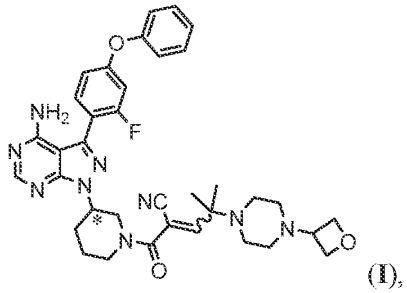
What is claimed is:

1. Crystalline Form A of Compound (**I**):



(**I**),

wherein C* is a stereochemical center.

2. Crystalline Form A according to claim 1, characterized by an X-ray powder diffractogram having a signal at at least three two-theta values chosen from 5.6 ± 0.2, 12.7 ± 0.2, 16.5 ± 0.2, 17.0 ± 0.2, 17.7 ± 0.2, 18.7 ± 0.2, 19.2 ± 0.2, 20.7 ± 0.2, 22.2 ± 0.2, and 24.4 ± 0.2.

3. Crystalline Form A according to claim 1 or 2, characterized by an X-ray powder diffractogram substantially similar to that in FIG. 1.

4. Crystalline Form A according to any one of claims 1-3, characterized by a DSC thermogram having a peak endotherm (melting temperature) at about 146 °C to about 147 °C.

5. Crystalline Form A according to any one of claims 1-4, characterized by a DSC thermogram showing onset of melting at about 140.6 °C to about 141.2 °C.

6. Crystalline Form A according to any one of claims 1-5, characterized by a mass loss of less than 1.0 wt. % between 25 °C and 200 °C by thermogravimetric analysis.

7. Crystalline Form A according to any one of claims 1-6, characterized by a water content of less than 1% upon storage at 95% relative humidity (RH).

8. Crystalline Form A according to any one of claims 1-7, wherein at least 95% of Compound (**I**) is the (E) isomer.

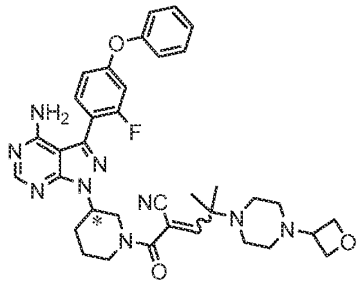
9. Crystalline Form A of Compound (**I**) prepared by a process comprising:

adding isopropyl acetate to amorphous (R)-2-[3-[4-amino-3-(2-fluoro-4-phenoxy-phenyl)pyrazolo[3,4-d]pyrimidin-1-yl]piperidine-1-carbonyl]-4-methyl-4-[4-(oxetan-3-yl)piperazin-1-yl]pent-2-enenitrile to form a solution;

agitating the solution to form a precipitate; and

isolating crystalline Form A by filtration.

10. Crystalline Form B of Compound (**I**):



(**I**),

wherein C* is a stereochemical center.

11. Crystalline Form B according to claim 10, characterized by an X-ray powder diffractogram having a signal at at least three two-theta values chosen from 10.8 ± 0.2, 15.3 ± 0.2, 16.3 ± 0.2, 17.9 ± 0.2, 18.4 ± 0.2, 18.7 ± 0.2, 22.0 ± 0.2, and 22.9 ± 0.2.

12. Crystalline Form B according to claim 10 or 11, wherein at least >99% of Compound (**I**) is the (E)-isomer.

13. Crystalline Form B according to claim 10 or 11, wherein 95% to 99% of Compound (**I**) is the (E)-isomer.

14. Crystalline Form B according to any one of claims 10-12, characterized by an X-ray powder diffractogram substantially similar to that in FIG. 4B.

15. Crystalline Form B according to any one of claims 10, 11, or 13, characterized by an X-ray powder diffractogram substantially similar to that in FIG. 4A.

16. Crystalline Form B according to any one of claims 10-12 or 14, characterized by a DSC thermogram having a peak endotherm (melting temperature) at about 144 °C to about 146 °C.

17. Crystalline Form B according to any one of claims 10-12, 14, or 16, characterized by a DSC thermogram showing onset of melting at about 139.3 °C.

18. Crystalline Form B according to any one of claims 10, 11, 13, or 15, characterized by a DSC thermogram having a peak endotherm (melting temperature) at about 141 °C to about 142 °C.

19. Crystalline Form B according to any one of claims 10, 11, 13, 15, or 18, characterized by a DSC thermogram showing onset of melting at about 131.8 °C to about 132.4 °C.

20. Crystalline Form B according to any one of claims 10-19, characterized by a water content of less than 1.3% upon storage at 95% relative humidity (RH).

21. Crystalline Form B of Compound (I) prepared by a process comprising:

adding ethyl acetate to amorphous (R)-2-[3-[4-amino-3-(2-fluoro-4-phenoxy-phenyl)pyrazolo[3,4-d]pyrimidin-1-yl]piperidine-1-carbonyl]-4-methyl-4-[4-(oxetan-3-yl)piperazin-1-yl]pent-2-enenitrile to form a solution;

seeding the solution with sodium chloride and stirring the solution to obtain a suspension;

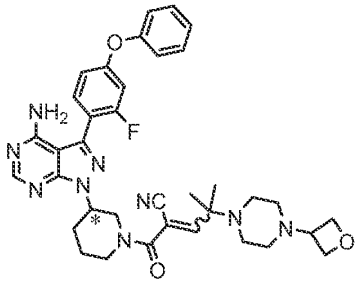
isolating crystalline Form B by filtration of the suspension.

22. Crystalline Form B of Compound (I) prepared by a process comprising:

adding ethanol to Form C of (R)-2-[3-[4-amino-3-(2-fluoro-4-phenoxy-phenyl)pyrazolo[3,4-d]pyrimidin-1-yl]piperidine-1-carbonyl]-4-methyl-4-[4-(oxetan-3-yl)piperazin-1-yl]pent-2-enenitrile to form a solution or a slurry;

seeding the solution or the slurry with seed crystals of Form B of Compound (**I**); and isolating crystalline Form B of Compound (**I**) by filtration.

23. Crystalline Form C of Compound (**I**):



(**I**),

wherein C* is a stereochemical center.

24. Crystalline Form C according to claim 23, characterized by an X-ray powder diffractogram having a signal at at least three two-theta values chosen from 9.8 ± 0.2, 10.2 ± 0.2, 15.6 ± 0.2, 16.6 ± 0.2, 18.6 ± 0.2, 18.9 ± 0.2, 19.6 ± 0.2, and 21.6 ± 0.2.

25. Crystalline Form C according to claim 23 or 24, characterized by an X-ray powder diffractogram substantially similar to that in FIG. 7.

26. Crystalline Form C according to any one of claims 23-25, characterized by a DSC thermogram having a peak endotherm (melting temperature) at about 118.5 °C to about 119 °C, wherein the DSC scanning rate is 15 °C/min.

27. Crystalline Form C according to any one of claims 23-26, characterized by a DSC thermogram showing onset of melting at about 115.6 °C to about 116 °C, wherein the DSC scanning rate is 15 °C/min.

28. Crystalline Form C according to any one of claims 23-27, characterized by a DSC thermogram having a peak endotherm (melting temperature) at about 120.5 °C to about 121 °C, wherein the DSC scanning rate is 10 °C/min.

29. Crystalline Form C according to any one of claims 23-28, characterized by a DSC thermogram showing onset of melting at about 118 °C to about 118.5 °C, wherein the DSC scanning rate is 10 °C/min.

30. Crystalline Form C according to any one of claims 23-29, wherein at least 95% of Compound (**I**) is the (E) isomer.

31. Crystalline Form C according to any one of claims 23-30, characterized by a P-1 space group.

32. Crystalline Form C according to any one of claims 23-31, characterized by the following unit cell dimensions at 200(2) K:

a = 10.6741 Å $\alpha = 93.654°$

b = 12.7684 Å $\beta = 104.400°$

c = 14.5287 Å $\gamma = 105.476°$.

33. Crystalline Form C of Compound (**I**) prepared by a process comprising:

adding acetonitrile to amorphous (R)-2-[3-[4-amino-3-(2-fluoro-4-phenoxy-phenyl)pyrazolo[3,4-d]pyrimidin-1-yl]piperidine-1-carbonyl]-4-methyl-4-[4-(oxetan-3-yl)piperazin-1-yl]pent-2-enenitrile to form a solution;

seeding the solution with crystalline Form B of Compound (**I**) to form a mixture and stirring the mixture to obtain a slurry; and

isolating crystalline Form C by filtering the slurry.

34. A pharmaceutical composition comprising:

at least one crystalline form of Compound (**I**) chosen from the crystalline forms any one of claims 1-33; and

at least one pharmaceutically acceptable excipient.

35. The pharmaceutical composition according to claim 34, wherein the pharmaceutical composition is in the form of a solid oral composition.

36. The pharmaceutical composition according to claim 34 or 35, wherein the pharmaceutical composition is in the form of a tablet or a capsule.

37. A method of inhibiting Bruton's tyrosine kinase (BTK) in a mammal comprising administering to the mammal in need of said BTK inhibition a therapeutically effective amount of at least one crystalline form chosen from the crystalline forms of any one of claims 1-33.

38. A method of treating a disease mediated by Bruton's tyrosine kinase (BTK) in a mammal in need thereof comprising administering to the mammal a therapeutically effective amount of at least one crystalline form chosen from the crystalline forms of any one of claims 1-33.

39. A method of treating pemphigus vulgaris or pemphigus foliaceus in a mammal in need thereof comprising administering to the mammal a therapeutically effective amount of at least one crystalline form chosen from the crystalline forms of any one of claims 1-33.

40. A method of treating immune thrombocytopenia in a mammal in need thereof comprising administering to the mammal a therapeutically effective amount of at least one crystalline form chosen from the crystalline forms of any one of claims 1-33.

41. The method of any one of claims 37-40, wherein the mammal is a human.