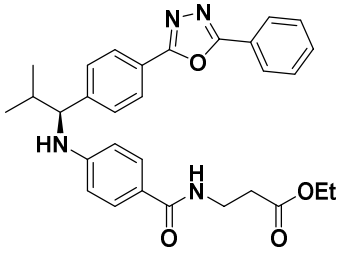
WHAT IS CLAIMED IS:

1. A crystalline form of a compound of formula (1),



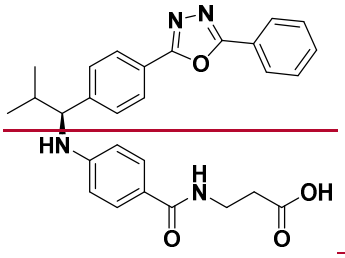
(1)

characterized by an X-ray diffraction (XRD) pattern having peaks at about 14.2, 15.6, 16.4, 20.1, 20.5 and 21.2° ± 0.2° 2θ.

2. The crystalline form of claim 1, wherein the XRD pattern further has peaks at about 17.4, 21.7 or 23.7° ± 0.2° 2θ.

3. The crystalline form of claim 1, wherein the XRD pattern is substantially as depicted in any of FIG. 1 to FIG. 4.

~~4. A crystalline form of a compound of formula (2),~~



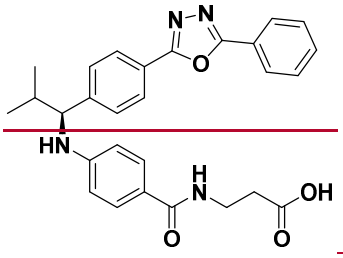
~~(2)~~

~~characterized by an XRD pattern having peaks at about 14.5, 18.6, 20.1, 21.8, 23.8, 25.0° ± 0.2° 2θ.~~

~~5. The crystalline form of claim 4, wherein the XRD pattern further has peaks at about 19.9, 22.0, 28.5 or 31.0° ± 0.2° 2θ.~~

6. The crystalline form of claim 4, wherein the XRD pattern is substantially as depicted in FIG. 5 or FIG. 6.

7. A salt of a compound of formula (2),



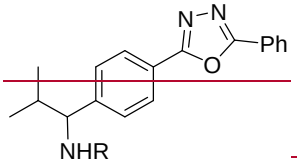
(2)

characterized by an XRD pattern substantially as depicted in any of FIG. 7 to FIG. 10.

8. The salt of claim 7, which is a metal salt of group IA or group IIA.

9. The salt of claim 7, which is a socium salt, a potassium salt, a magnesium salt or a calcium salt.

10. A compound of formula (3),



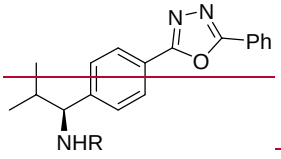
(3)

or a salt thereof,

wherein R is H, C_{1-6} alkyl being optionally substituted with phenyl, C_{2-6} alkenyl, $-S(=O)R_1$, $-P(=O)R_2R_3$ or phenyl substituted with $-COOR_4$;

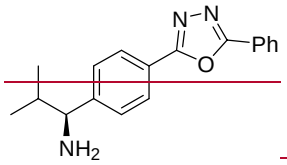
wherein R_1 is C_{1-6} alkyl, R_2 is aryl, R_3 is aryl, and R_4 is H or C_{1-6} alkyl.

11. The compound of claim 10, which is represented by the following formula (3'),



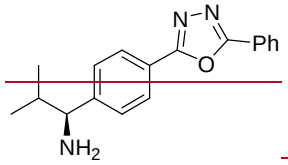
(3').

12. The compound of claim 10, which is represented by the following formula (3-1),



(3-1).

13. A process for preparing a compound of formula (3-1), comprising the following steps:

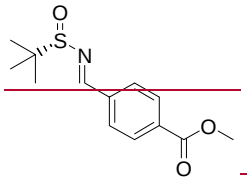


(3-1)

reacting methyl 4-formylbenzoate to form the compound of formula (3-1).

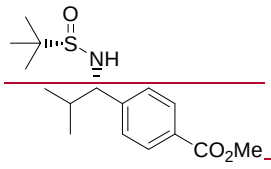
14. The process of claim 13, wherein the step of reacting methyl 4-formylbenzoate to form the compound of formula (3-1) comprises the following steps:

reacting methyl 4-formylbenzoate to form a compound of formula (A);



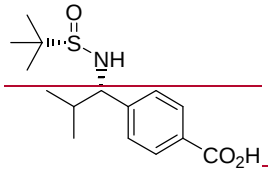
(A)

reacting the compound of formula (A) to form a compound of formala (B);



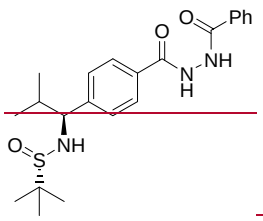
(B)

reacting the compound of formula (B) to form a compound of formula (C);



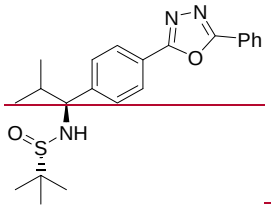
(C)

reacting the compound of formula (C) to form a compound of formula (D);



(D)

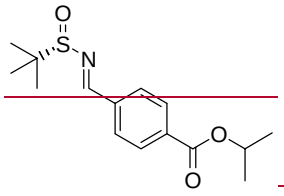
reacting the compound of formula (D) to form a compound of formula (E); and



(E)

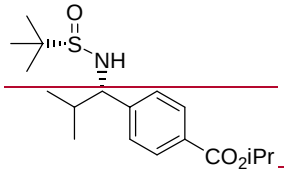
reacting the compound of formula (E) to form the compound of the formula (3-1).

15. The process of claim 14, wherein a compound of formula (A') is further formed in the step of reacting methyl 4-formylbenzoate to form the compound of formula (A):



(A').

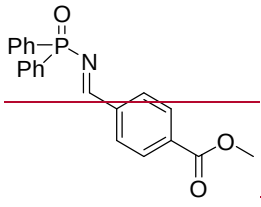
16. The process of claim 15, wherein a compound of (B') is further formed in the step of reacting the compound of formula (A) to form the compound of formula (B):



(B').

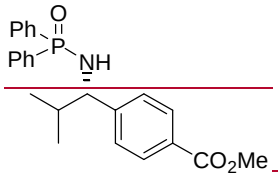
17. The process of claim 13, wherein the step of reacting methyl 4-formylbenzoate to form the compound of formula (3-1) comprises the following steps:

reacting methyl 4-formylbenzoate to form a compound of formula (G);



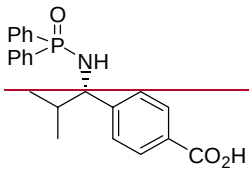
(G)

reacting the compound of formula (G) to form a compound of formula (H);



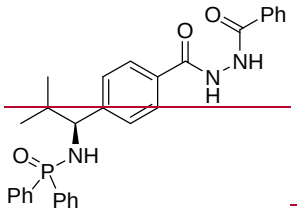
(H)

reacting the compound of formula (H) to form a compound of formula (I);



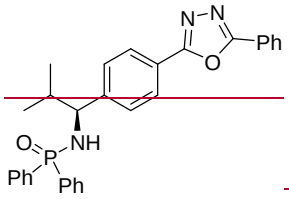
(I)

reacting the compound of formula (I) to form a compound of formula (J);



(J)

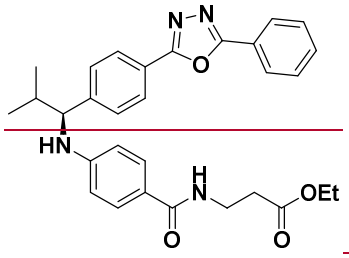
reacting the compound of formula (J) to form a compound of formula (K); and



(K)

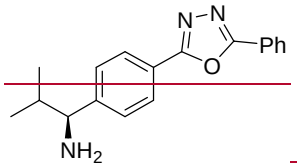
reacting the compound of formula (K) to form the compound of formula (3-1).

18. A process for preparing a compound of formula (1), comprising the following steps:



(1)

reacting a compound of formula (3-1) to form the compound of formula (1):



(3-1).

19. The process of claim 18, wherein the compound of formula (3-1) is reacted with ethyl 3-(4-halobenzamido) propanoate to obtain the compound of formula (1).

20. The process of claim 19, wherein ethyl 3-(4-halobenzamido) propanoate is ethyl 3-(4-bromobenzamido) propanoate or ethyl 3-(4-iodobenzamido) propanoate.

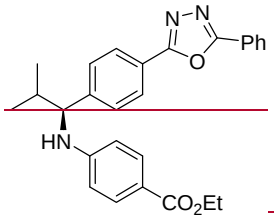
21. The process of claim 19, wherein the compound of formula (3-1) is reacted with ethyl 3-(4-halobenzamido) propanoate by using a ligand and a base.

22. The process of claim 21, wherein the ligand is BINAP or XPhos.

23. The process of claim 21, wherein the base is Cs_2CO_3.

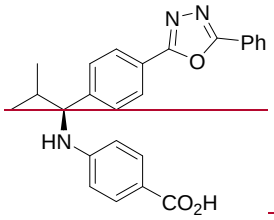
24. The process of claim 18, wherein the step of reacting the compound of formula (3-1) to form the compound of formula (1) comprises the following steps:

reacting the compound of formula (3-1) to form a compound of formula (U);



(U)

coverting the compound of formula (U) into a compound of formula (V); and



(V)

reacting the compound of formula (V) to form the compound of formula (1).

25. The process of claim 24, wherein the compound of formula (3-1) is reacted with ethyl 4-(((trifluoromethyl)sulfonyl)oxy) benzoate or ethyl 4-halobenzoate to form the compound of formula (U).

26. The process of claim 25, wherein ethyl 4-halobenzoate is ethyl 4-bromobenzoate or ethyl 4-iodobenzoate.

27. The process of claim 25, wherein the compound of formula (3-1) is reacted with ethyl 4-(((trifluoromethyl)sulfonyl)oxy) benzoate or ethyl 4-halobenzoate by using a ligand and a base.

28. The process of claim 27, wherein the ligand is BIANP, XPhos, SPhos or CyJohnPhos.

29. The process of claim 27, wherein the base is Cs_2CO_3.

30. The process of claim 24, wherein the compound of formula (U) is coverted to the compound of formula (V) by using a base.

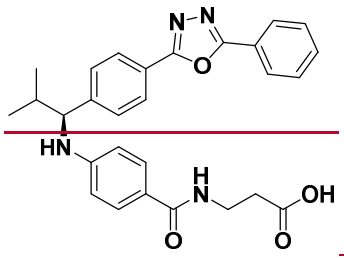
31. The process of claim 30, wherein the base is LiOH, NaOH or KOH.

32. The process of claim 24, wherein the compound of formula (V) is reacted with ethyl 3-aminopropanoate hydrochloride to form the compound of formula (1).

33. The process of claim 32, wherein the compound (V) is reacted with ethyl 3-aminopropanoate hydrochloride by using a coupling agent.

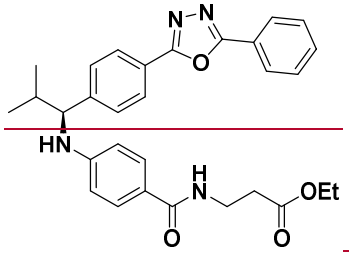
~~34. The process of claim 33, wherein the coupling agent is EDCI, HOBt, HBTU, HATU, CDMT, PyBOP or a combination thereof.~~

~~35. A process for preparing a compound of formula (2), comprising the following steps:~~



~~(2)~~

~~coverting a compound of formula (1) into the compound of formula (2):~~



~~(1).~~

~~36. The process of claim 35, wherein the compound of formula (1) is converted into the compound of formula (2) by using a base.~~

~~37. The process of claim 36, wherein the base is LiOH, NaOH or KOH.~~