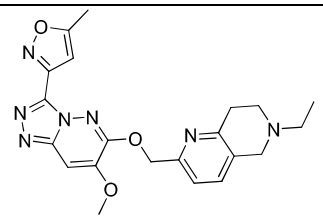
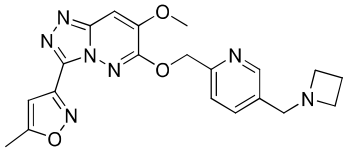
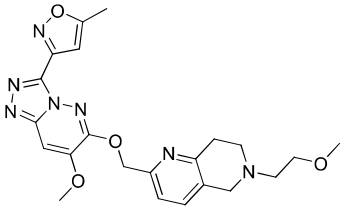
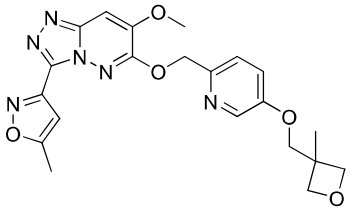
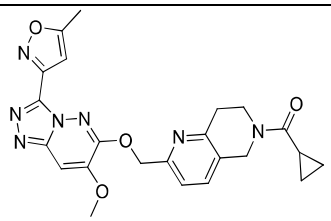
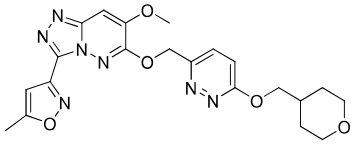
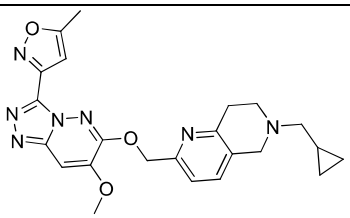
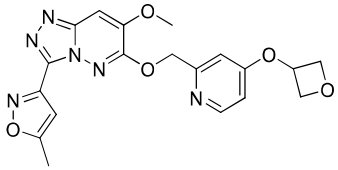
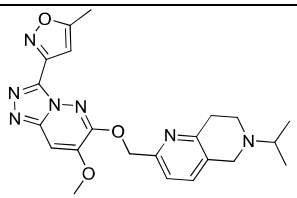
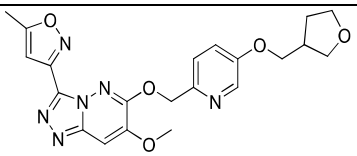
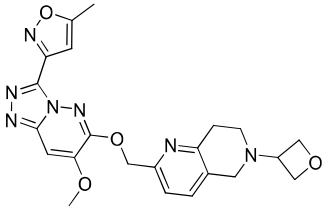
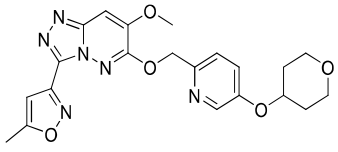
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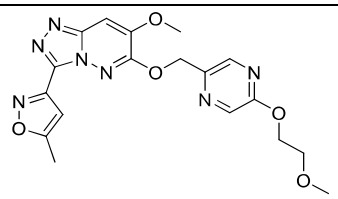
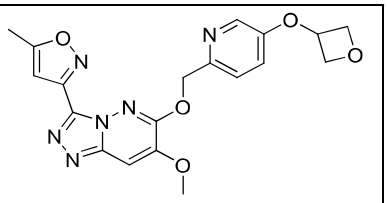
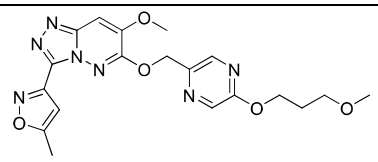
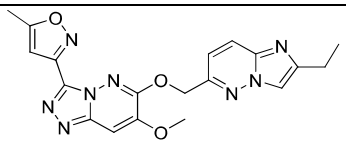
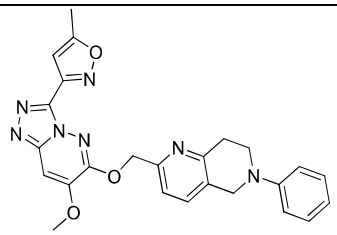
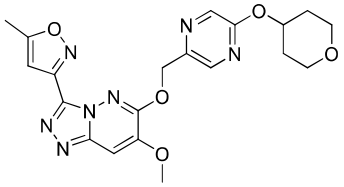
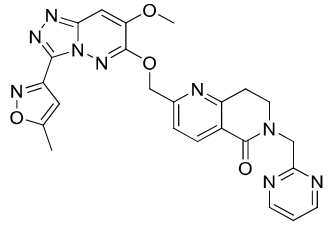
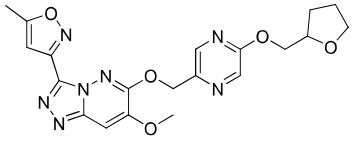
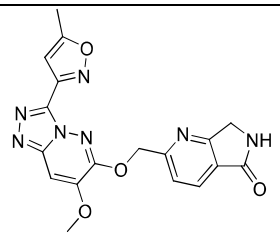
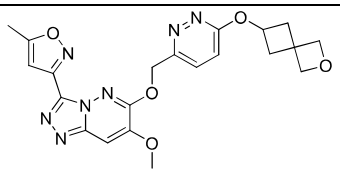
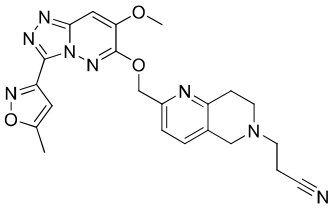
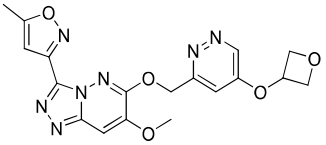
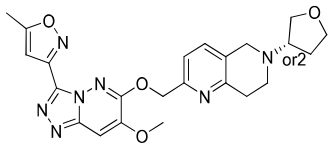
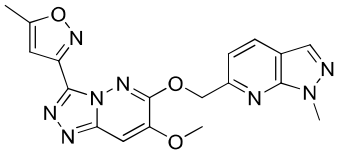
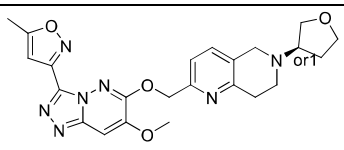
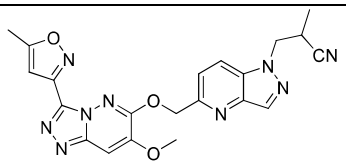
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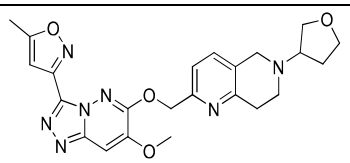
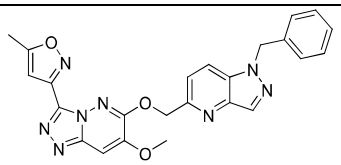
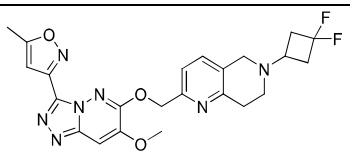
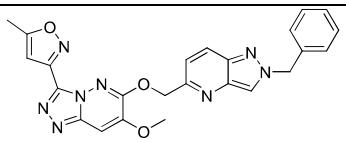
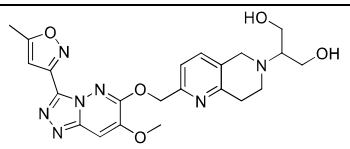
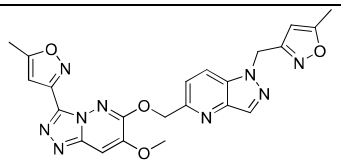
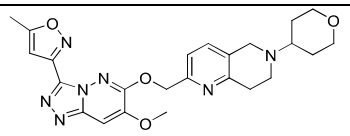
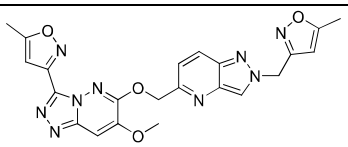
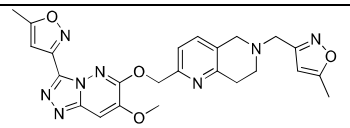
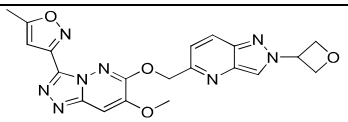
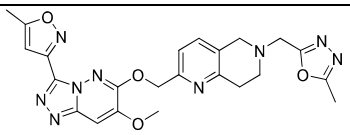
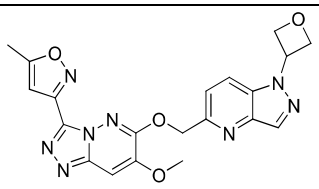
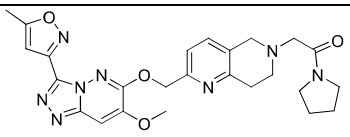
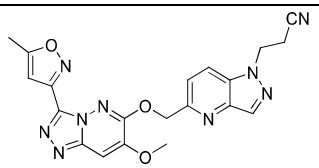
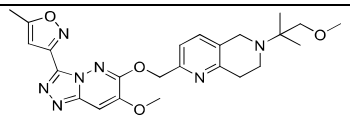
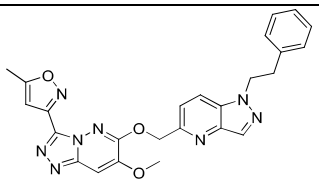
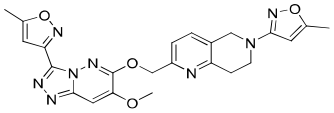
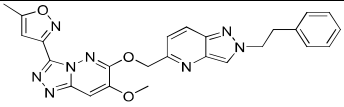
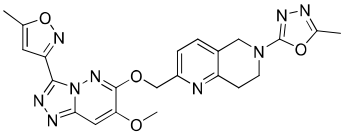
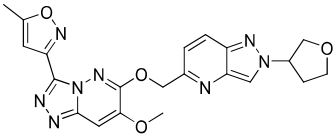
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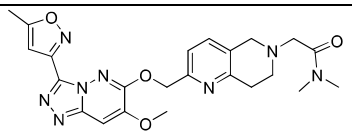
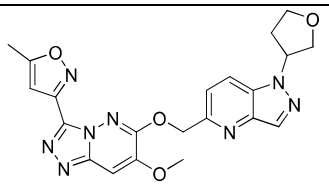
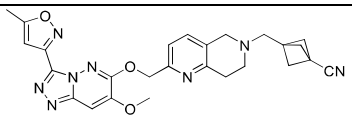
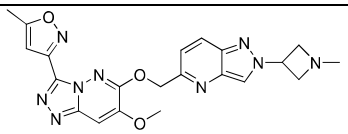
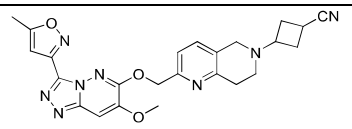
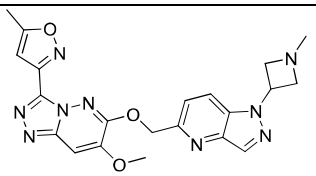
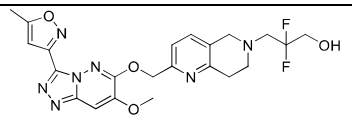
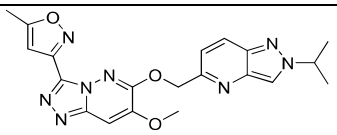
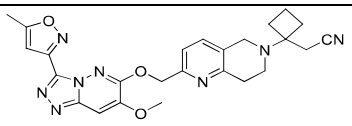
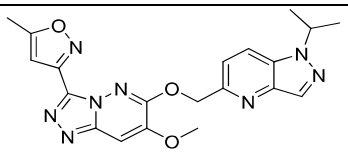
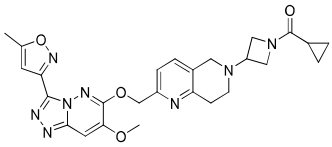
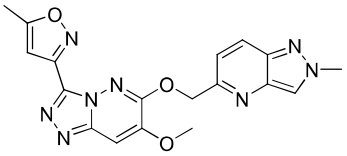
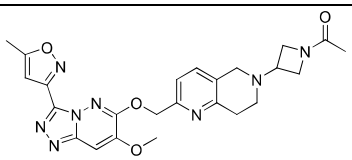
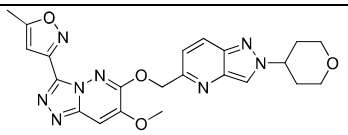
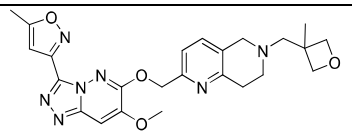
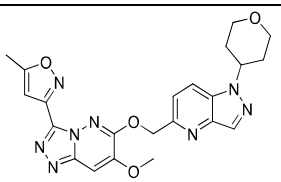
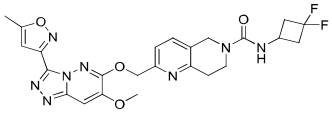
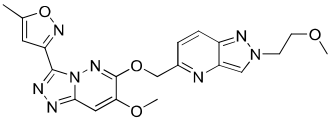
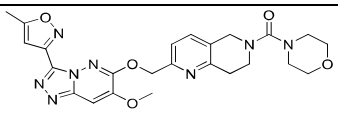
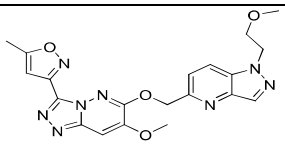
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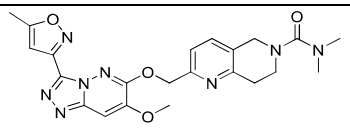
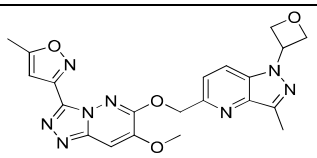
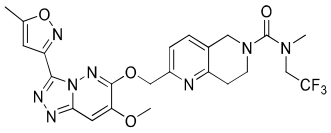
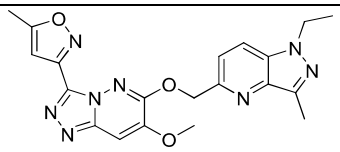
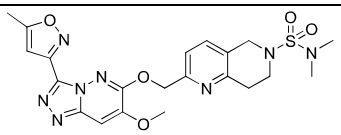
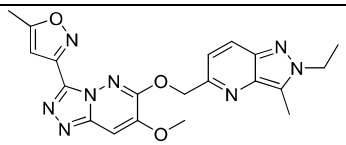
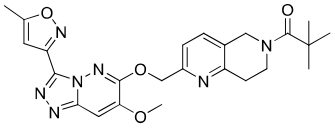
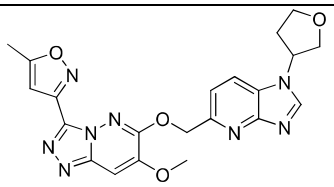
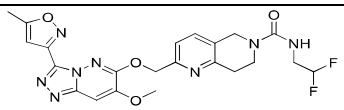
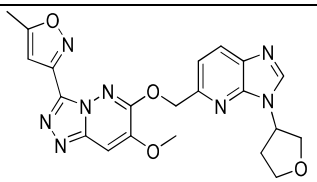
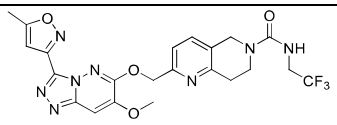
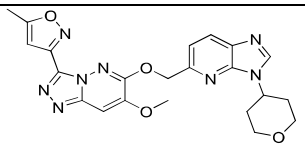
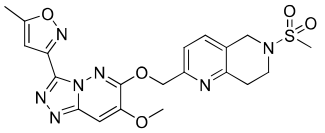
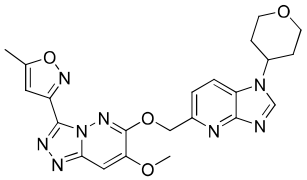
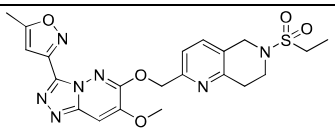
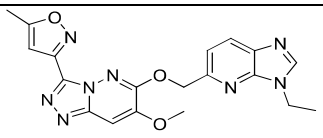
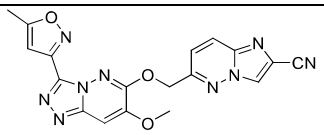
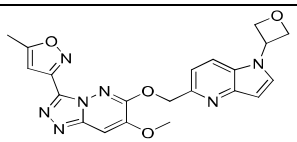
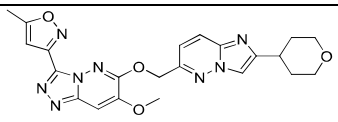
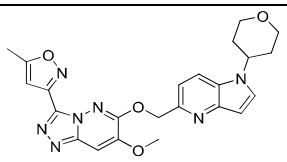
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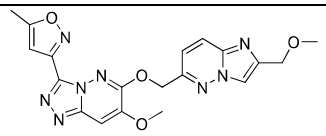
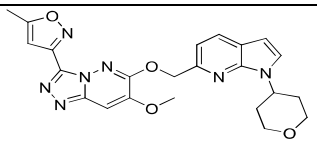
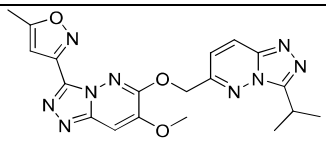
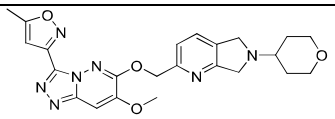
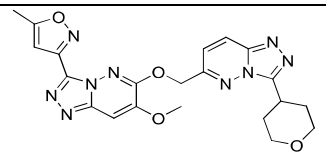
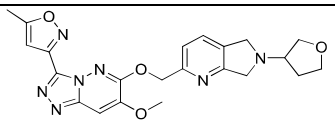
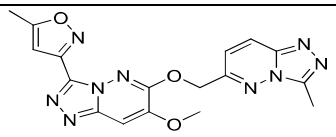
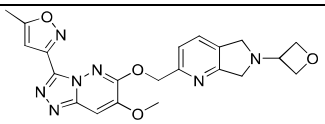
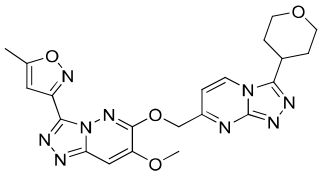
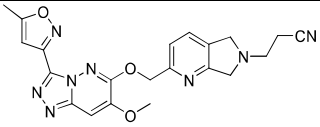
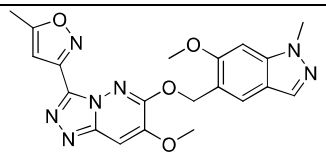
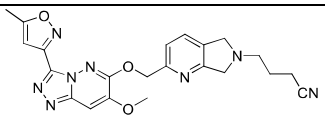
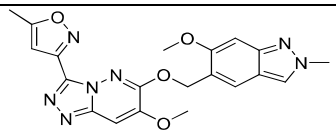
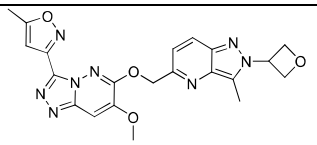
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20. A pharmaceutical composition, comprising the compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as defined in any one of claims 1 to 19 and a pharmaceutically acceptable carrier.

21. A use of the compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as defined in any one of claims 1 to 19, or the pharmaceutical composition as defined in

claim 20 in the manufacture of a medicament for treating or preventing a disease related to an α5-GABAA receptor, wherein, the disease related to the α5-GABAA receptor is, one or more of cognitive diseases, Alzheimer's disease, dysmnesia, Down's syndrome, amyotrophic lateral sclerosis, drug addiction, restless leg syndrome, cognitive deficiency, multi-infarct dementia, pain, stroke, and attention deficit.

22. A use of the compound represented by formula II, the *cis-trans* isomer thereof, the enantiomer thereof, the diastereomer thereof, the racemate thereof, the solvate thereof, the hydrate thereof or the pharmaceutically acceptable salt thereof as defined in any one of claims 1 to 19, or the pharmaceutical composition as defined in claim 20 in the manufacture of a medicament for treating or preventing a disease, wherein the disease is one or more of pain, Alzheimer's disease, multi-infarct dementia, and stroke.