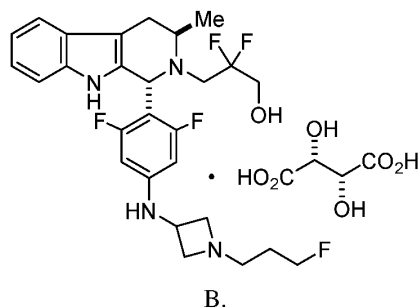
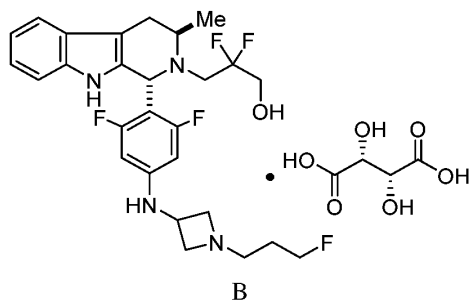


What is claimed is:

1. A compound having the structure:



2. A crystal form comprising Compound B



having an X-ray powder diffraction pattern comprising peaks at 19.32, 20.26, 21.63, 23.28, or $24.81 \pm 0.1^\circ 2\theta$ ($\pm 0.1^\circ 2\theta$).

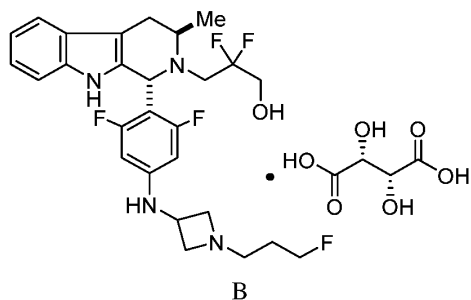
3. The crystal form of claim 2, wherein the crystal form of Compound B has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 16.

4. The crystal form of claim 2, wherein the crystal form of Compound B has an X-ray powder diffraction pattern substantially as shown in FIG. 1.

5. The crystal form of any one of claims 2-4, wherein the crystal form of Compound B has a TGA thermograph corresponding substantially to the representative TGA thermogram as depicted in FIG. 2.

6. The crystal form of any one of claims 2-5, wherein the crystal form of Compound B has a DSC thermogram substantially as depicted in FIG. 3.

7. A crystal form comprising Compound B



having an X-ray powder diffraction pattern comprising peaks at 11.49, 12.54, 19.16, 19.42, or $24.67 \pm 0.1^\circ 2\theta$ ($\pm 0.1^\circ 2\theta$).

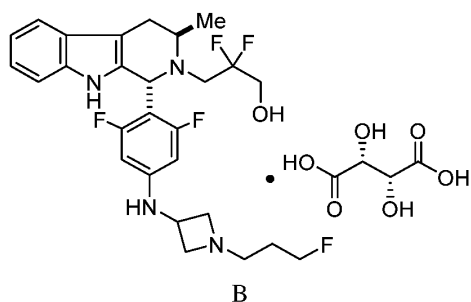
8. The crystal form of claim 7, wherein the crystal form of Compound B has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 11.

9. The crystal form of claim 7, wherein the crystal form of Compound A has an X-ray powder diffraction pattern substantially as shown in FIG. 4.

10. The crystal form of any one of claims 7-9, wherein the crystal form of Compound A has a TGA thermograph corresponding substantially to the representative TGA thermogram as depicted in FIG. 5.

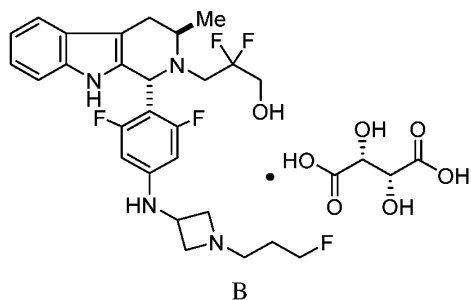
11. The crystal form of any one of claims 7-10, wherein the crystal form of Compound A has a DSC thermogram substantially as depicted in FIG. 5.

12. A crystal form comprising Compound B



having an X-ray powder diffraction pattern substantially as shown in FIG. 10.

13. A crystal form comprising Compound B



having an X-ray powder diffraction pattern comprising peaks at 11.31, 15.70, 16.54, 19.10, or $22.76 \pm 0.1^\circ 2\theta$.

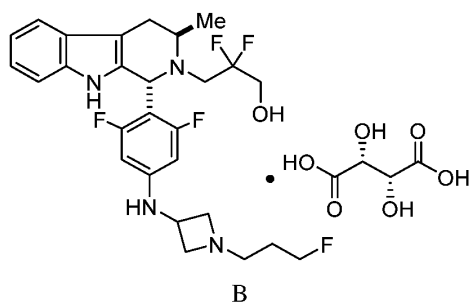
14. The crystal form of claim 13, wherein the crystal form of Compound B has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 13.

15. The crystal form of claim 13, wherein the crystal form of Compound B has an X-ray powder diffraction pattern substantially as shown in FIG. 12.

16. The crystal form of any one of claims 13-15, wherein the crystal form of Compound B has a TGA thermograph corresponding substantially to the representative TGA thermogram as depicted in FIG. 13.

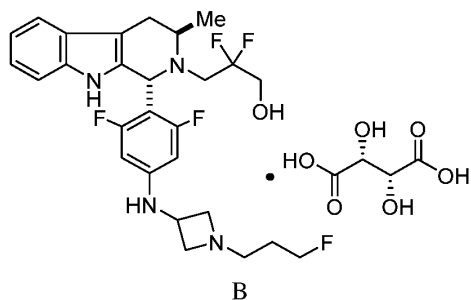
17. The crystal form of any one of claims 13-16, wherein the crystal form of Compound B has a DSC thermogram substantially as depicted in FIG. 13.

18. A crystal form comprising Compound B



having an X-ray powder diffraction pattern substantially as shown in FIG. 14.

19. A crystal form comprising Compound B



having an X-ray powder diffraction pattern comprising peaks at 12.52, 15.90, 19.66, 20.65, or $24.99 \pm 0.1^\circ 2\theta$.

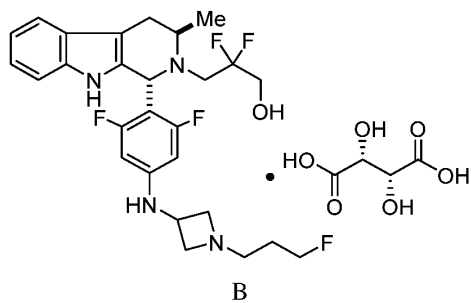
20. The crystal form of claim 19, wherein the crystal form of Compound B has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 14.

21. The crystal form of claim 19, wherein the crystal form of Compound B has an X-ray powder diffraction pattern substantially as shown in FIG. 16.

22. The crystal form of any one of claims 19-21, wherein the crystal form of Compound B has a TGA thermograph corresponding substantially to the representative TGA thermogram as depicted in FIG. 17.

23. The crystal form of any one of claims 19-22, wherein the crystal form of Compound B has a DSC thermogram substantially as depicted in FIG. 18.

24. A crystal form comprising Compound B



having an X-ray powder diffraction pattern comprising peaks at 11.46, 12.51, 19.29, 19.42, or $20.23 \pm 0.1^\circ 2\theta$.

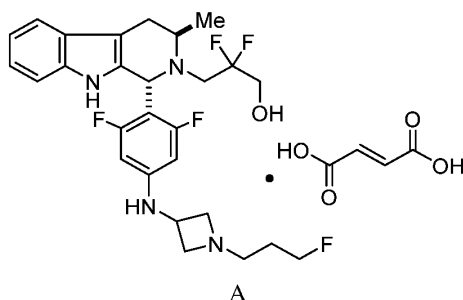
25. The crystal form of claim 24, wherein the crystal form of Compound B has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven,

twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 15.

26. The crystal form of any one of claims 24-25, wherein the crystal form of Compound B has an X-ray powder diffraction pattern substantially as shown in FIG. 19.

27. The crystal form of any one of claims 24-26, wherein the crystal form of Compound A has a TGA thermograph corresponding substantially to the representative TGA thermogram as depicted in FIG. 20.

28. A crystal form comprising Compound C

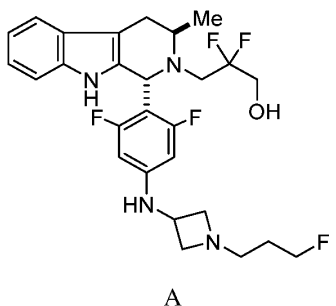


having an X-ray powder diffraction pattern comprising peaks at 16.09, 18.92, 19.69, 19.86, or $23.16 \pm 0.1^\circ 2\theta$.

29. The crystal form of claim 28, wherein the crystal form of Compound C has an X-ray powder diffraction pattern one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, or twenty, characteristic X-ray powder diffraction peaks as set forth in Table 30.

30. The crystal form of claim 28, wherein the crystal form of Compound C has an X-ray powder diffraction pattern substantially as shown in FIG. 27.

31. An amorphous solid comprising Compound A



32. The amorphous solid of claim 31, wherein the amorphous solid of Compound A has an X-ray powder diffraction pattern substantially as shown in FIG. 32.

33. The amorphous solid of claim 31, wherein the amorphous solid of Compound A has a TGA and a DSC thermogram substantially as depicted in FIG. 33.

34. A pharmaceutical composition comprising the solid form of any one of claims 1 to 33 and at least one pharmaceutically acceptable excipient.

35. A method for treating lung cancer, ovarian cancer, endometrial cancer, prostate cancer, uterine cancer, or breast cancer in a patient having said cancer, said method comprising administering an effective amount of a compound of any one of claims 1 to 33 or the pharmaceutical composition of claim 34 to the cancer patient.

36. A method for treating breast cancer in a breast cancer patient, said method comprising administering an effective amount of a compound of any one of claims 1 to 33 or the pharmaceutical composition of claim 34 to the cancer patient.

37. The method of claim 36, wherein said breast cancer is hormone receptor positive breast cancer, HER2-positive breast cancer, triple negative breast cancer,

38. The method of claim 36, wherein the breast cancer is metastatic breast cancer.

39. The method of any one of claims 36-38, wherein the compound or pharmaceutical composition is administered as a component of adjuvant therapy.

40. The method of any one of claims 36-38, wherein the compound or pharmaceutical composition is administered as a component of neoadjuvant therapy.

41. The method of any one of claims 36-40, wherein the breast cancer is stage 0, I, II, III, or IV.

42. The method of claim 37, wherein the hormone receptor positive breast cancer is HER2 negative.

43. The method of any one of claims 36-42, wherein the patient has had previous treatment with one or more anti-cancer agents or radiation therapy.

44. The method of any one of claims 36-43, wherein the patient has had surgery prior to treatment with a compound of any one of claims 1 to 33.

45. The method of any one of claims 36-44, wherein the compound of any one of claims 1 to 33 is administered in combination with one or more of radiation therapy, hormone therapy, or an anti-cancer agent.

46. The method of claim 45, wherein anti-cancer agent comprises administration of one or more of doxorubicin, pegylated liposomal doxorubicin, epirubicin, paclitaxel, albumin-bound paclitaxel, docetaxel, 5-fluorouracil, cyclophosphamide, cisplatin, carboplatin, vinorelbine, capecitabine, gemcitabine, ixabepilone, eribulin, olaparib, methotrexate, anastrozole, exemestane, toremifene, letrozole, tamoxifen, 4-hydroxy tamoxifen, raloxifene, droloxifene, trioxifene, keoxifene, flutamide, nilutamide, bicalutamide, lapatinib, vinblastine, goserelin, leuprolide, pegfilgrastim, filgrastim, venetoclax,

47. The method of claim 45, wherein the anti-cancer agent comprises one or more of an AKT inhibitor, a CDK4/6 inhibitor, a PARP inhibitor, an aromatase inhibitor

48. The method of claim 45, wherein the anti-cancer agent is abemaciclib, ribociclib, or palbociclib.

49. The method of claim 45, wherein the anti-cancer agent is ipatasertib.

50. The method of claim 45, wherein the anti-cancer agent is everolimus or fulvestrant.

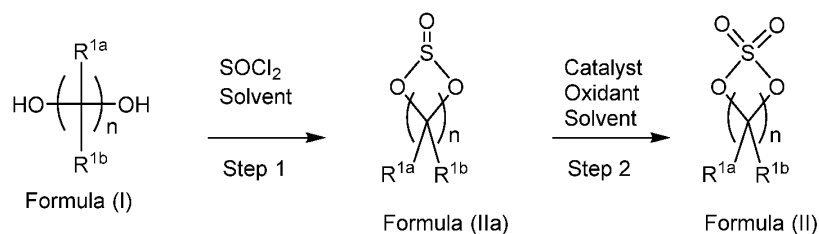
51. The method of claim 45, wherein the anti-cancer agent is ado-trastuzumab emtansine, trastuzumab, pertuzumab, atezolizumab

52. The method of claim 45, wherein the anti-cancer agent is alemtuzumab, bevacizumab, cetuximab, panitumumab, rituximab, tositumomab, or a combination thereof

53. The compound or solid form of any one of claims 1 to 33 for use in a method for treating breast cancer, said method comprising administering an effective amount of the compound or solid form to a patient having breast cancer

54. A process for preparing a compound of formula (IV) or a salt thereof, the process comprising:

(a) reacting a reaction mixture comprising a compound of formula (I), an organic solvent and thionyl chloride to form a compound of formula (IIa) according to step 1 below, and reacting a reaction mixture comprising the compound of formula (IIa), a catalyst, an oxidant and a solvent to form a compound of formula (II) according to step 2 below

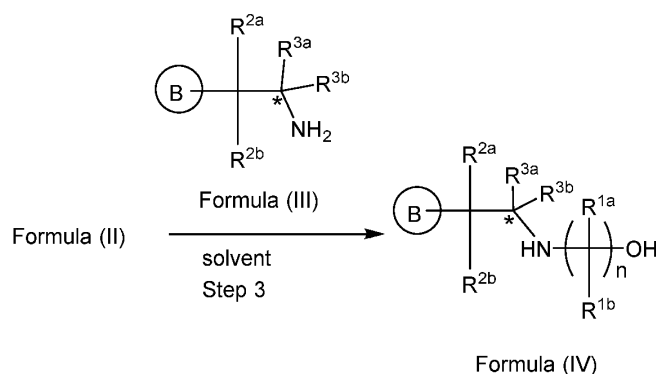


wherein

each of R^{1a} and R^{1b} is independently hydrogen, halogen, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, -CN, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl, and

n is an integer of 2 or 3; and

(b) reacting a reaction mixture comprising the compound of formula (II) and a compound of formula (III) in an organic solvent to form a compound of formula (IV) or a salt thereof according to step 3 below



wherein

B is substituted or unsubstituted indolyl, benzofuranyl, benzothiophenyl, indazolyl, aza-indolyl, benzimidazolyl, pyrrolopyridinyl, furopyridinyl, thienopyridinyl, pyrrolopyridazinyl, pyrrolopyrimidinyl, pyrrolopyrazinyl, thienopyridazinyl, thienopyrimidinyl, thienopyrazinyl, furopyridazinyl, furopyrimidinyl, or furopyrazinyl,

each of R^{2a} and R^{2b} is independently hydrogen, halogen, -OH, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, -CN, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl,

R^{3a} and R^{3b} are independently hydrogen, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} hydroxyalkyl, -CN, C_{3-6} cycloalkyl, C_{3-6} heterocycloalkyl, phenyl, C_{3-6} heteroaryl, or C_{3-6} spirocycloalkyl, and

the asterisk represents a chiral center when R^{3a} and R^{3b} are different.

55. The process of claim 54, wherein B is a substituted or unsubstituted indolyl, benzofuranyl, or benzothiophenyl.

56. The process of claim 55, wherein B is a substituted or unsubstituted indolyl.

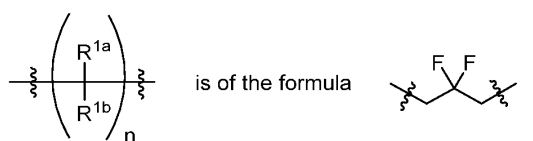
57. The process of claim 54, wherein B is a substituted or unsubstituted pyrrolopyridazinyl, pyrrolopyrimidinyl, or pyrrolopyrazinyl.

58. The process of any one of claims 54 to 57, wherein B is substituted with one or two substituents independently fluorine, chlorine, C₁₋₃ alkyl, C₁₋₃ haloalkyl, -CN, -OH, C₁₋₃ alkoxy, or C₁₋₃ hydroxyalkyl.

59. The process of any one of claims 54 to 58, wherein each of R^{1a} and R^{1b} is independently hydrogen, F, -Cl, -OH, -CN, -CH₃, -CF₃, -CHF₂, -CH₂F, or spirocyclopropyl.

60. The process of any one of claims 54 to 59, wherein n is 3.

61. The process of any one of claims 54 to 60, wherein:



62. The process of any one of claims 54 to 61, wherein each of R^{2a} and R^{2b} is hydrogen.

63. The process of any one of claims 54 to 62, wherein R^{3a} and R^{3b} are independently hydrogen or -CH₃.

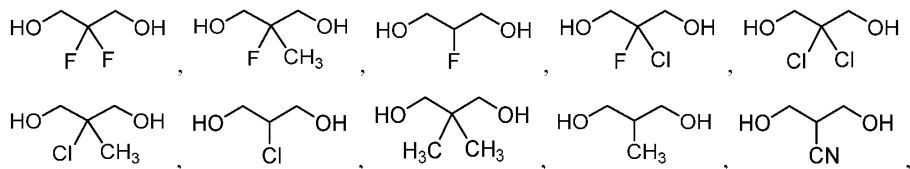
64. The process of any one of claims 54 to 63, wherein the step 1 and step 2 organic solvent is a non-polar solvent.

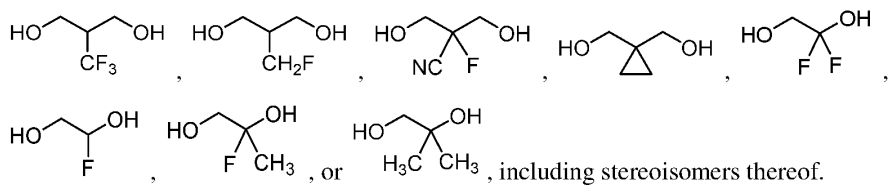
65. The process of any one of claims 54 to 64, wherein the step 2 catalyst is redox active metal catalyst.

66. The process of any one of claims 54 to 65, wherein the step 3 organic solvent is a polar aprotic solvent.

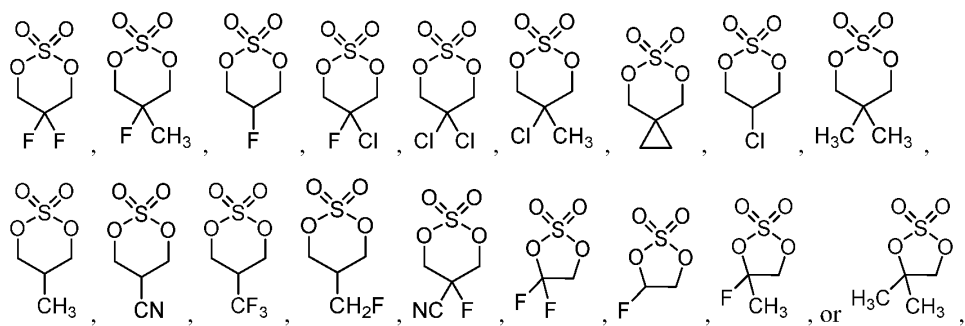
67. The process of any one of claims 54 to 66, wherein step 3 further comprises an acid catalyst.

68. The process of any one of claims 54 to 67, wherein the compound of formula (I) is:



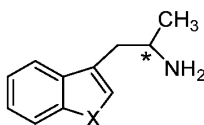


69. 16. The process of any one of claims 54 to 68 wherein the compound of formula (II) is:



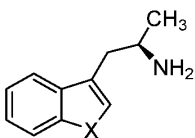
including stereoisomers thereof.

70. The process of any one of claims 54 to 69 wherein the compound of formula (III) is:

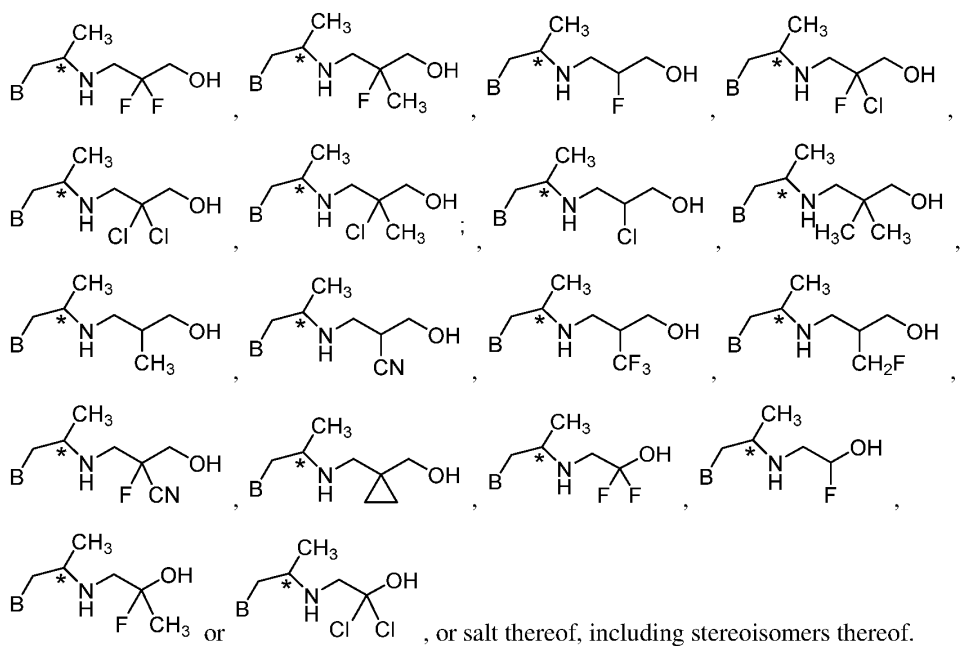


wherein X is -NH-, -N-C₁-C₃ unsubstituted alkyl, -O- or -S-.

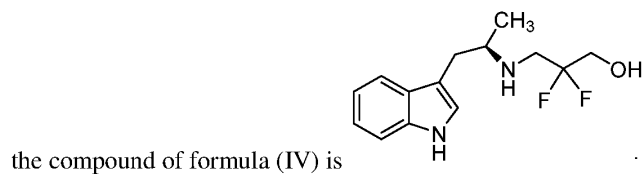
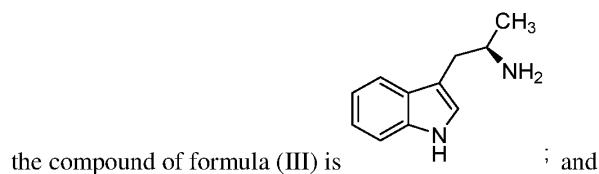
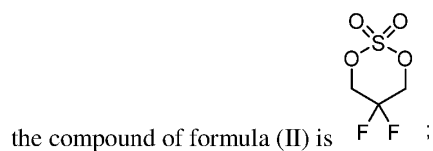
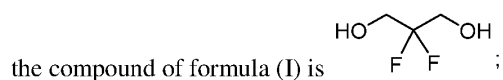
71. The process of claim 70, wherein the compound of formula (III) is:



72. The process of any one of claims 54 to 71, wherein the compound of formula (IV) is:

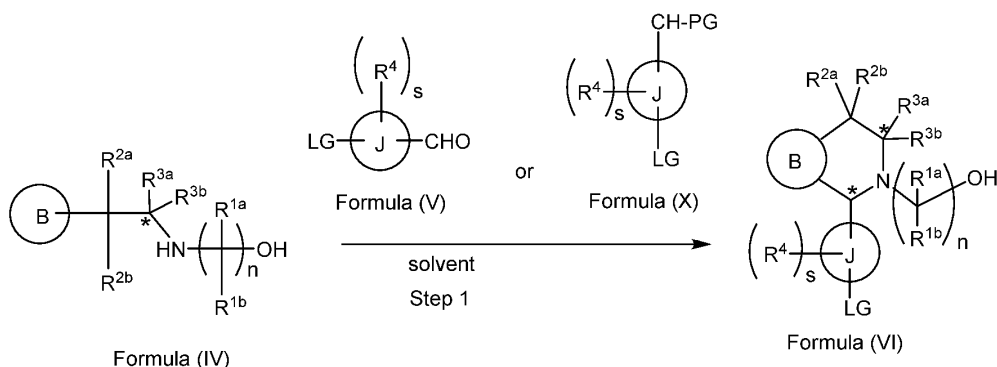


73. The process of any one of claims 54 to 72, wherein:



74. A process for preparing a compound of formula (VIII) or a salt thereof, the process comprising:

(a) reacting a reaction mixture comprising a compound of formula (IV), a compound of formula (V) or a compound of formula (X), and an organic solvent to form a compound of formula (VI) according to step 1 below



wherein

B is substituted or unsubstituted indolyl, benzofuranyl, benzothiophenyl, aza-indolyl, indazolyl, benzimidazolyl, pyrrolopyridinyl, furopyridinyl, thienopyridinyl, pyrrolopyridazinyl, pyrrolopyrimidinyl, pyrrolopyrazinyl, thienopyridazinyl, thienopyrimidinyl, thienopyrazinyl, furopyridazinyl, furopyrimidinyl, or furopyrazinyl;

each of R^{1a} and R^{1b} is independently hydrogen, fluorine, chlorine, -OH, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, and -CN, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl,

n is an integer of 2 or 3,

each of R^{2a} and R^{2b} is independently hydrogen, halogen, -OH, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, -CN, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl,

R^{3a} and R^{3b} are independently hydrogen, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, -CN, C_{3-6} cycloalkyl, C_{3-6} heterocycloalkyl, phenyl, C_{3-6} heteroaryl, or C_{3-6} spirocycloalkyl,

J is phenyl or pyridinyl;

each R^4 is independently hydrogen, halogen or C_{1-3} alkyl,

s is an integer from 0 to 2,

LG is a leaving group,

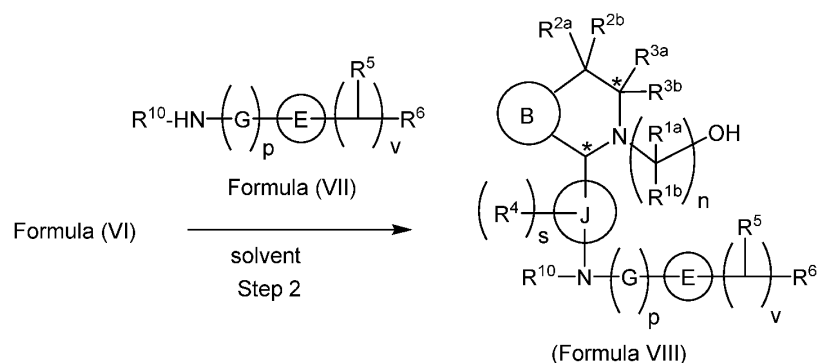
LG and CHO are located in the para position with respect to each other on J on the compound of formula (V),

PG is an aldehyde protecting group,

LG and CH-PG are located in the para position with respect to each other on J on the compound formula (X), and

each asterisk independently represents a chiral center wherein the carbon bearing R^{3a} and R^{3b} is a chiral center when R^{3a} and R^{3b} are different; and

(b) reacting a reaction mixture comprising the compound of formula (VI), an organic solvent, and a compound of formula (VII) or a salt thereof to form a compound of formula (VIII) or a salt thereof according to step 2 below



wherein

G is C_{1-3} alkyl,

p is 0 or 1,

E is substituted or unsubstituted azetidiny or pyrrolidinyl,

each R^5 is independently hydrogen, halogen, -OH, -CN, C_{1-5} alkoxy, or C_{1-5} hydroxyalkyl,

v is an integer from 1 to 5, and

R^6 is halogen or -CN;

R^{10} is hydrogen or C_{1-3} alkyl.

75. The process of claim 74, wherein B is a substituted or unsubstituted indolyl, benzofuranyl, or benzothiophenyl.

76. The process of claim 75, wherein B is a substituted or unsubstituted indolyl.

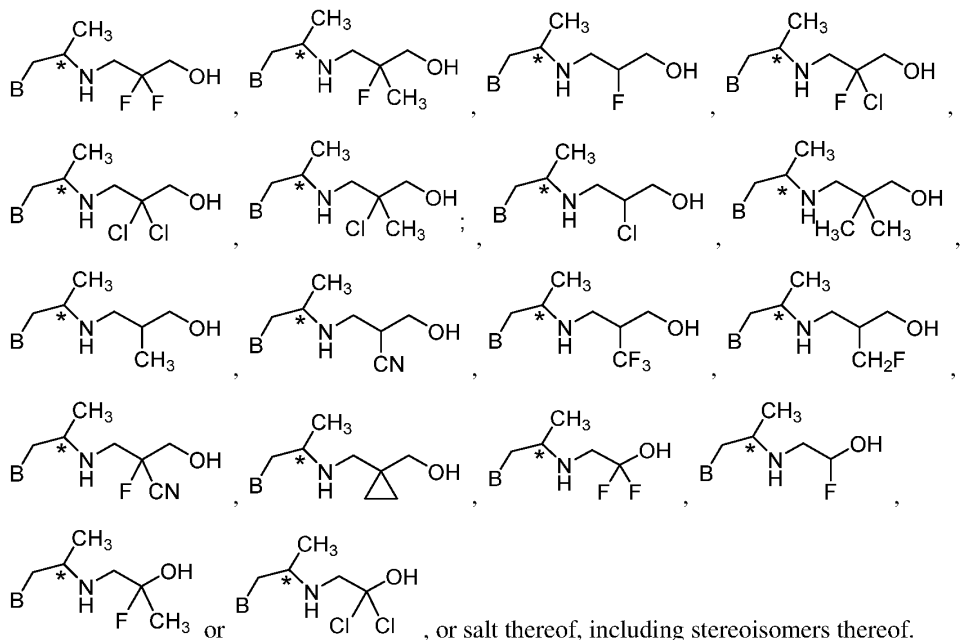
77. The process wherein 74, is a substituted or unsubstituted pyrrolopyridazinyl, pyrrolopyrimidinyl, or pyrrolopyrazinyl.

78. The process of any one of claims 74 to 77, wherein B is substituted with one or two substituents independently fluorine, chlorine, C_{1-3} alkyl, C_{1-3} haloalkyl, -CN, -OH, C_{1-3} alkoxy, or C_{1-3} hydroxyalkyl.

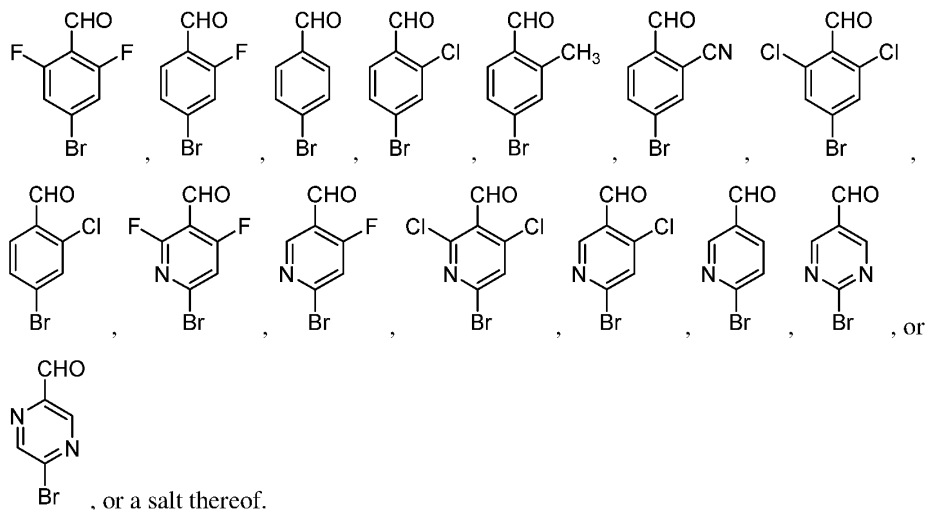
79. The process of any one of claims 74 to 78, wherein each of R^{1a} and R^{1b} is independently hydrogen, -F, -Cl, -OH, -CN, -CH₃, -CF₃, -CHF₂, -CH₂F, or spirocyclopropyl.

80. The process of any one of claims 74 to 79, wherein n is 3.

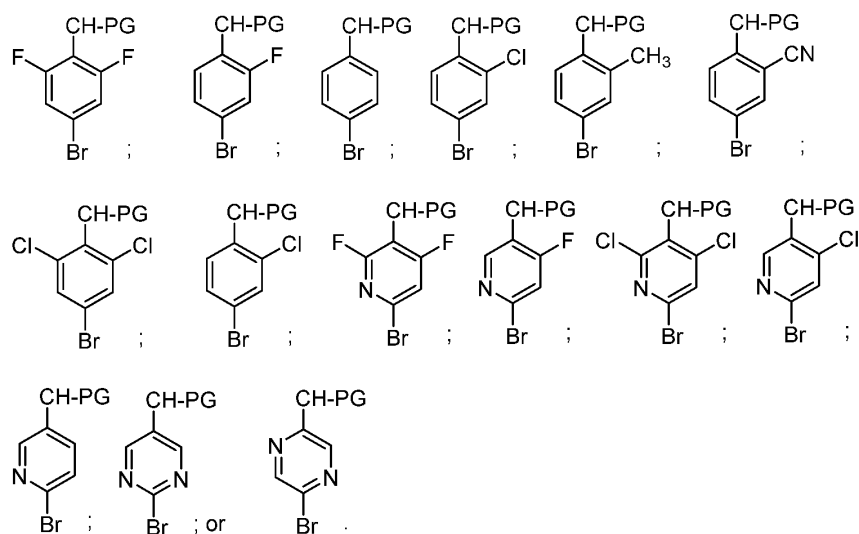
97. The process of any one of claims 74 to 96, wherein the compound of formula (IV) is:



98. The process of any one of claims 74 to 97, wherein the compound of formula (V) is:

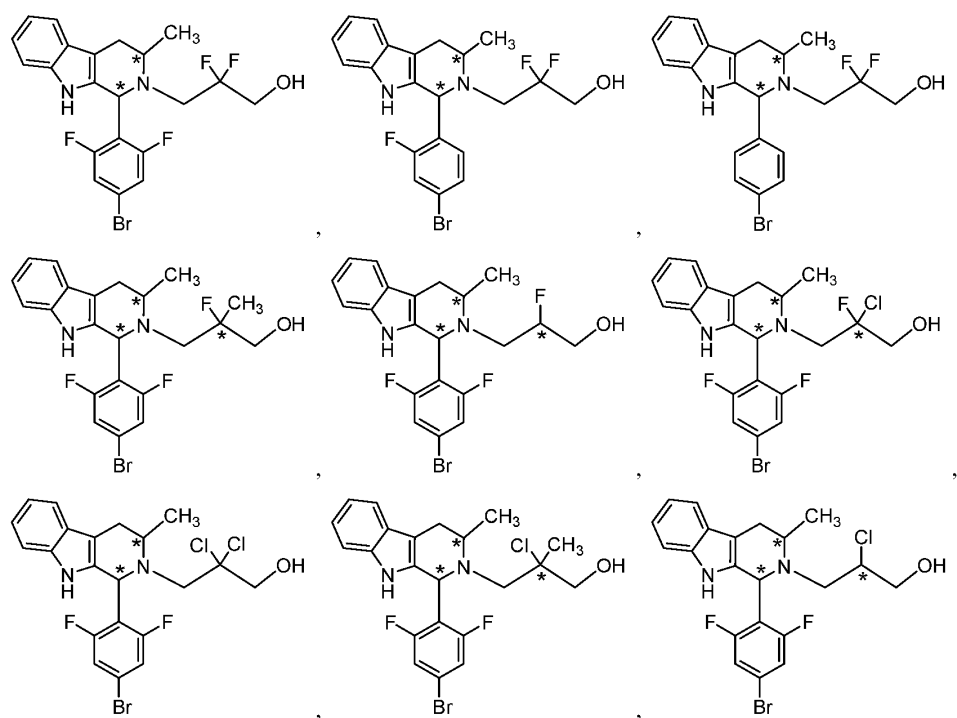


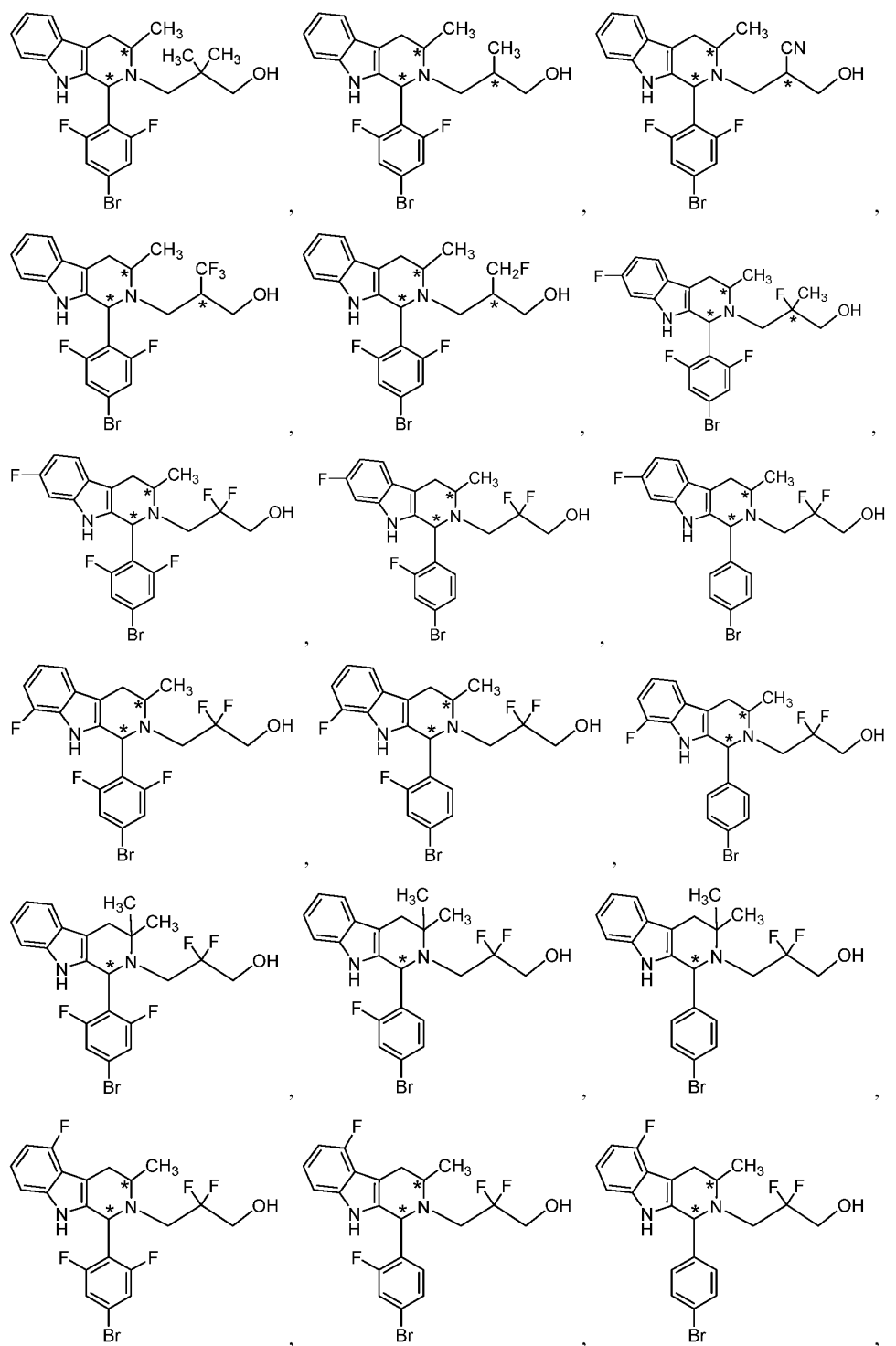
99. The process of any one of claims 74 to 98, wherein the compound of formula (X) is:

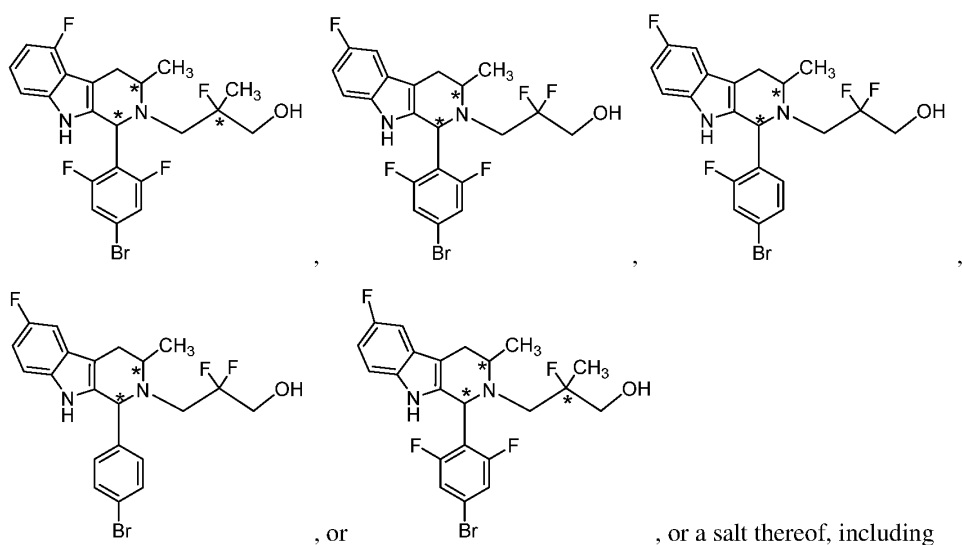


100. The process of any one of claims 74 to 99, wherein the compound of formula (VI)

is:

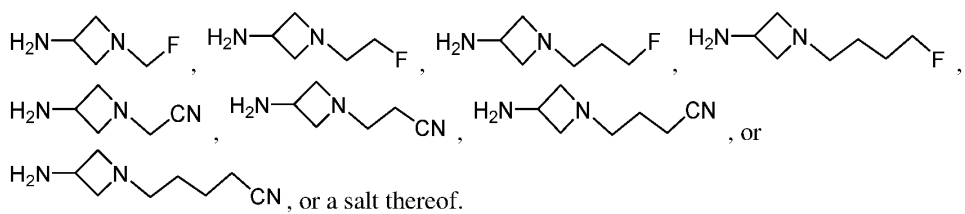






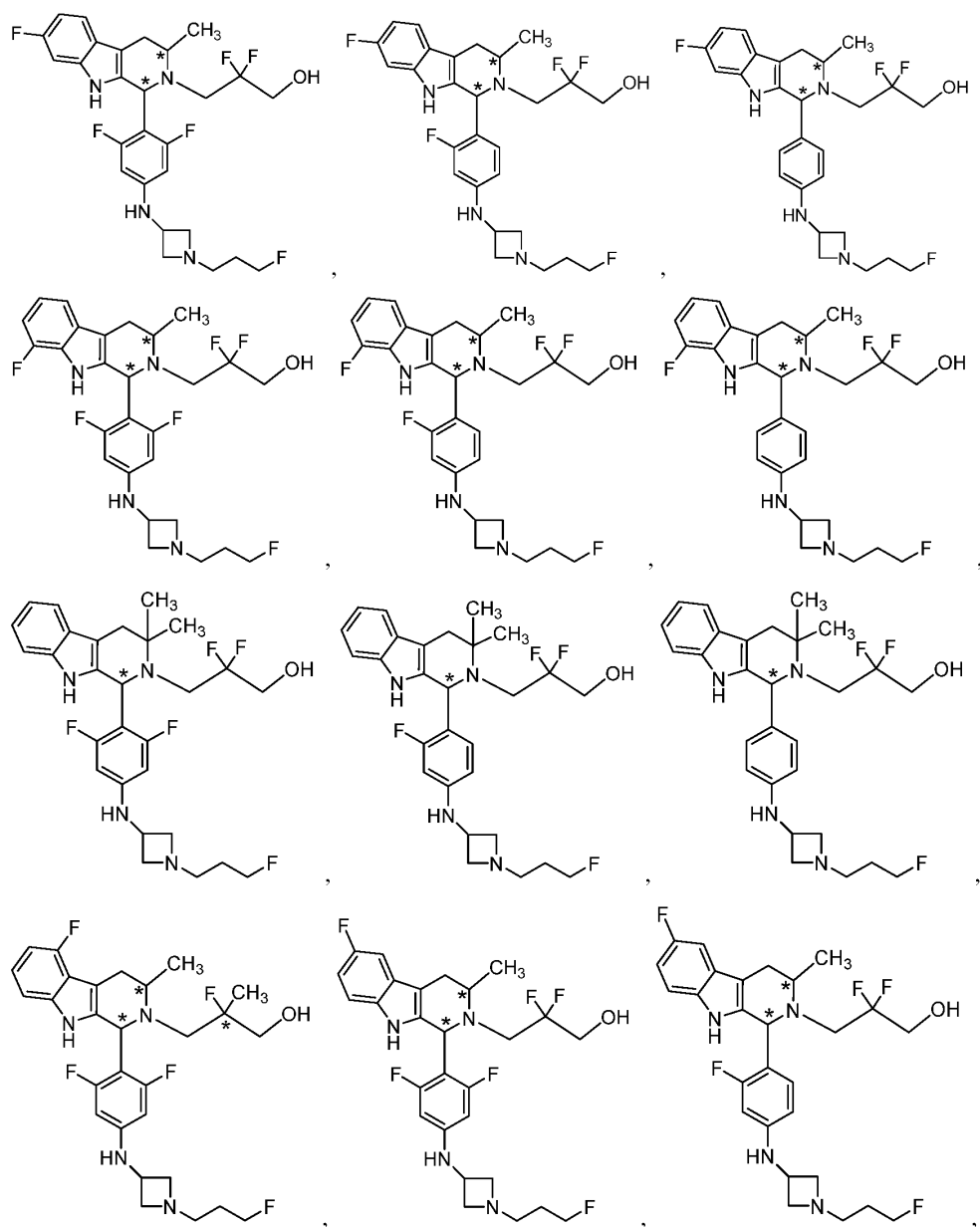
stereoisomers thereof.

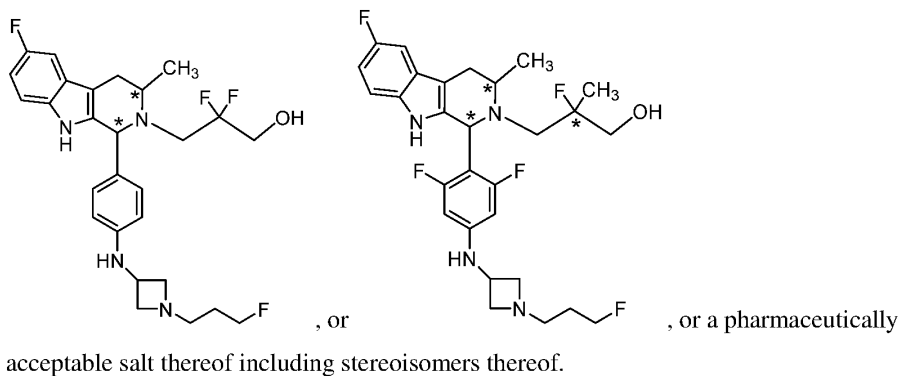
101. The process of any one of claims 74 to 100, wherein the compound of formula (VII) is:



102. The process of any one of claims 74 to 101, wherein the compound of formula (VIII) is:

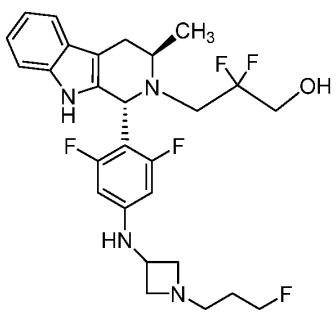






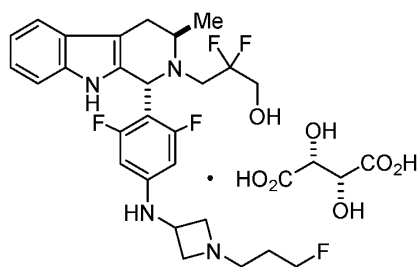
103. The process of claim 102, further comprising contacting the compound of formula (VIII) with (2*R*-3*R*)-tartaric acid in the presence of an organic solvent.

104. The process of any one of claims 74 to 103, wherein the compound of formula (VIII) is:



or a pharmaceutically acceptable salt thereof.

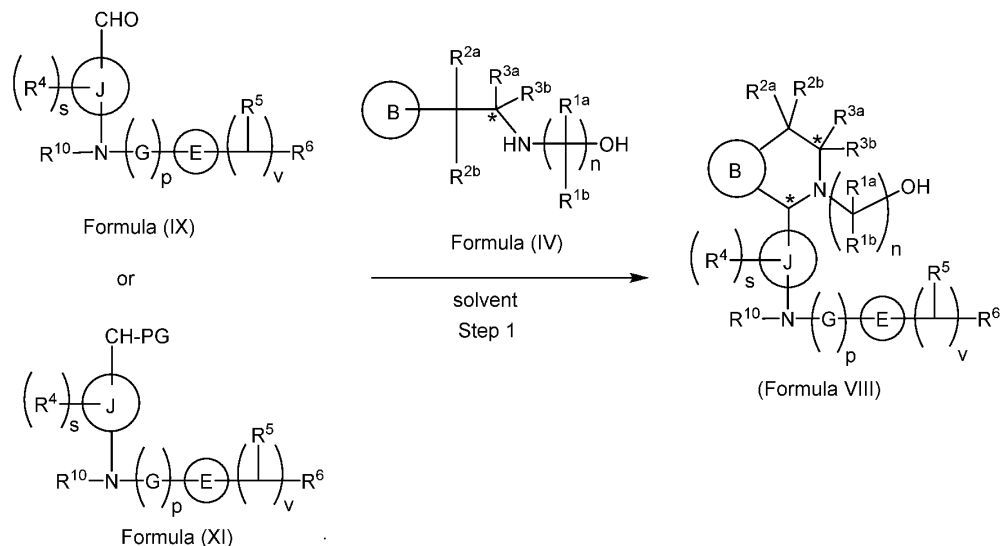
105. The process of claim 104, wherein the compound of formula (VIII) is:



106. The process of any one of claims 74 to 105, further comprising crystallizing the compound of formula (VIII) as the tartaric acid salt thereof.

107. A process for preparing a compound of formula (VIII) or a salt thereof, the process comprising reacting a reaction mixture comprising a compound of formula (IX) or a

compound of formula (XI), a compound of formula (IV) and an organic solvent to form the compound of formula (VIII) or a salt thereof according to step 1 below



wherein:

B is substituted or unsubstituted indolyl, benzofuranyl, benzothiophenyl, aza-indolyl, indazolyl, benzimidazolyl, pyrrolopyridinyl, furopyridinyl, thienopyridinyl, pyrrolopyridazinyl, pyrrolopyrimidinyl, pyrrolopyrazinyl, thienopyridazinyl, thienopyrimidinyl, thienopyrazinyl, furopyridazinyl, furopyrimidinyl, or furopyrazinyl;

each of R^{1a} and R^{1b} is independently hydrogen, halogen, $-OH$, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, and $-CN$, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl;

n is an integer of 2 or 3;

each of R^{2a} and R^{2b} is independently hydrogen, halogen, $-OH$, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, $-CN$, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl;

R^{3a} and R^{3b} are independently hydrogen, halogen, $-OH$, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, $-CN$, C_{3-6} cycloalkyl, or C_{3-6} spirocycloalkyl;

J is phenyl or pyridinyl;

each R^4 is independently hydrogen, halogen or C_{1-3} alkyl;

s is an integer from 0 to 2;

G is C_{1-3} alkyl;

p is 0 or 1;

E is substituted or unsubstituted azetidiny or pyrrolidinyl;

each R^5 is independently hydrogen, halogen, $-OH$, $-CN$, C_{1-5} alkoxy or C_{1-5} hydroxyalkyl;

v is an integer from 1 to 5;

R^6 is halogen or -CN;

R^{10} is H or C_{1-3} alkyl;

the CHO moiety and the nitrogen atom linking J and G are located in the para position with respect to each other on J on the compound of formula (IX);

PG is an aldehyde protecting group,

CH-PG and the nitrogen atom linking J and G are located in the para position with respect to each other on J on the compound of formula (XI); and

each asterisk independently represents a chiral center wherein the carbon bearing R^{3a} and R^{3b} is a chiral center when R^{3a} and R^{3b} are different.

108. The process of claim 107, wherein B is a substituted or unsubstituted indolyl, benzofuranyl, or benzothiophenyl.

109. The process of claim 108, wherein B is a substituted or unsubstituted indolyl.

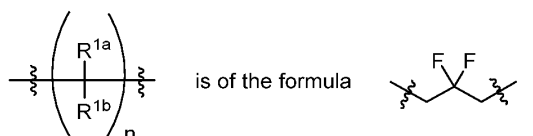
110. The process of claim 107, wherein B is a substituted or unsubstituted pyrrolopyridazinyl, pyrrolopyrimidinyl, or pyrrolopyrazinyl.

111. The process of any one of claims 107 to 110, wherein B is substituted with one or two substituents independently fluorine, chlorine, C_{1-3} alkyl, C_{1-3} haloalkyl, -CN, -OH, C_{1-3} alkoxy or C_{1-3} hydroxyalkyl.

112. The process of any one of claims 107 to 111, wherein each of R^{1a} and R^{1b} is independently hydrogen, F, -Cl, -OH, -CN, -CH₃, -CF₃, -CHF₂, -CH₂F, or spirocyclopropyl.

113. The process of any one of claims 107 to 112, wherein n is 3.

114. The process of any one of claims 107 to 113, wherein:

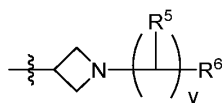


115. The process of any one of claims 107 to 114, wherein each of R^{2a} and R^{2b} is hydrogen.

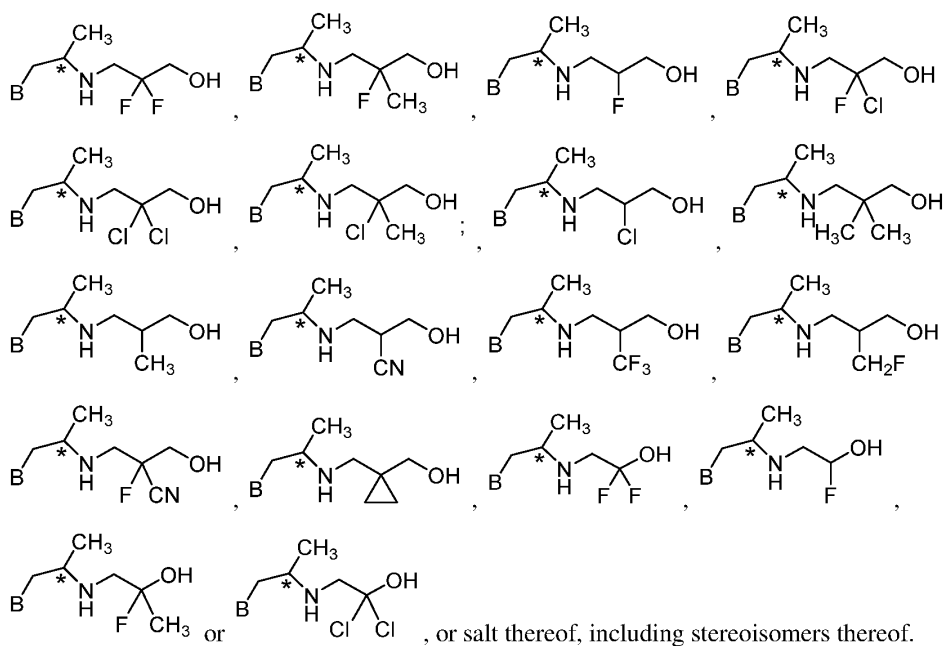
116. The process of any one of claims 107 to 115, wherein R^{3a} and R^{3b} are independently hydrogen or -CH₃.

117. The process of any one of claims 107 to 116, wherein J is phenyl.

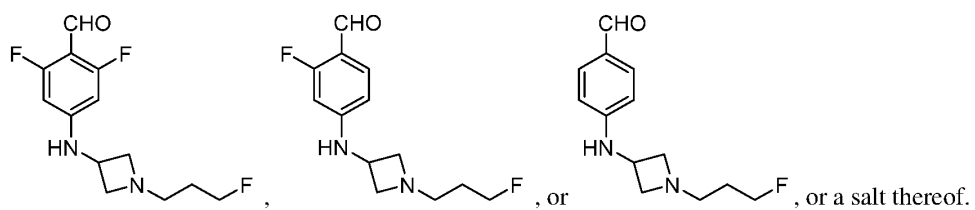
118. The process of any one of claims 107 to 117, wherein E is azetidiny of the following structure:



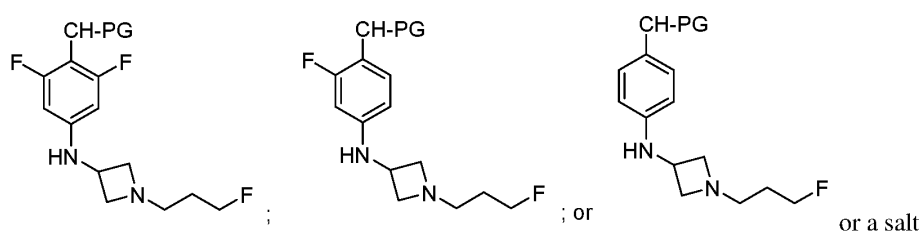
119. The process of any one of claims 107 to 118, wherein each R^4 is fluorine.
120. The process of any one of claims 107 to 119, wherein s is 2.
121. The process of any one of claims 107 to 120, wherein p is 0.
122. The process of any one of claims 107 to 121, wherein each R^5 is hydrogen.
123. The process of any one of claims 107 to 122, wherein v is 3.
124. The process of any one of claims 107 to 123, wherein R^6 is fluorine.
125. The process of any one of claims 107 to 124, wherein the organic solvent is a polar protic solvent.
126. The process of any one of claims 107 to 125, wherein the compound of formula (IV) is:



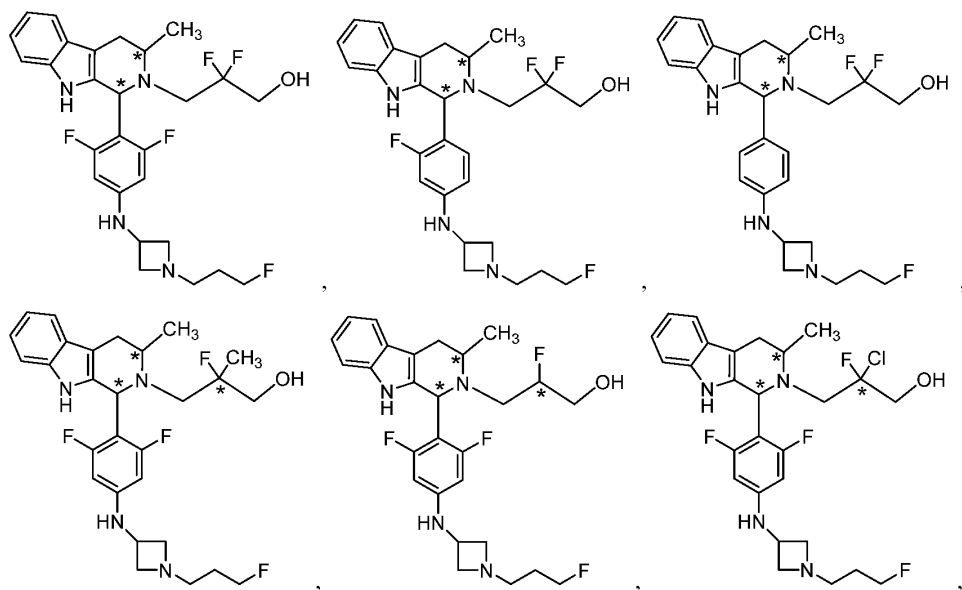
127. The process of any one of claims 107 to 126, wherein the compound of formula (IX) is:

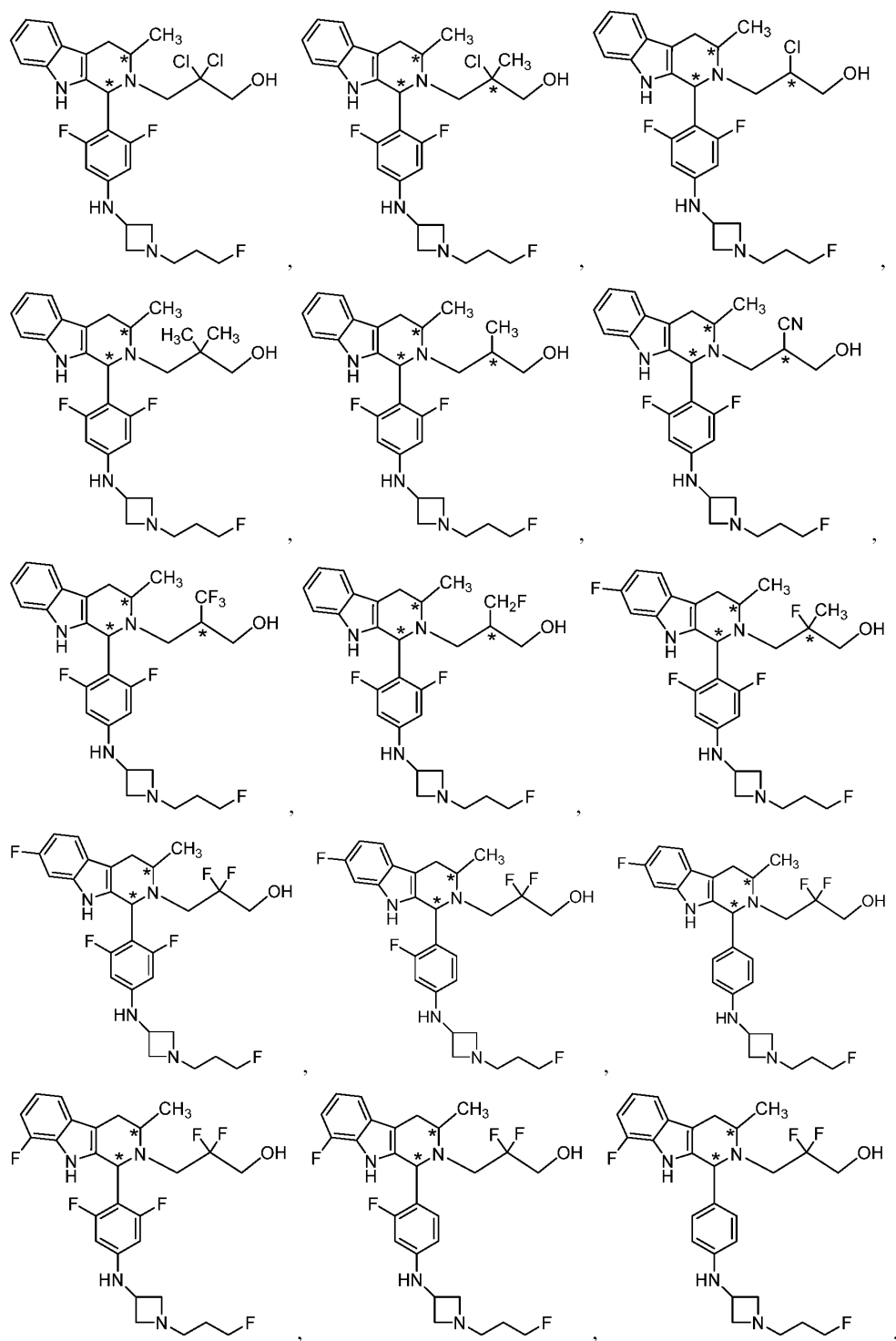


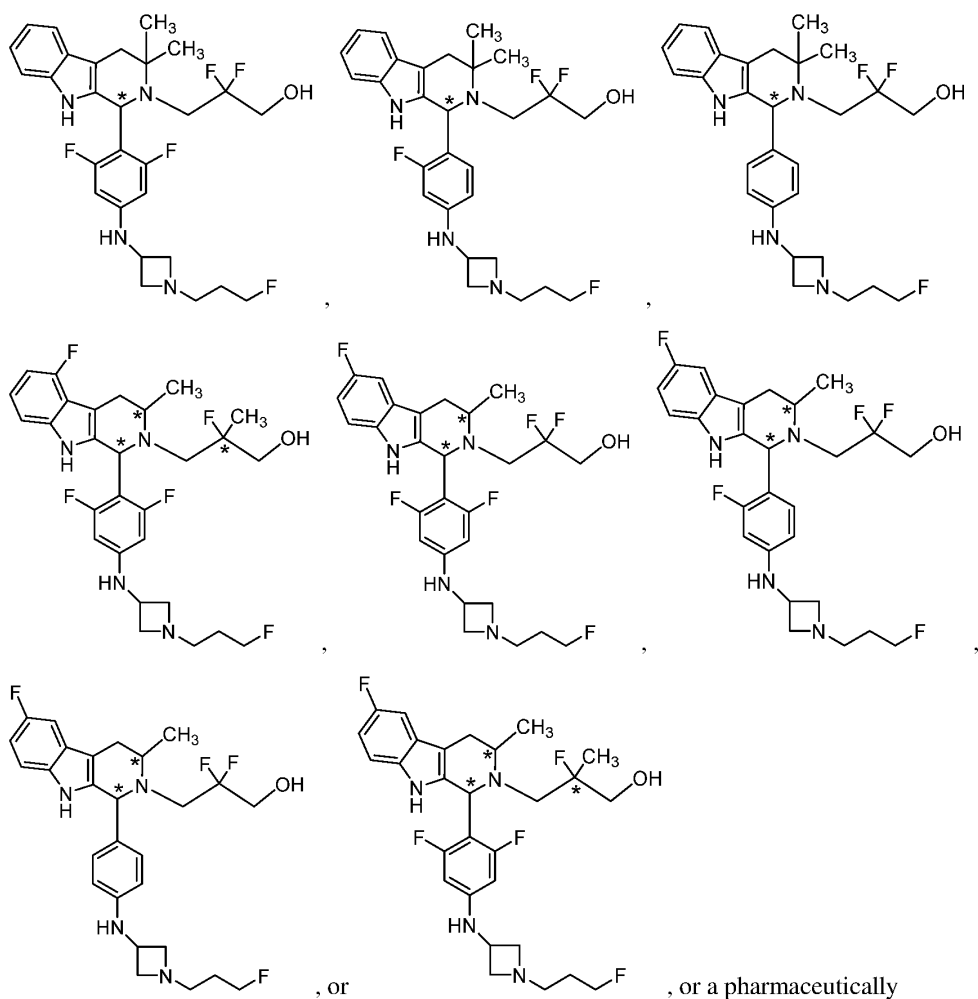
128. The process of any one of claims 107 to 127, wherein the compound of formula (XI) is:



129. The process of any one of claims 107 to 128, wherein the compound of formula (VIII) is:



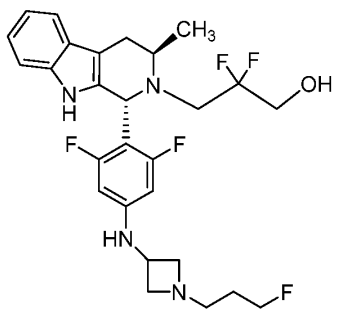




acceptable salt thereof including stereoisomers thereof.

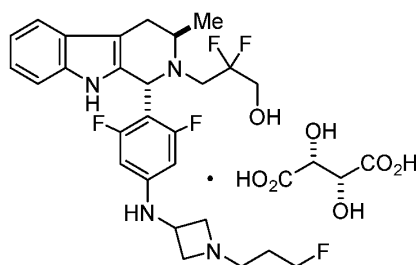
130. The process of any one of claims 107 to 129, further comprising contacting the compound of formula (VIII) with (2*R*-3*R*)-tartaric acid in the presence of an organic solvent.

131. The process of any one of claims 107 to 130, wherein the compound of formula (VIII) is:



or a pharmaceutically acceptable salt thereof.

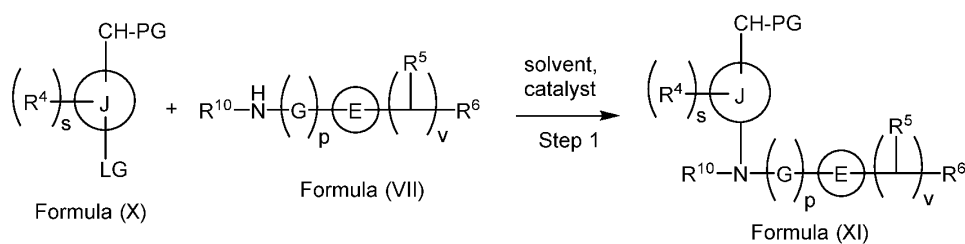
132. The process of claim 131, wherein the compound of formula (VIII) is:



133. The process of any one of claims 107 to 132, further comprising crystallizing the compound of formula (VIII) as the tartaric acid salt thereof.

134. A process for preparing a compound of formula (IX) or a salt thereof, the process comprising:

(1) reacting a reaction mixture comprising a compound of formula (X), a compound of formula (VII) or a salt thereof, an organic solvent and a catalyst to form a compound of formula (XI) according to step 1 below



wherein

J is phenyl or pyridinyl;

each R⁴ is independently hydrogen, halogen or C₁₋₃ alkyl,

s is an integer from 0 to 2,

LG is a leaving group,

PG is an aldehyde protecting group,

LG and CH-PG are located in the para position with respect to each other on J,

G is C₁₋₃ alkyl,

p is 0 or 1,

E is substituted or unsubstituted azetidinyll or pyrrolidinyl,

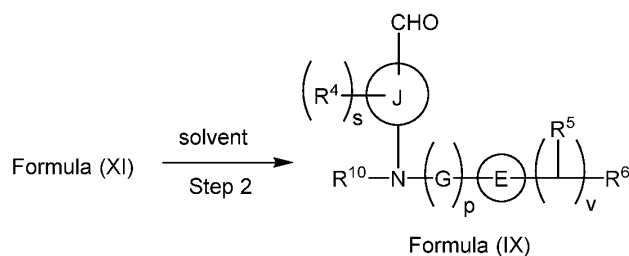
each R⁵ is independently hydrogen, halogen, -OH, -CN, C₁₋₅ alkoxy or C₁₋₅ hydroxyalkyl,

v is an integer from 1 to 5,

R⁶ is halogen or -CN, and

R¹⁰ is hydrogen or C₁₋₃ alkyl; and

(2) deprotecting the compound of formula (XI) to form the compound of formula (IX) according to step 2 below



135. The process of claim 134, wherein J is phenyl.

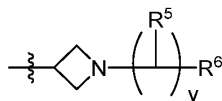
136. The process of claim 134 or claim 135, wherein each R⁴ is fluorine.

137. The process of any one of claims 134 to 136, wherein s is 2.

138. The process of any one of claims 134 to 137, wherein the leaving group is bromine.

139. The process of any one of claims 134 to 138, wherein p is 0.

140. The process of any one of claims 134 to 139, wherein E is azetidinyll of the following structure:



141. The process of any one of claims 134 to 140, wherein each R⁵ is hydrogen.

142. The process of any one of claims 134 to 141, wherein v is 3.

143. The process of any one of claims 134 to 142, wherein R⁶ is fluorine.

144. The process of any one of claims 134 to 143, wherein the compound of formula (VII) is a salt of an acid.

145. The process of any one of claims 134 to 144, wherein the aldehyde protecting group is a trialkylorthoformate.

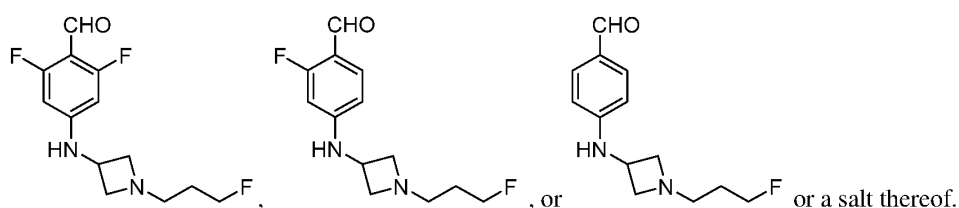
146. The process of any one of claims 134 to 145, wherein the step 1 organic solvent is a non-polar solvent.

147. The process of any one of claims 134 to 146, wherein the step 1 catalyst is a transition metal catalyst.

148. The process of any one of claims 134 to 147, wherein the step 2 organic solvent is a non-polar solvent.

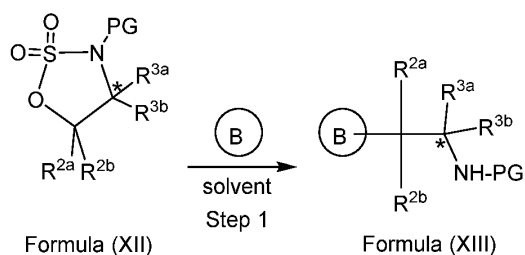
149. The process of any one of claims 134 to 148, wherein the compound of formula (XI) is deprotected by contact with an acid.

150. The process of any one of claims 134 to 149, wherein the compound of formula (IX) is:



151. A process for preparing a compound of formula (III) or a salt thereof, the process comprising:

(1) reacting a reaction mixture comprising a compound of formula (XII), a compound B and an organic solvent to form the compound of formula (XIII) according to step 1 below



wherein:

B is selected from substituted or unsubstituted indolyl, benzofuranyl, benzothiophenyl, aza-indolyl, indazolyl, benzimidazolyl, pyrrolopyridinyl, furopyridinyl, thienopyridinyl,

pyrrolopyridazinyl, pyrrolopyrimidinyl, pyrrolopyrazinyl, thienopyridazinyl, thienopyrimidinyl, thienopyrazinyl, furopyridazinyl, furopyrimidinyl, and furopyrazinyl,

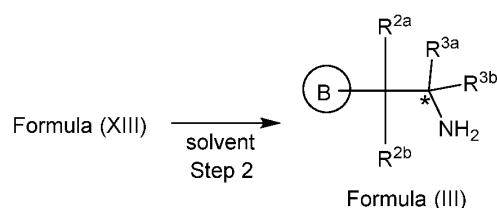
each of R^{2a} and R^{2b} is independently selected from hydrogen, halogen, -OH, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, -CN, C_{3-6} cycloalkyl, and C_{3-6} spirocycloalkyl,

R^{3a} and R^{3b} are independently selected from hydrogen, halogen, -OH, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} alkoxy, C_{1-3} hydroxyalkyl, -CN, C_{3-6} cycloalkyl, and C_{3-6} spirocycloalkyl,

PG is an amine protecting group, and

each asterisk represents a chiral center when R^{3a} and R^{3b} are different; and

(2) deprotecting the compound of formula (XIII) to form the compound of formula (III) according to step 2 below



152. The process of claim 151, wherein B is a substituted or unsubstituted indolyl, benzofuranyl, or benzothiophenyl.

153. The process of claim 152, wherein B is a substituted or unsubstituted indolyl.

154. The process of claim 151, wherein B is a substituted or unsubstituted pyrrolopyridazinyl, pyrrolopyrimidinyl, or pyrrolopyrazinyl.

155. The process of any one of claims 151 to 154, wherein B is substituted with one or two substituents independently selected from fluorine, chlorine, C_{1-3} alkyl, C_{1-3} haloalkyl, -CN, -OH, C_{1-3} alkoxy and C_{1-3} hydroxyalkyl.

156. The process of any one of claims 151 to 155, wherein each of R^{2a} and R^{2b} is hydrogen.

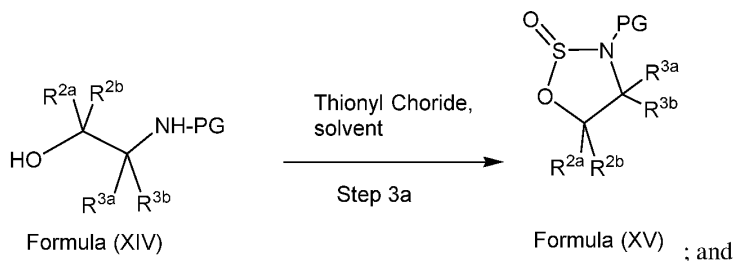
157. The process of any one of claims 151 to 156, wherein R^{3a} and R^{3b} are independently selected from hydrogen and -CH₃.

158. The process of any one of claims 151 to 157, wherein the step 1 organic solvent is a non-polar solvent.

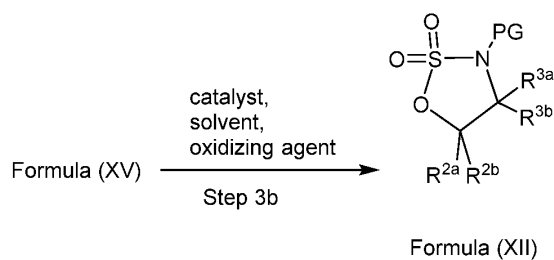
159. The process of any one of claims 151 to 158, wherein the step 1 reaction mixture further comprises a catalyst.

160. The process of any one of claims 151 to 159, further comprising preparing the compound of formula (XII) or a salt thereof, the process comprising:

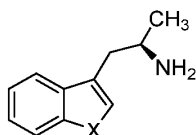
(1) reacting a reaction mixture comprising a compound of formula (XIV), thionyl chloride, and an organic solvent to form a compound of formula (XV) according to step 3a below



(2) reacting a reaction mixture comprising the compound of formula (XV), a catalyst, an oxidizing agent, and an organic solvent to form the compound of formula (XII) according to step 3a below

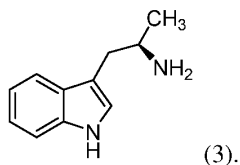


161. The process of any one of claims 151 to 160, wherein the compound of formula (III) is:

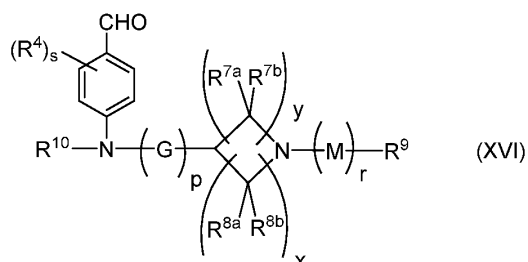


wherein X is selected from -NH-, -N-C₁-C₃ unsubstituted alkyl, -O- and -S-.

162. The process of any one of claims 151 to 161, wherein the compound of formula (III) is of the structure:



163. A compound of formula (XVI)



wherein:

each R^4 is independently selected from hydrogen, halogen and C_{1-3} alkyl;

s is an integer from 0 to 2;

G is C_{1-3} alkyl;

p is 0 or 1;

each R^{7a} and R^{7b} is independently selected from hydrogen, halogen, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} hydroxyalkyl, and $-CN$;

each R^{8a} and R^{8b} is independently selected from hydrogen, halogen, C_{1-3} alkyl, C_{1-3} haloalkyl, C_{1-3} hydroxyalkyl, and $-CN$;

R^{10} is hydrogen or C_{1-3} alkyl;

y is an integer selected from 1 and 2, x is an integer selected from 1 and 2, and the total of x and y is 2 or 3;

M is substituted or unsubstituted C_{1-5} alkyl;

r is 0 or 1; and

R^9 is halogen or $-CN$.

164. The compound of claim 163, wherein each R^4 is independently selected from hydrogen, fluorine and $-CH_3$.

165. The compound of claim 163 or claim 164, wherein each R^4 is fluorine.

166. The compound of any one of claims 163 to 165, wherein s is 1 or 2.

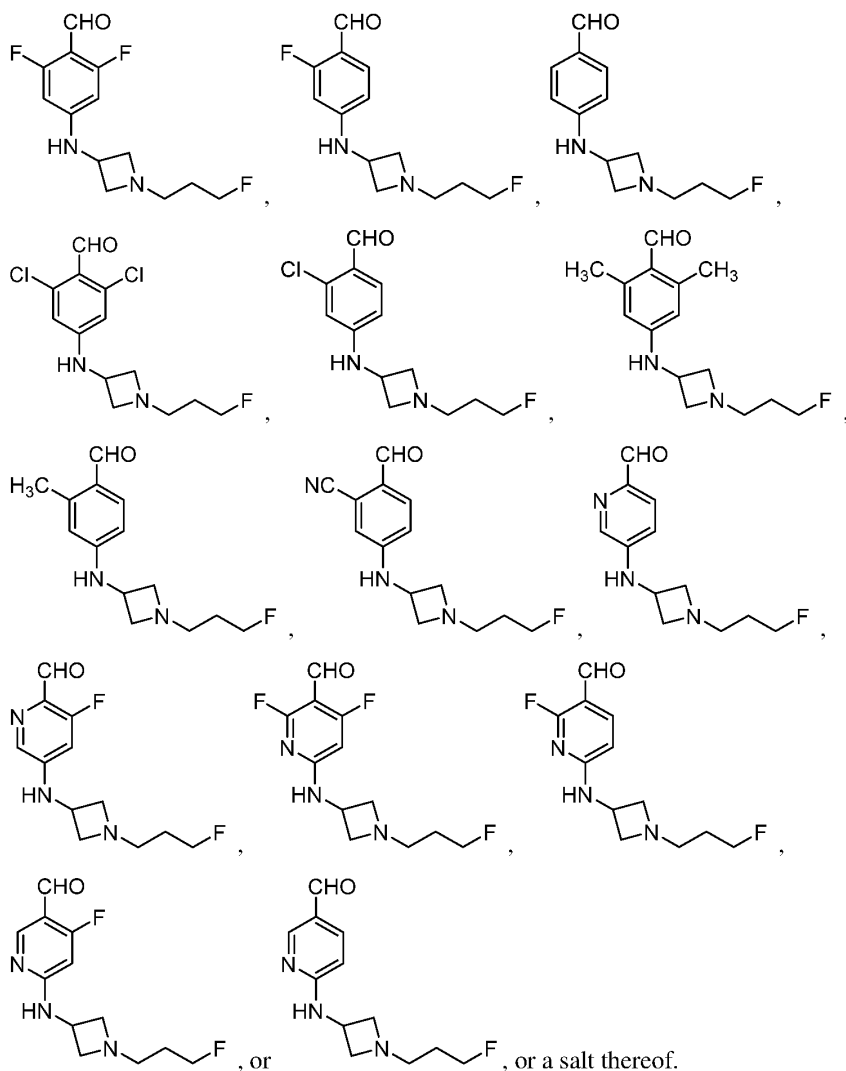
167. The compound of any one of claims 163 to 166, wherein p is 0.

168. The compound of any one of claims 163 to 167, wherein each of R^{7a} , R^{7b} , R^{8a} and R^{8b} is independently selected from hydrogen, fluorine, $-CH_3$, and $-CN$.

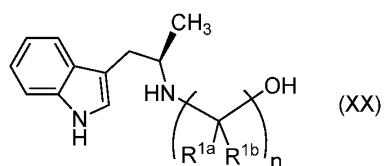
169. The compound of any one of claims 163 to 168, wherein each of R^{7a} , R^{7b} , R^{8a} and R^{8b} is hydrogen.

170. The compound of any one of claims 163 to 169, wherein M is $-CH_2CH_2CH_2-$, p is 1, and R^9 is fluorine.

171. The compound of any one of claims 163 to 170, wherein compound formula (XVI) is selected from:

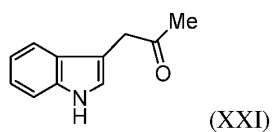


172. A process for preparing a compound having formula (XX):

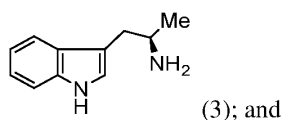


the process comprising:

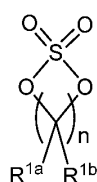
contacting a compound of formula (XXI)



with a protein transaminase to form a compound of formula (3):



contacting the compound of formula (3) with a compound of formula (II) to form compound formula (XX)



Formula (II) ,

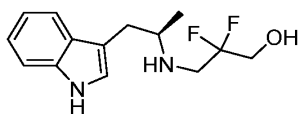
wherein

n is 3; and

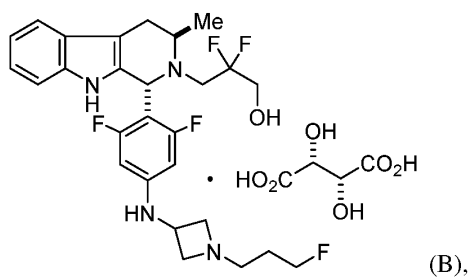
each of R^{1a} and R^{1b} is independently selected from hydrogen, halogen, -OH, C₁₋₃ alkyl, C₁₋₃ haloalkyl, C₁₋₃ alkoxy, C₁₋₃ hydroxyalkyl, -CN, C₃₋₆ cycloalkyl, and C₃₋₆ spirocycloalkyl.

173. The process of claim 172, wherein the protein transaminase is selected from a (S)-enantioselective transaminase of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, and SEQ ID NO:4.

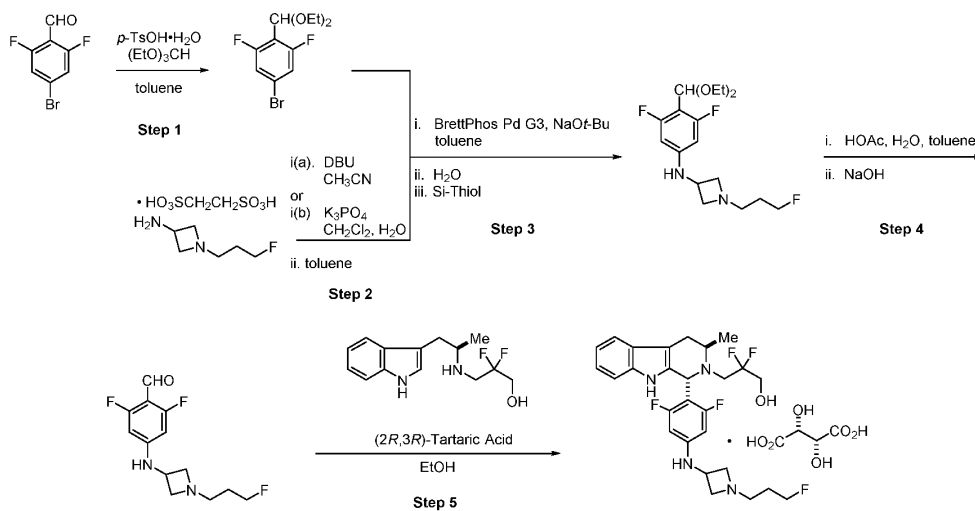
174. The process of claim 171 or claim 172, wherein compound formula (XX) is of the structure:



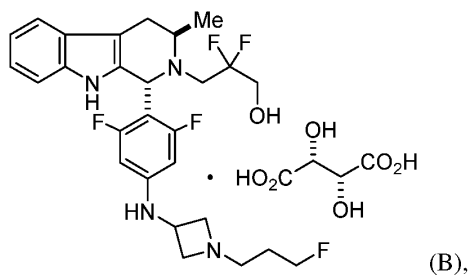
175. A process for the preparation of Compound B,



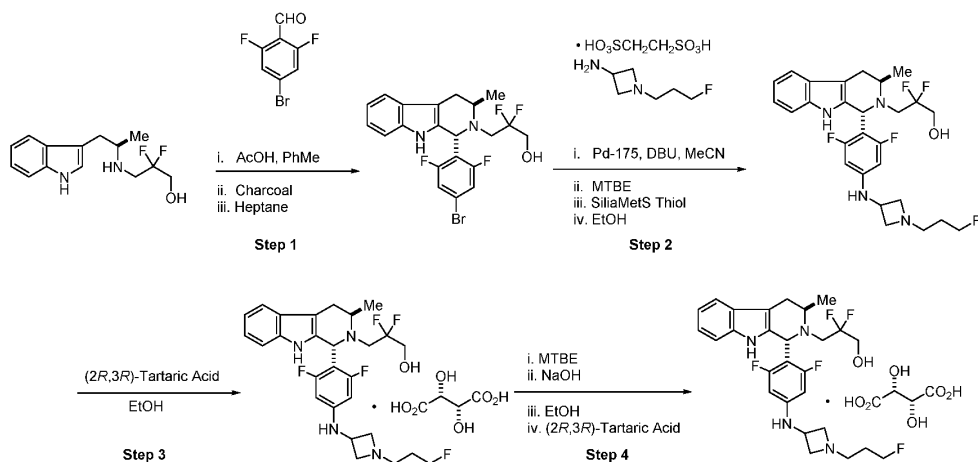
wherein the process comprises the steps of:



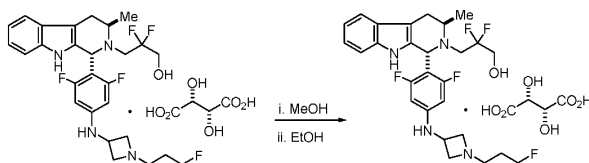
176. A process for the preparation of Compound B,



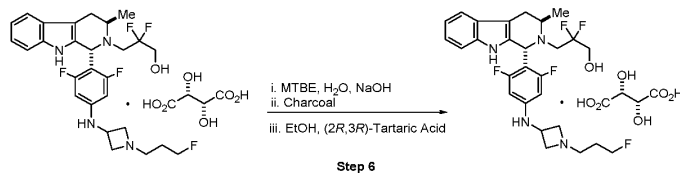
wherein the process comprises the steps of:



177. The process of claim 175 or 176, wherein the process further comprises recrystallization of Compound B in methanol and ethanol;



178. The process of claim 175 or 176, wherein the process further comprises recrystallization of Compound B in MTBE, water, NaOH and ethanol;



179. The process of any one of claims 175-178, wherein the indolyl intermediates are synthesized according to the steps:

