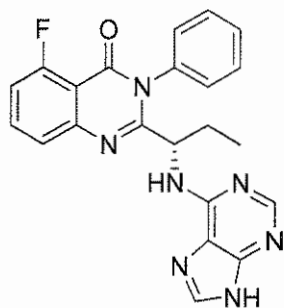


BRIEF SUMMARY

[0006] (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, has been chosen for further development. Consequently, it is desired to produce this compound in a form that is bioavailable and stable. ~~In one aspect, p~~ Provided herein are polymorphs of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, a compound having the molecular structure:



Specifically, polymorphic Forms I, II, III, IV, V, VI and VII of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, and methods of making and using these polymorphic forms are provided. Also provided are polymorphic products obtained by the processes (*e.g.* methods of making). Pharmaceutical compositions comprising one or more polymorphic forms of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one (any one or more of polymorphic Forms I, II, III, IV, V, VI and VII) and a pharmaceutically acceptable carrier are provided. Articles of manufacture and unit dosage forms comprising any one of more of the polymorphic forms of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one (*e.g.*, any one of more of polymorphic Forms I, II, III, IV, V, VI and VII) are provided. Kits comprising any one of more of the polymorphic forms (*e.g.*, polymorphic Forms I, II, III, IV, V, VI and VII of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one), and instructions for use (*e.g.*, instructions for use in PI3K-mediated disorder, such as cancer) are also provided.

[0007] These polymorphs are characterized by a variety of solid state analytical data, including for example X-ray powder diffraction pattern (XRPD) and differential scanning calorimetry (DSC).

[0007a] In a first aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern comprising characteristic peaks, plus or minus 0.2 degrees 2 θ , at 17.7 degrees 2 θ and 24.9 degrees 2 θ .

[0007b] In a second aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern substantially as shown in FIG. 1A.

[0007c] In a third aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form I having a unit cell, as determined by crystal X-ray crystallography, of the following dimensions: $a = 12.6971(7) \text{ \AA}$; $b = 11.3577(8) \text{ \AA}$; $c = 15.2065(10) \text{ \AA}$; $\alpha = 90.00^\circ$; $\beta = 104.112^\circ$; and $\gamma = 90.00^\circ$.

[0007d] In a fourth aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one which is bioequivalent to the polymorph of any one of the first to third aspects.

[0007e] In a fifth aspect, there is provided a composition comprising the polymorph of any one of first to fourth aspects, wherein the composition is substantially free of polymorphs other than polymorphic Form I of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one.

[0007f] In a sixth aspect, there is provided a method of preparing the polymorph of any one of the first to third aspects comprising:

- a) combining (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one with a solvent to form a mixture;
- b) heating the mixture to form a solution; and
- c) cooling the heated solution to form the polymorph of any one of the first to third aspects.

[0007g] In a seventh aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern comprising a characteristic peak, plus or minus 0.2 degrees 2 θ , at 18.6 degrees 2 θ .

[0007h] In an eighth aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern substantially as shown in FIG. 2A.

[0007i] In a ninth aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorph is Form II having a unit cell, as determined by crystal X-ray crystallography, of the following dimensions: $a = 9.1183(3) \text{ \AA}$; $b = 11.3299(3) \text{ \AA}$; $c = 20.7936(5) \text{ \AA}$; $\alpha = 90.00^\circ$; $\beta = 98.498^\circ$; and $\gamma = 90.00^\circ$.

[0007j] In a tenth aspect, there is provided a polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one which is bioequivalent to the polymorph of any one of the seventh to ninth aspects.

[0007k] In an eleventh aspect, there is provided a composition comprising the polymorph of any one of the seventh to tenth aspects, wherein the composition is substantially free of polymorphs other than polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one.

[0007l] In a twelfth aspect, there is provided a method of preparing the polymorph of any one of the seventh to ninth aspects, comprising:

- a) grinding polymorphic Form I of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one; and
- b) stirring the ground polymorphic Form I in a solvent to form the polymorph of any one of the seventh to ninth aspects.

[0007m] In a thirteenth aspect, there is provided a method of preparing a polymorph of any one of the seventh to ninth aspects, comprising:

compressing polymorphic Form I of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one at a pressure of between about 500 psi and 5000 psi to form a polymorph of any one of the seventh to ninth aspects.

[0007n] In a fourteenth aspect, there is provided a composition comprising polymorphic Form I and polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein:

the polymorphic Form I has an X-ray powder diffraction pattern comprising characteristic peaks, plus or minus 0.2 degrees 2θ , at 17.7 degrees 2θ and 24.9 degrees 2θ ; and

the polymorphic Form II has an X-ray powder diffraction pattern comprising a characteristic peak, plus or minus 0.2 degrees 2θ , at 18.6 degrees 2θ .

[0007o] In a fifteenth aspect, there is provided a composition comprising polymorphic Form I and polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein the polymorphic Form I has an X-ray powder diffraction pattern substantially as shown in FIG. 1A, wherein the polymorphic Form II has

an X-ray powder diffraction pattern substantially as shown in FIG. 2A, wherein the composition is substantially free of polymorphs other than polymorphic Form I and polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one.

[0007p] In a sixteenth aspect, there is provided a pharmaceutical composition comprising the polymorph of any one of the first to fourth aspects, and seventh to tenth aspects, and one or more pharmaceutically acceptable carriers or excipients.

[0007q] In a seventeenth aspect, there is provided a kit comprising the polymorph of any one of the first to fourth aspects and seventh to tenth aspects, and packaging.

[0007r] In an eighteenth aspect, there is provided a pharmaceutical composition comprising the composition of any one of the fifth, eleventh, fourteenth and fifteenth aspects, and one or more pharmaceutical acceptable carriers or excipients.

[0007s] In a nineteenth aspect, there is provided a use of a composition comprising the polymorph of any one of the first to fourth, and seventh to tenth aspects and one or more pharmaceutically acceptable carriers or excipients in the manufacture of a medicament for treating a patient in need of a cancer treatment.

[0007t] In a twentieth aspect, there is provided a use of a composition of any one of the fifth, eleventh, fourteenth and fifteenth aspects, or a pharmaceutical composition of any one of the sixteenth and eighteenth aspects, and one or more pharmaceutically acceptable carriers or excipients in the manufacture of a medicament for treating a patient with a cancer.

CLAIMS

What is claimed is:

1. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern comprising characteristic peaks at about 17.7 degrees 2 θ and about 24.9 degrees 2 θ .
2. The polymorph of claim 1, wherein the X-ray powder diffraction pattern further comprises characteristic peaks at about 14.3 degrees 2 θ , about 17.2 degrees 2 θ , about 20.9 degrees 2 θ , and about 23.9 degrees 2 θ .
3. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern substantially as shown in FIG. 1A.
4. A polymorph of any one of claims 1 to 3 obtained by:
 - a) combining (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one with a solvent to form a mixture;
 - b) heating the mixture to form a solution; and
 - c) cooling the heated solution to form the polymorph of any one of claims 1 to 3.
5. The polymorph of claim 4, wherein the mixture is heated to a temperature of at least 50°C.
6. The polymorph of claim 4 or 5, wherein the heated solution is cooled to a temperature of at least about 30°C.
7. The polymorph of any one of claims 4 to 6, wherein the solvent comprises water, an organic solvent, or a mixture thereof.
8. The polymorph of any one of claims 1 to 7, wherein the polymorph is anhydrous.
9. The polymorph of any one of claims 1 to 8, wherein the polymorph is a substantially pure polymorph.

10. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one which is bioequivalent to the polymorph of any one of claims 1 to 9.
11. A composition comprising the polymorph of any one of claims 1 to 10, wherein the composition is substantially free of polymorphs other than polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one.
12. A method of preparing the polymorph of any one of claims 1 to 9 comprising:
 - a) combining (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one with a solvent to form a mixture;
 - b) heating the mixture to form a solution; and
 - c) cooling the heated solution to form the polymorph of any one of claims 1 to 9.
13. The method of claim 12, wherein the mixture is heated to a temperature of at least about 50°C.
14. The method of claim 12 or 13, wherein the solution is cooled to a temperature of at least about 30°C.
15. The method of any one of claims 12 to 14, further comprising:
isolating the polymorph as solids;
washing the isolated solids; and
drying the washed isolated solids.
16. The method of any one of claims 12 to 15, wherein the solvent comprises water, an organic solvent, or a mixture thereof.
17. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern comprises a characteristic peak at about 18.6 degrees 2θ.
18. The polymorph of claim 17, wherein the X-ray powder diffraction pattern further comprises characteristic peaks at about 24.3 degrees 2θ and about 14.0 degrees 2θ.
19. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern substantially as shown in FIG. 2A.

20. A polymorph of any one of claims 17 to 19 obtained by:
 - a) grinding the polymorphic Form I; and
 - b) stirring the ground polymorphic Form I in a solvent to form the polymorph of any one of claims 17 to 19.
21. The polymorph of claim 20, wherein the polymorph is obtained by further heating the stirred mixture to form the polymorph of any one of claims 17 to 19.
22. The polymorph of claim 20, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 25°C.
23. The polymorph of any one of claims 20 to 22, wherein the grinding is performed using a mortar and pestle, a high shear wet mill, a high shear dry mixer, a jet mill, a ball mill, or a combination thereof.
24. The polymorph of any one of claims 20 to 23, wherein the solvent comprises an organic solvent.
25. A polymorph of any one of claims 17 to 19 obtained by compressing polymorphic Form I of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one at a pressure of between about 500 psi and 5000 psi to convert at least a portion of the polymorphic Form I to a polymorph of any one of claims 17 to 19.
26. The polymorph of any one of claims 17 to 25, wherein the polymorph is anhydrous.
27. The polymorph of any one of claims 17 to 26, wherein the polymorph is a substantially pure polymorph.
28. A polymorph of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one which is bioequivalent to the polymorph of any one of claims 17 to 27.
29. A composition comprising the polymorph of any one of claims 17 to 28, wherein the composition is substantially free of polymorphs other than polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one.
30. A method of preparing the polymorph of any one of claims 17 to 19, comprising:
 - a) grinding the polymorphic Form I; and

- b) stirring the ground polymorphic Form I in a solvent to form the polymorph of any one of claims 17 to 19.
31. The method of claim 30, further comprising heating the stirred mixture to form the polymorph of any one of claims 17 to 19.
32. The method of claim 30, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 25°C
33. The method of any one of claims 30 to 32, wherein the grinding is performed using a mortar and pestle, a high shear wet mill, a high shear dry mixer, a jet mill, a ball mill, or a combination thereof.
34. The method of any one of claims 30 to 33, wherein the solvent comprises an organic solvent.
35. A method of preparing a polymorph of any one of claims 17 to 19, comprising: compressing polymorphic Form I of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one at a pressure of between about 500 psi and 5000 psi to form a polymorph of any one of claims 17 to 19.
36. A composition comprising polymorphic Form I and polymorphic Form II of (S)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3H)-one, wherein:
- the polymorphic Form I has an X-ray powder diffraction pattern comprising characteristic peaks at about 17.7 degrees 2 θ and about 24.9 degrees 2 θ ; and
- the polymorphic Form II has an X-ray powder diffraction pattern comprising a characteristic peak at about 18.6 degrees 2 θ .
37. The composition of claim 36, wherein:
- the X-ray powder diffraction pattern for the polymorphic Form I further comprises one or more characteristic peaks at about 14.3 degrees 2 θ , about 17.2 degrees 2 θ , about 20.9 degrees 2 θ , and about 23.9 degrees 2 θ ; and
- the X-ray powder diffraction pattern for the polymorphic Form II further comprises one or more characteristic peaks at about 24.3 degrees 2 θ and about 14.0 degrees 2 θ .

38. The composition of claim 36 or 37, wherein the weight ratio of polymorphic Form I to polymorphic Form II is between 90:1 and 99:1.
39. A composition comprising polymorphic Form I and polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorphic Form I has an X-ray powder diffraction pattern substantially as shown in FIG. 1A, wherein the polymorphic Form II has an X-ray powder diffraction pattern substantially as shown in FIG. 2A, wherein the composition is substantially free of polymorphs other than polymorphic Form I and polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one.
40. A pharmaceutical composition comprising the polymorph of any one of claims 1 to 10, and 17 to 28, and one or more pharmaceutically acceptable carriers or excipients.
41. A kit comprising the polymorph of any one of claims 1 to 10, and 17 to 28, and packaging.
42. A pharmaceutical composition comprising the composition of any one of claims 11, 29, and 36 to 39, and one or more pharmaceutical acceptable carriers or excipients.
43. The pharmaceutical composition of claim 42, wherein the pharmaceutical composition is a tablet.
44. A method of treating a patient in need of a cancer treatment, comprising administering to the patient a composition comprising the polymorph of any one of claims 1 to 10, and 17 to 28, and one or more pharmaceutically acceptable carriers or excipients.
45. A method of treating a patient with a cancer, comprising administering to the patient a composition of any one of claims 11, 29, and 36 to 39, or a pharmaceutical composition of claim 42 or 43, and one or more pharmaceutically acceptable carriers or excipients.
46. The method of claim 44 or 45, wherein the cancer is a hematologic malignancy.
47. The method of claim 44 or 45, wherein the cancer is selected from the group consisting of acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), small lymphocytic lymphoma (SLL),

myelodysplastic syndrome (MDS), myeloproliferative disease (MPD), chronic myeloid leukemia (CML), multiple myeloma (MM), non-Hodgkin's lymphoma (iNHL), refractory iNHL, non-Hodgkin's lymphoma (NHL), mantle cell lymphoma (MCL), follicular lymphoma, Waldestrom's macroglobulinemia (WM), T-cell lymphoma, B-cell lymphoma, and diffuse large B-cell lymphoma (DLBCL).

48. The method of claim 44 or 45, wherein the cancer is selected from the group consisting of chronic lymphocytic leukemia (CLL), non-Hodgkin's lymphoma (iNHL), and refractory iNHL.

CLAIMS

What is claimed is:

1. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern comprising characteristic peaks, plus or minus 0.2 degrees 2 θ , at 17.7 degrees 2 θ and 24.9 degrees 2 θ .
2. The polymorph of claim 1, wherein the X-ray powder diffraction pattern further comprises characteristic peaks, plus or minus 0.2 degrees 2 θ , at 14.3 degrees 2 θ , 17.2 degrees 2 θ , 20.9 degrees 2 θ , and 23.9 degrees 2 θ .
3. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form I having an X-ray powder diffraction pattern substantially as shown in FIG. 1A.
4. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form I having a unit cell, as determined by crystal X-ray crystallography, of the following dimensions: $a = 12.6971(7)\text{\AA}$; $b = 11.3577(8)\text{\AA}$; $c = 15.2065(10)\text{\AA}$; $\alpha = 90.00^\circ$; $\beta = 104.112^\circ$; and $\gamma = 90.00^\circ$.
5. A polymorph of any one of claims 1 to 4 obtained by:
 - a) combining (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one with a solvent to form a mixture;
 - b) heating the mixture to form a solution; and
 - c) cooling the heated solution to form the polymorph of any one of claims 1 to 4.
6. The polymorph of claim 5, wherein the mixture is heated to a temperature of at least 50°C.
7. The polymorph of claim 5 or 6, wherein the heated solution is cooled to a temperature of at least about 30°C.
8. The polymorph of any one of claims 5 to 7, wherein the solvent comprises water, an organic solvent, or a mixture thereof.

9. The polymorph of any one of claims 1 to 8, wherein the polymorph is anhydrous.
10. The polymorph of any one of claims 1 to 9, wherein the polymorph is a substantially pure polymorph.
11. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one which is bioequivalent to the polymorph of any one of claims 1 to 10.
12. A composition comprising the polymorph of any one of claims 1 to 11, wherein the composition is substantially free of polymorphs other than polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one.
13. A method of preparing the polymorph of any one of claims 1 to 10 comprising:
 - a) combining (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one with a solvent to form a mixture;
 - b) heating the mixture to form a solution; and
 - c) cooling the heated solution to form the polymorph of any one of claims 1 to 10.
14. The method of claim 13, wherein the mixture is heated to a temperature of at least about 50°C.
15. The method of claim 13 or 14, wherein the solution is cooled to a temperature of at least about 30°C.
16. The method of any one of claims 13 to 15, further comprising:
isolating the polymorph as solids;
washing the isolated solids; and
drying the washed isolated solids.
17. The method of any one of claims 13 to 16, wherein the solvent comprises water, an organic solvent, or a mixture thereof.
18. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern comprising a characteristic peak, plus or minus 0.2 degrees 2 θ , at 18.6 degrees 2 θ .

19. The polymorph of claim 18, wherein the X-ray powder diffraction pattern further comprises characteristic peaks, plus or minus 0.2 degrees 2θ , at 24.3 degrees 2θ and 14.0 degrees 2θ .
20. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form II having an X-ray powder diffraction pattern substantially as shown in FIG. 2A.
21. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein the polymorph is Form II having a unit cell, as determined by crystal X-ray crystallography, of the following dimensions: $a = 9.1183(3) \text{ \AA}$; $b = 11.3299(3) \text{ \AA}$; $c = 20.7936(5) \text{ \AA}$; $\alpha = 90.00^\circ$; $\beta = 98.498^\circ$; and $\gamma = 90.00^\circ$.
22. A polymorph of any one of claims 18 to 21 obtained by:
 - a) grinding polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one; and
 - b) stirring the ground polymorphic Form I in a solvent to form the polymorph of any one of claims 18 to 21.
23. The polymorph of claim 22, wherein the polymorph is obtained by further heating the stirred mixture to form the polymorph of any one of claims 18 to 21.
24. The polymorph of claim 23, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 30°C .
25. The polymorph of claim 24, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 25°C .
26. The polymorph of any one of claims 22 to 25, wherein the grinding is performed using a mortar and pestle, a high shear wet mill, a high shear dry mixer, a jet mill, a ball mill, or a combination thereof.
27. The polymorph of any one of claims 22 to 26, wherein the solvent comprises an organic solvent.

28. The polymorph of claim 27, wherein the solvent comprises acetone or isopropyl alcohol.
29. A polymorph of any one of claims 18 to 21 obtained by compressing polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one at a pressure of between about 500 psi and 5000 psi to convert at least a portion of the polymorphic Form I to a polymorph of any one of claims 18 to 21.
30. The polymorph of any one of claims 18 to 29, wherein the polymorph is anhydrous.
31. The polymorph of any one of claims 18 to 30, wherein the polymorph is a substantially pure polymorph.
32. A polymorph of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one which is bioequivalent to the polymorph of any one of claims 18 to 31.
33. A composition comprising the polymorph of any one of claims 18 to 32, wherein the composition is substantially free of polymorphs other than polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one.
34. A method of preparing the polymorph of any one of claims 18 to 21, comprising:
- a) grinding polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one; and
 - b) stirring the ground polymorphic Form I in a solvent to form the polymorph of any one of claims 18 to 21.
35. The method of claim 34, further comprising heating the stirred mixture to form the polymorph of any one of claims 18 to 21.
36. The method of claim 35, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 30°C.
37. The method of claim 36, wherein the ground polymorphic Form I is stirred in the solvent at a temperature of between about 10°C and 25°C.

38. The method of any one of claims 34 to 37, wherein the grinding is performed using a mortar and pestle, a high shear wet mill, a high shear dry mixer, a jet mill, a ball mill, or a combination thereof.
39. The method of any one of claims 34 to 38, wherein the solvent comprises an organic solvent.
40. The method of claim 39, wherein the solvent comprises acetone or isopropyl alcohol.
41. A method of preparing a polymorph of any one of claims 18 to 21, comprising:
compressing polymorphic Form I of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one at a pressure of between about 500 psi and 5000 psi to form a polymorph of any one of claims 18 to 21.
42. A composition comprising polymorphic Form I and polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(3*H*)-one, wherein:

the polymorphic Form I has an X-ray powder diffraction pattern comprising characteristic peaks, plus or minus 0.2 degrees 2 θ , at 17.7 degrees 2 θ and 24.9 degrees 2 θ ; and

the polymorphic Form II has an X-ray powder diffraction pattern comprising a characteristic peak, plus or minus 0.2 degrees 2 θ , at 18.6 degrees 2 θ .
43. The composition of claim 42, wherein:

the X-ray powder diffraction pattern for the polymorphic Form I further comprises one or more characteristic peaks, plus or minus 0.2 degrees 2 θ , at 14.3 degrees 2 θ , 17.2 degrees 2 θ , 20.9 degrees 2 θ , and 23.9 degrees 2 θ ; and

the X-ray powder diffraction pattern for the polymorphic Form II further comprises one or more characteristic peaks, plus or minus 0.2 degrees 2 θ , at 24.3 degrees 2 θ and 14.0 degrees 2 θ .

44. The composition of claim 42 or 43, wherein the weight ratio of polymorphic Form I to polymorphic Form II is between 90:1 and 99:1.
45. A composition comprising polymorphic Form I and polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(*3H*)-one, wherein the polymorphic Form I has an X-ray powder diffraction pattern substantially as shown in FIG. 1A, wherein the polymorphic Form II has an X-ray powder diffraction pattern substantially as shown in FIG. 2A, wherein the composition is substantially free of polymorphs other than polymorphic Form I and polymorphic Form II of (*S*)-2-(1-(9H-purin-6-ylamino)propyl)-5-fluoro-3-phenylquinazolin-4(*3H*)-one.
46. A pharmaceutical composition comprising the polymorph of any one of claims 1 to 11, and 18 to 32, and one or more pharmaceutically acceptable carriers or excipients.
47. A kit comprising the polymorph of any one of claims 1 to 11 and 18 to 32, and packaging.
48. A pharmaceutical composition comprising the composition of any one of claims 12, 33, and 42 to 45, and one or more pharmaceutical acceptable carriers or excipients.
49. The pharmaceutical composition of claim 46 or 48, wherein the pharmaceutical composition is a tablet.
50. Use of a composition comprising the polymorph of any one of claims 1 to 11, and 18 to 32, and one or more pharmaceutically acceptable carriers or excipients in the manufacture of a medicament for treating a patient in need of a cancer treatment.
51. Use of a composition of any one of claims 12, 33, and 42 to 45, or a pharmaceutical composition of any one of claims 46, 48 and 49, and one or more pharmaceutically acceptable carriers or excipients in the manufacture of a medicament for treating a patient with a cancer.
52. The use of claim 50 or 51, wherein the cancer is a hematologic malignancy.

53. The use of claim 50 or 51, wherein the cancer is selected from the group consisting of acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), small lymphocytic lymphoma (SLL), myelodysplastic syndrome (MDS), myeloproliferative disease (MPD), chronic myeloid leukemia (CML), multiple myeloma (MM), indolent non-Hodgkin's lymphoma (iNHL), refractory iNHL, non-Hodgkin's lymphoma (NHL), mantle cell lymphoma (MCL), follicular lymphoma, Waldstrom's macroglobulinemia (WM), T-cell lymphoma, B-cell lymphoma, and diffuse large B-cell lymphoma (DLBCL).
54. The use of claim 50 or 51, wherein the cancer is selected from the group consisting of chronic lymphocytic leukemia (CLL), indolent non-Hodgkin's lymphoma (iNHL), and refractory iNHL.