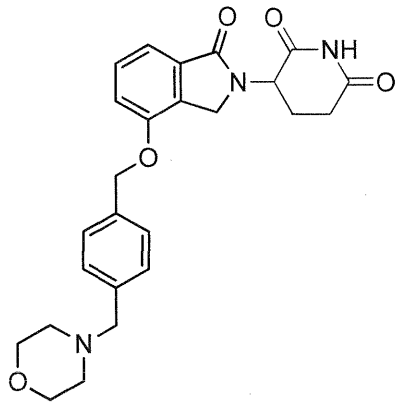
susceptible to polymorphism, wherein a given multiple-component composition may exist in more than one three-dimensional crystalline arrangement. The discovery of solid forms is of great importance in the development of a safe, effective, stable and marketable pharmaceutical compound.

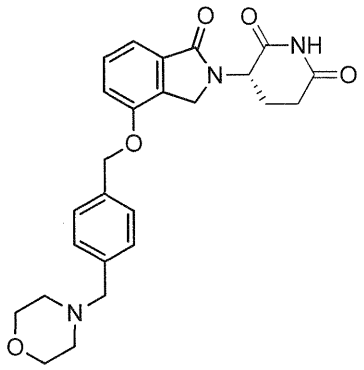
3. SUMMARY

[0017] Provided herein are salts and solid forms of the compound of formula (I) or a stereoisomer thereof, solid forms of the salts, and methods of synthesizing the salts and solid forms.



(I).

[0017a] In a first aspect of the present disclosure, there is provided solid form comprising a salt, hydrate, or solvate of Compound (I-S):



(I-S),

wherein the solid form is crystalline, wherein the solid form comprises Compound (I-S) and water, having an XRPD pattern comprising peaks at approximately 8.31, 11.80, and 17.37 degrees 2θ;

comprises Compound (I-S) and THF, having an XRPD pattern comprising peaks at approximately 11.80, 20.89, and 22.16 degrees 2θ;

comprises a besylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 19.07, 20.71, and 23.96 degrees 2θ;

comprises a DMSO solvate of a besylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 16.88, 18.14, and 20.02 degrees 2θ;

comprises a D-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 17.00, 19.73, and 25.86 degrees 2θ;

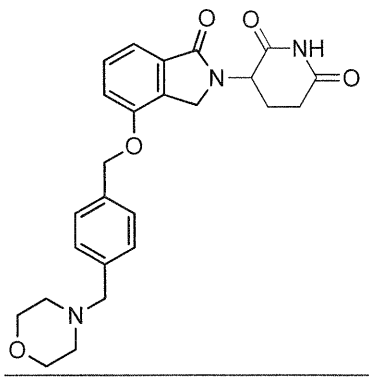
comprises a hemi D-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 6.21, 12.91, and 16.32 degrees 2θ;

comprises a L-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 6.27, 10.90, and 15.32 degrees 2θ;

comprises a tosylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 9.77, 15.41, and 19.25 degrees 2θ; or

comprises a (+) camphorsulfonic acid salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 9.05, 14.61, and 16.82 degrees 2θ.

[0017b] In a second aspect of the present disclosure, there is provided a solid form comprising a racemic Compound (I):



(I),

or a salt, hydrate, anhydrate, or solvate thereof, wherein the solid form is crystalline, wherein the solid form

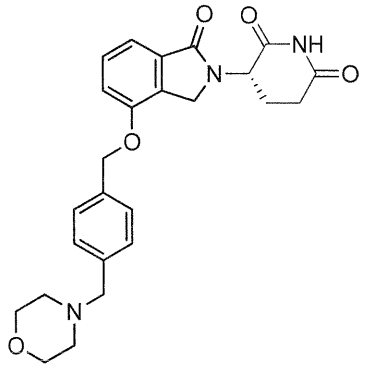
comprises racemic Compound (I), having an XRPD pattern comprising peaks at approximately 4.95, 8.96, and 14.83 degrees 2θ;

comprises racemic Compound (I) and water, having an XRPD pattern comprising peaks at approximately 14.01, 17.28, and 26.21 degrees 2θ;

comprises a HCl salt of racemic Compound (I) and water, having an XRPD pattern comprising peaks at approximately 13.88, 14.30, and 15.36 degrees 2θ; or

comprises a HCl salt of racemic Compound (I) and methanol, having an XRPD pattern comprising peaks at approximately 12.38, 14.54, and 26.10 degrees 2θ.

[0017c] In a third aspect of the present disclosure, there is provided a solid form comprising a HCl salt of Compound (I-S):



(I-S),

or a salt, hydrate, anhydrate, or solvate of the HCl salt, wherein the solid form is crystalline, wherein the solid form

is Form A crystal form characterized by an XRPD pattern comprising peaks at approximately 15.09, 15.94, and 22.30 degrees 2θ;

is Form B crystal form characterized by an XRPD pattern comprising peaks at approximately 7.11, 14.20, and 20.71 degrees 2θ;

is Form C crystal form characterized by an XRPD pattern comprising peaks at approximately 6.55, 13.14, and 13.37 degrees 2θ;

is Form D crystal form characterized by an XRPD pattern comprising peaks at approximately 13.52, 14.16, and 25.00 degrees 2θ;

is Form E crystal form characterized by an XRPD pattern comprising peaks at approximately 9.82, 17.06, and 17.73 degrees 2θ;

is Form F crystal form characterized by an XRPD pattern comprising peaks at approximately 13.71, 14.22, and 20.87 degrees 2θ;

is Form G crystal form characterized by an XRPD pattern comprising peaks at approximately 6.85, 20.20, and 20.60 degrees 2θ;

is Form H crystal form characterized by an XRPD pattern comprising peaks at approximately 6.83, 20.19, and 20.58 degrees 2θ;

is Form I crystal form characterized by an XRPD pattern comprising peaks at approximately 13.95, 23.39, and 24.10 degrees 2θ;

is Form J crystal form characterized by an XRPD pattern comprising peaks at approximately 4.86, 13.48, and 20.06 degrees 2θ; or

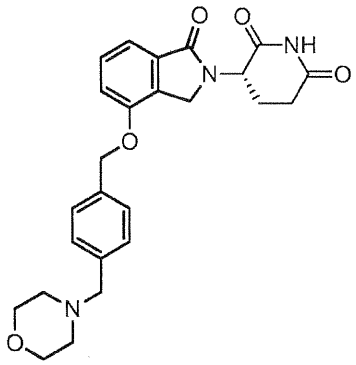
is Form K crystal form characterized by an XRPD pattern comprising peaks at approximately 7.09, 14.03, and 14.22 degrees 2θ.

[0018] In one embodiment, provided herein are salts and solid forms of the racemic compound of formula (I), solid forms of the salts, and methods of synthesizing the salts and solid forms. In one embodiment, provided herein are solid forms comprising the racemic Compound of formula (I) and a significant quantity of one or more additional species, such as ions and/or molecules.

[0019] In one embodiment, provided herein are salts and solid forms of the compound of formula (I-S), solid forms of the salts, and methods of synthesizing the salts and solid forms. In one embodiment, provided herein are solid forms comprising the Compound of formula (I-S) and a significant quantity of one or more additional species, such as ions and/or molecules.

WHAT IS CLAIMED:

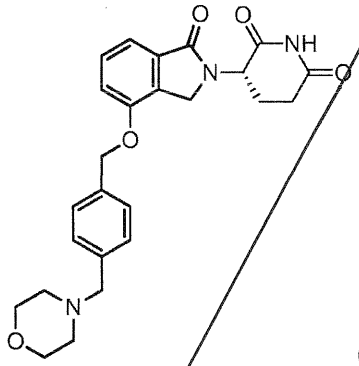
1. A solid form comprising an anhydrate of Compound (I-S):



(I-S).

2. The solid form of claim 1 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 1.

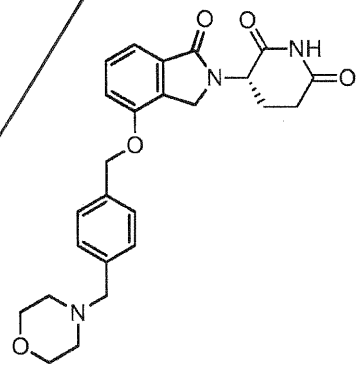
3. A solid form comprising a hydrate of Compoun (I-S):



(I-S).

4. The solid form of claim 3 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 5.

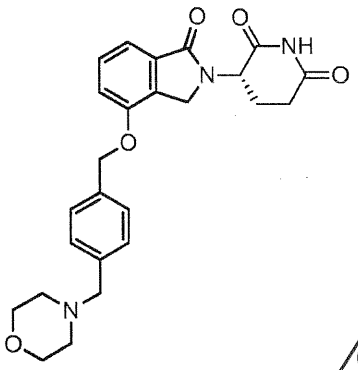
5. A solid form comprising a THF solvate of Compound (I-S):



(I-S).

6. The solid form of claim 5 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 8.

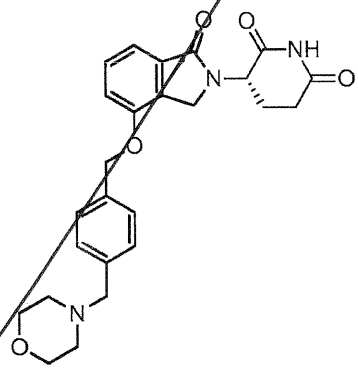
7. A solid form comprising a besylate salt of Compound (I-S):



(I-S).

8. The solid form of claim 7 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 11.

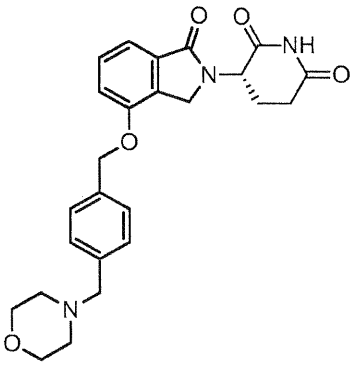
9. A solid form comprising a DMSO solvate of a besylate salt of Compound (I-S):



(I-S).

10. The solid form of claim 9 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 16.

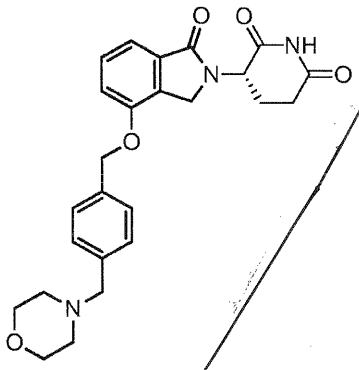
11. A solid form comprising a D-tartaric acid salt of Compound (I-S):



(I-S).

12. The solid form of claim 11 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 20.

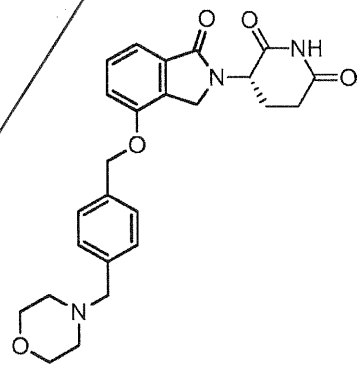
13. A solid form comprising a D-tartaric acid salt of Compound (I-S) that is the hemi D-tartrate:



(I-S).

14. The solid form of claim 13 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 23.

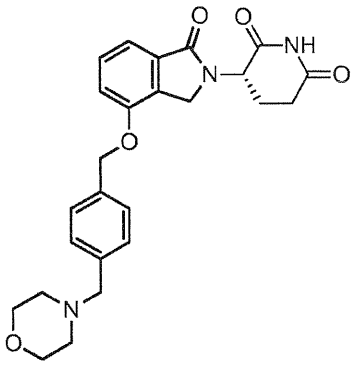
15. A solid form comprising a L-tartaric acid salt of Compound (I-S):



(I-S).

16. The solid form of claim 15 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 26.

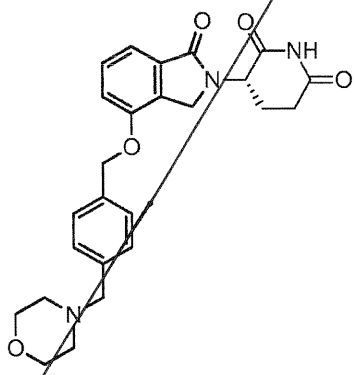
17. A solid form comprising a tosylate salt of Compound (I-S):



(I-S).

18. The solid form of claim 17 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 29.

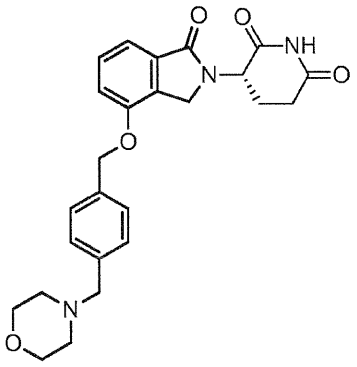
19. A solid form comprising a (+) camphorsulfonic acid salt of Compound (I-S):



(I-S).

20. The solid form of claim 19 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 32.

21. A solid form comprising a HCl salt of Compound (I-S):



(I-S).

22. The solid form of claim 21, wherein the solid form is a hydrate, anhydrate, or solvate.

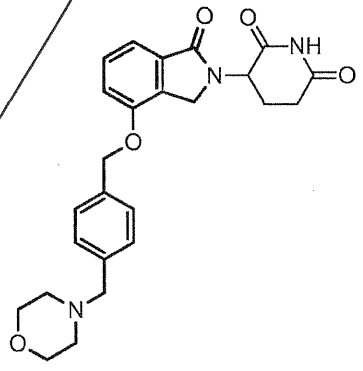
23. The solid form of claim 21, wherein the solid form is crystalline.

24. The solid form of claim 21, wherein the solid form is the Form A crystal form.

25. The solid form of claim 24 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 36.

26. The solid form of claim 21, wherein the solid form is the Form B crystal form, Form C crystal form, Form D crystal form, Form E crystal form, Form F crystal form, Form G crystal form, Form H crystal form, Form I crystal form, Form J crystal form, or Form K crystal form.

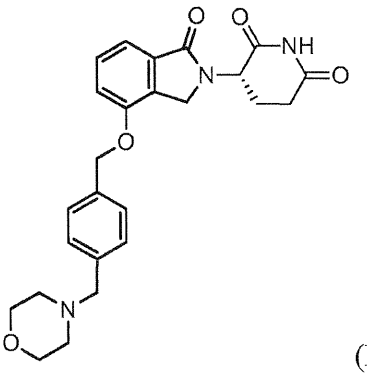
27. A solid form comprising an anhydrate of racemic Compound (I):



(I).

28. The solid form of claim 26 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 97.

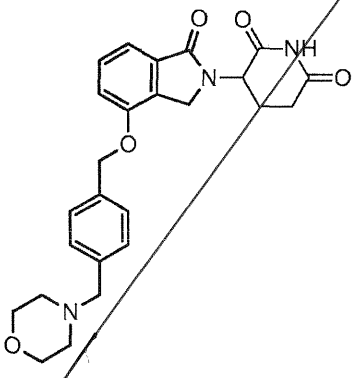
29. A solid form comprising a hydrate of a HCl salt of Compound (I-S):



(I-S).

30. The solid form of claim 29 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 64.

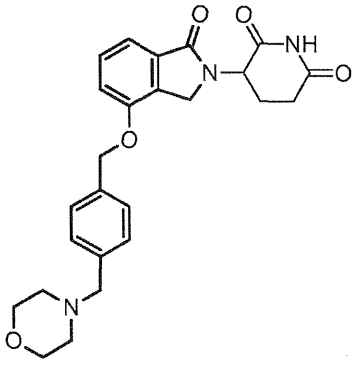
31. A solid form comprising a hydrate of racemic Compound (I):



(I).

32. The solid form of claim 31 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 73.

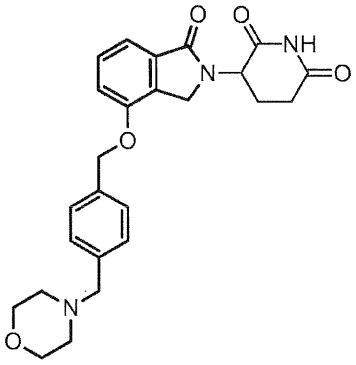
33. A solid form comprising a hydrate of racemic Compound (I):



(I).

34. The solid form of claim 28 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 99.

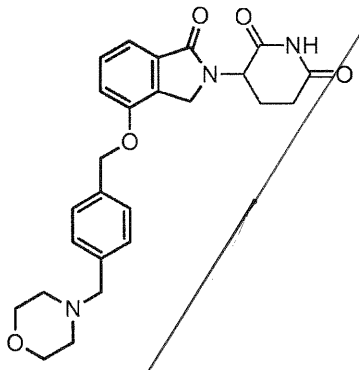
35. A solid form comprising a hydrate of a HCl salt of racemic Compound (I):



(I).

36. The solid form of claim 30 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 101.

37. A solid form comprising a methanol solvate of a HCl salt of racemic Compound (I):

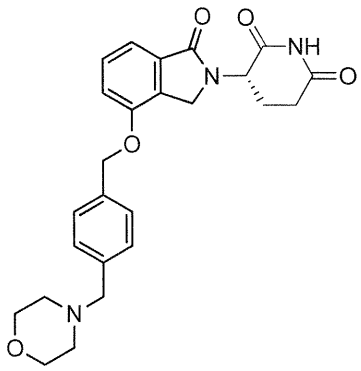


(I).

38. The solid form of claim 32 having an X-ray power diffraction pattern which matches the XRPD pattern presented in FIG 104.

WHAT IS CLAIMED:

1. A solid form comprising a salt, hydrate, or solvate of Compound (I-S):



(I-S),

wherein the solid form is crystalline, wherein the solid form

comprises Compound (I-S) and water, having an XRPD pattern comprising peaks at approximately 8.31, 11.80, and 17.37 degrees 2θ;

comprises Compound (I-S) and THF, having an XRPD pattern comprising peaks at approximately 11.80, 20.89, and 22.16 degrees 2θ;

comprises a besylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 19.07, 20.71, and 23.96 degrees 2θ;

comprises a DMSO solvate of a besylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 16.88, 18.14, and 20.02 degrees 2θ;

comprises a D-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 17.00, 19.73, and 25.86 degrees 2θ;

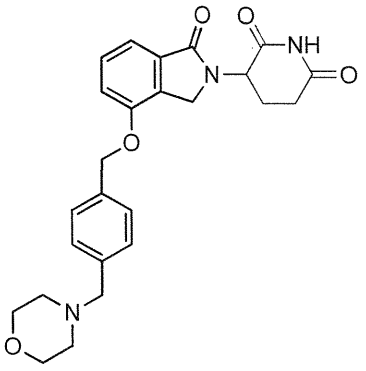
comprises a hemi D-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 6.21, 12.91, and 16.32 degrees 2θ;

comprises a L-tartrate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 6.27, 10.90, and 15.32 degrees 2θ;

comprises a tosylate salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 9.77, 15.41, and 19.25 degrees 2θ; or

comprises a (+) camphorsulfonic acid salt of Compound (I-S), having an XRPD pattern comprising peaks at approximately 9.05, 14.61, and 16.82 degrees 2θ.

2. A solid form comprising a racemic Compound (I):



(I),

or a salt, hydrate, anhydrate, or solvate thereof, wherein the solid form is crystalline, wherein the solid form

comprises racemic Compound (I), having an XRPD pattern comprising peaks at approximately 4.95, 8.96, and 14.83 degrees 2θ;

comprises racemic Compound (I) and water, having an XRPD pattern comprising peaks at approximately 14.01, 17.28, and 26.21 degrees 2θ;

comprises a HCl salt of racemic Compound (I) and water, having an XRPD pattern comprising peaks at approximately 13.88, 14.30, and 15.36 degrees 2θ; or

comprises a HCl salt of racemic Compound (I) and methanol, having an XRPD pattern comprising peaks at approximately 12.38, 14.54, and 26.10 degrees 2θ.

3. The solid form of claim 1, comprising Compound (I-S) and water having an XRPD pattern comprising peaks at approximately 8.31, 11.80, and 17.37 degrees 2θ.

4. The solid form of claim 3, further comprises peaks at approximately 13.79, 17.15, and 26.00 degrees 2θ.

5. The solid form of claim 3, comprising Compound (I-S) and water, wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG 5.

6. The solid form of claim 1, comprising Compound (I-S) and THF having an XRPD pattern comprising peaks at approximately 11.80, 20.89, and 22.16 degrees 2θ.

7. The solid form of claim 6, further comprises peaks at approximately 6.03 and 18.59 degrees 2θ.

8. The solid form of claim 6, comprising Compound (I-S) and THF, wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 8.

9. The solid form of claim 1, comprising a besylate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 19.07, 20.71, and 23.96 degrees 2θ.

10. The solid form of claim 9, further comprises peaks at approximately 15.48 and 15.92 degrees 2θ.

11. The solid form of claim 9, comprising a besylate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 11.

12. The solid form of claim 1, comprising a DMSO solvate of a besylate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 16.88, 18.14, and 20.02 degrees 2θ.

13. The solid form of claim 12, further comprises peaks at approximately 7.31 and 24.49 degrees 2θ.

14. The solid form of claim 12, comprising a DMSO solvate of a besylate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 16.

15. The solid form of claim 1, comprising a D-tartrate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 17.00, 19.73, and 25.86 degrees 2θ.

16. The solid form of claim 15, further comprises peaks at approximately 19.25 and 21.25 degrees 2θ.

17. The solid form of claim 15, comprising a D-tartrate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG 20.

18. The solid form of claim 1, comprising a hemi D-tartrate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 6.21, 12.91, and 16.32 degrees 2θ.

19. The solid form of claim 18, further comprises peaks at approximately 12.32 and 19.09 degrees 2θ.

20. The solid form of claim 18, comprising a hemi D-tartrate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 23.

21. The solid form of claim 1, comprising a L-tartrate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 6.27, 10.90, and 15.32 degrees 2θ.

22. The solid form of claim 21, further comprises peaks at approximately 11.97, 14.41, and 17.08 degrees 2θ.

23. The solid form of claim 21, comprising a L-tartrate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG 26.

24. The solid form of claim 1, comprising a tosylate salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 9.77, 15.41, and 19.25 degrees 2θ.

25. The solid form of claim 24, further comprises peaks at approximately 7.41 and 22.97 degrees 2θ.

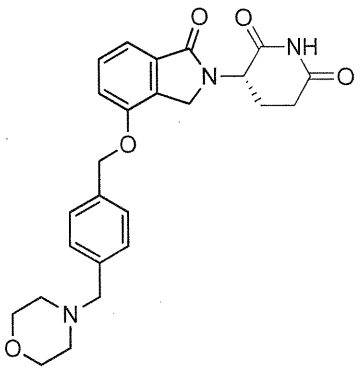
26. The solid form of claim 24, comprising a tosylate salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 29.

27. The solid form of claim 1, comprising a (+) camphorsulfonic acid salt of Compound (I-S) having an XRPD pattern comprising peaks at approximately 9.05, 14.61, and 16.82 degrees 2θ.

28. The solid form of claim 27, further comprises peaks at approximately 13.97, 15.34, and 16.35 degrees 2θ.

29. The solid form of claim 27, comprising a (+) camphorsulfonic acid salt of Compound (I-S), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 32.

30. A solid form comprising a HCl salt of Compound (I-S):



(I-S),

or a salt, hydrate, anhydrate, or solvate of the HCl salt, wherein the solid form is crystalline, wherein the solid form

is Form A crystal form characterized by an XRPD pattern comprising peaks at approximately 15.09, 15.94, and 22.30 degrees 2θ;

is Form B crystal form characterized by an XRPD pattern comprising peaks at approximately 7.11, 14.20, and 20.71 degrees 2θ;

is Form C crystal form characterized by an XRPD pattern comprising peaks at approximately 6.55, 13.14, and 13.37 degrees 2θ;

is Form D crystal form characterized by an XRPD pattern comprising peaks at approximately 13.52, 14.16, and 25.00 degrees 2θ;

is Form E crystal form characterized by an XRPD pattern comprising peaks at approximately 9.82, 17.06, and 17.73 degrees 2θ;

is Form F crystal form characterized by an XRPD pattern comprising peaks at approximately 13.71, 14.22, and 20.87 degrees 2θ;

is Form G crystal form characterized by an XRPD pattern comprising peaks at approximately 6.85, 20.20, and 20.60 degrees 2θ;

is Form H crystal form characterized by an XRPD pattern comprising peaks at approximately 6.83, 20.19, and 20.58 degrees 2θ;

is Form I crystal form characterized by an XRPD pattern comprising peaks at approximately 13.95, 23.39, and 24.10 degrees 2θ;

is Form J crystal form characterized by an XRPD pattern comprising peaks at approximately 4.86, 13.48, and 20.06 degrees 2θ; or

is Form K crystal form characterized by an XRPD pattern comprising peaks at approximately 7.09, 14.03, and 14.22 degrees 2θ.

31. The solid form of claim 30, wherein the solid form is Form A crystal form characterized by an XRPD pattern comprising peaks at approximately 15.09, 15.94, and 22.30 degrees 2θ.

32. The solid form of claim 31, further comprises peaks at approximately 17.65, 22.47, and 26.77 degrees 2θ.

33. The solid form of claim 31, wherein the solid form is Form A crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 36.

34. The solid form of claim 31, which exhibits a thermal event, as characterized by DSC, with a peak temperature of about 261 °C and an onset temperature of about 256 °C.

35. The solid form of claim 31, which exhibits a weight loss of about 0.16% of the total sample weight upon heating from about 25 to about 120 °C.

36. The solid form of claim 30, wherein the solid form is Form B crystal form characterized by an XRPD pattern comprising peaks at approximately 7.11, 14.20, and 20.71 degrees 2θ.

37. The solid form of claim 36, further comprises peaks at approximately 9.93 and 21.36 degrees 2θ.

38. The solid form of claim 36, wherein the solid form is Form B crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 44.

39. The solid form of claim 30, wherein the solid form is Form C crystal form characterized by an XRPD pattern comprising peaks at approximately 6.55, 13.14, and 13.37 degrees 2θ.

40. The solid form of claim 39, further comprises peaks at approximately 9.09, 19.62, and 19.80 degrees 2θ.

41. The solid form of claim 39, wherein the solid form is Form C crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 50.

42. The solid form of claim 30, wherein the solid form is Form D crystal form characterized by an XRPD pattern comprising peaks at approximately 13.52, 14.16, and 25.00 degrees 2θ.

43. The solid form of claim 42, further comprises peaks at approximately 6.82, 8.07, and 15.71 degrees 2θ.

44. The solid form of claim 42, wherein the solid form is Form D crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 57.

45. The solid form of claim 30, wherein the solid form is Form E crystal form characterized by an XRPD pattern comprising peaks at approximately 9.82, 17.06, and 17.73 degrees 2θ.

46. The solid form of claim 45, further comprises peaks at approximately 16.05, 25.71, and 26.15 degrees 2θ.

47. The solid form of claim 45, wherein the solid form is Form E crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 64.

48. The solid form of claim 30, wherein the solid form is Form F crystal form characterized by an XRPD pattern comprising peaks at approximately 13.71, 14.22, and 20.87 degrees 2θ.

49. The solid form of claim 48, further comprises peaks at approximately 7.10, 16.35, and 28.36 degrees 2θ.

50. The solid form of claim 48, wherein the solid form is Form F crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 73.

51. The solid form of claim 30, wherein the solid form is Form G crystal form characterized by an XRPD pattern comprising peaks at approximately 6.85, 20.20, and 20.60 degrees 2θ.

52. The solid form of claim 51, further comprises peaks at approximately 9.56, 13.69, 19.05, and 23.57 degrees 2θ.

53. The solid form of claim 51, wherein the solid form is Form G crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 82.

54. The solid form of claim 30, wherein the solid form is Form H crystal form characterized by an XRPD pattern comprising peaks at approximately 6.83, 20.19, and 20.58 degrees 2θ.

55. The solid form of claim 54, further comprises peaks at approximately 9.47 and 13.63 degrees 2θ.

56. The solid form of claim 54, wherein the solid form is Form H crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 86.

57. The solid form of claim 30, wherein the solid form is Form I crystal form characterized by an XRPD pattern comprising peaks at approximately 13.95, 23.39, and 24.10 degrees 2θ.

58. The solid form of claim 57, further comprises peaks at approximately 13.51 and 24.30 degrees 2θ.

59. The solid form of claim 57, wherein the solid form is Form I crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 90.

60. The solid form of claim 30, wherein the solid form is Form J crystal form characterized by an XRPD pattern comprising peaks at approximately 4.86, 13.48, and 20.06 degrees 2θ.

61. The solid form of claim 60, further comprises peaks at approximately 20.39, 22.15, and 23.45 degrees 2θ.

62. The solid form of claim 60, wherein the solid form is Form J crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 92.

63. The solid form of claim 30, wherein the solid form is Form K crystal form characterized by an XRPD pattern comprising peaks at approximately 7.09, 14.03, and 14.22 degrees 2θ.

64. The solid form of claim 63, further comprises peaks at approximately 9.35 and 21.60 degrees 2θ.

65. The solid form of claim 63, wherein the solid form is Form K crystal form characterized by an XRPD diffraction pattern which matches the XRPD diffraction pattern presented in FIG 95.

66. The solid form of claim 2, comprising racemic Compound (I) having an XRPD pattern comprising peaks at approximately 4.95, 8.96, and 14.83 degrees 2θ.

67. The solid form of claim 66, further comprises peaks at approximately 12.67, 14.30, 20.09, and 26.57 degrees 2θ.

68. The solid form of claim 66, comprising racemic Compound (I), wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 97.

69. The solid form of claim 2, comprising racemic Compound (I) and water having an XRPD pattern comprising peaks at approximately 14.01, 17.28, and 26.21 degrees 2θ.

70. The solid form of claim 69, further comprises peaks at approximately 8.34, 11.79, and 17.01 degrees 2θ.

71. The solid form of claim 69, comprising racemic Compound (I) and water, wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG. 99.

72. The solid form of claim 2, comprising a HCl salt of racemic Compound (I) and water having an XRPD pattern comprising peaks at approximately 13.88, 14.30, and 15.36 degrees 2θ.

73. The solid form of claim 72, further comprises peaks at approximately 9.84, 16.42, and 19.82 degrees 2θ.

74. The solid form of claim 72, comprising a HCl salt of racemic Compound (I) and water, wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG 101.

75. The solid form of claim 2, comprising a HCl salt of racemic Compound (I) and methanol having an XRPD pattern comprising peaks at approximately 12.38, 14.54, and 26.10 degrees 2θ.

76. The solid form of claim 75, further comprises peaks at approximately 15.06, 20.00, and 26.86 degrees 2θ.

77. The solid form of claim 75, comprising a HCl salt of racemic Compound (I) and methanol, wherein the solid form is characterized by an XRPD diffraction pattern which matches the XRPD pattern presented in FIG 104.