CLAIMS

1. A polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern substantially similar to that set forth in Figure 3.

2. A polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern including one or more peaks selected from the group consisting of peaks at least at about 7.5, 9.9, 12.3, 15, 23, 23.3, 24.6, and 28.4 degrees 2θ.

3. The polymorph of claim 2, wherein the polymorph is a polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern including two or more peaks from a peak at least at about 7.5 degrees 2θ, a peak at least at about 9.9 degrees 2θ, a peak at least at about 12.3 degrees 2θ, a peak at least at about 15 degrees 2θ, a peak at least at about 23 degrees 2θ, a peak at least at about 23.3 degrees 2θ, a peak at least at about 24.6 degrees 2θ, and a peak at least at about 28.4 degrees 2θ and any combinations thereof.

4. A polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 3, wherein the polymorph is in a particle form, and wherein the particle has a diameter in the range of about 0.02 to about 20 micrometers.

5. A polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 3, wherein the polymorph is in a pharmaceutical composition comprising a population of particles of the polymorph, and wherein a fraction of the cumulative total of the particles have a diameter in the range of 0.2 μm to 20 μm.

6. The pharmaceutical composition of claim 5, wherein the fraction is at least about 1%, about 5%, about 10%, about 20%, about 50%, or about 90% of the cumulative total of the particles.

7. A polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 3, wherein the polymorph is in a pharmaceutical composition comprising a

population of particles of the polymorph, and wherein 50% of the cumulative total of the particles (D50) have a diameter of about 2 μm.

8. A composition comprising a purified form of a polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 7, wherein the composition has a purity greater than or equal to 95.0% as determined by high performance liquid chromatography (HPLC), nuclear magnetic resonance (NMR) or both HPLC and NMR, and wherein the composition comprises less than or equal to 5% impurities.

9. The composition of claim 8, wherein the composition has a purity greater than or equal to 99% as determined by HPLC, NMR or both HPLC and NMR.

10. The composition of claim 8, wherein the composition comprises less than or equal to 0.2% of each single impurity.

11. The composition of claim 8, wherein the impurities comprising a residual solvent selected from the group consisting of ethyl acetate (EtOAc), toluene, Ethanol, methanol, chloroform, and CH_2Cl_2/hexane.

12. A process of preparing a polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern substantially similar to that set forth in Figure 3 comprising the steps of:

(a) reacting 3-butene-2-one with Br_2 to form 3,4-dibromobutene-2-one;

(b) debrominating 3,4-dibromobutene-2-one to form 3-bromo-3-buten-2-one;

(c) reacting 3-bromo-3-buten-2-one with 2-hydroxy-1,4-naphthoquinone to form 2-acetyl-2,3-dihydropnaphtho[2,3-n]furan-4,9-dione;

(d) reacting 2-acetyl-2,3-dihydropnaphtho[2,3-n]furan-4,9-dione with MnO_2 and toluene to form 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione;

(e) crystallizing the 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione; and

(f) slurrying 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione in ethyl acetate to form a polymorph of 2-acetyl-4H, 9H-naphtho[2,3-b]furan-4,9-dione.

13. A compound according to any one of claims 1 to 6, 15 or 23, or a pharmaceutically acceptable salt thereof for use in the treatment of cancer in a human subject.

14. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is selected from the group consisting of colorectal adenocarcinoma, breast cancer, ovarian cancer, head and neck cancer, melanoma, angiosarcoma, gastric adenocarinoma, and adrenocorticoid.

15. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is colorectal adenocarcinoma.

16. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is ovarian cancer.

17. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is breast cancer.

18. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is lung cancer.

19. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is refractory cancer.

20. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is recurrent cancer.

21. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is metastatic cancer.

22. The compound or pharmaceutically acceptable salt of claim 13, wherein the cancer is associated with overexpression of STAT3.

23. A compound according to any one of claims 1 to 3, or a pharmaceutically acceptable salt thereof for use in prolonging progression free survival (PFS) in a cancer patient.

24. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is selected from the group consisting of colorectal adenocarcinoma, breast cancer, ovarian cancer, head and neck cancer, melanoma, angiosarcoma, gastric adenocarinoma, and adrenocorticoid.

25. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is colorectal adenocarcinoma.

26. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is ovarian cancer.

27. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is breast cancer.

28. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is lung cancer.

29. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is refractory cancer.

30. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is recurrent cancer.

31. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is metastatic cancer.

32. The compound or pharmaceutically acceptable salt of claim 23, wherein the cancer is associated with overexpression of STAT3.

33. Use of a therapeutically effective amount of a compound according to any one of claims 1 to 3, or a pharmaceutically acceptable salt thereof in the manufacture of a medicament for the treatment of cancer in a human subject.

34. The use according to claim 33, wherein the cancer is selected from the group consisting of colorectal adenocarcinoma, breast cancer, ovarian cancer, head and neck cancer, melanoma, angiosarcoma, gastric adenocarinoma, and adrenocorticoid.

35. The use according to claim 33, wherein the cancer is colorectal adenocarcinoma.

36. The use according to claim 33, wherein the cancer is ovarian cancer.

37. The use according to claim 33, wherein the cancer is breast cancer.

38. The use according to claim 33, wherein the cancer is lung cancer.

39. The use according to claim 33, wherein the cancer is refractory cancer.

40. The use according to claim 33, wherein the cancer is recurrent cancer.

41. The use according to claim 33, wherein the cancer is metastatic cancer.

42. The use according to claim 33, wherein the cancer is associated with overexpression of STAT3.

43. Use of a therapeutically effective amount of a compound according to any one of claims 1 to 3, or a pharmaceutically acceptable salt thereof in the manufacture of a medicament for prolonging progression free survival (PFS) in a cancer patient.

44. The use according to claim 43, wherein the cancer is selected from the group consisting of colorectal adenocarcinoma, breast cancer, ovarian cancer, head and neck cancer, melanoma, angiosarcoma, gastric adenocarinoma, and adrenocorticoid.

45. The use according to claim 43, wherein the cancer is colorectal adenocarcinoma.

46. The use according to claim 43, wherein the cancer is ovarian cancer.

47. The use according to claim 43, wherein the cancer is breast cancer.

48. The use according to claim 43, wherein the cancer is lung cancer.

49. The use according to claim 43, wherein the cancer is refractory cancer.

50. The use according to claim 43, wherein the cancer is recurrent cancer.

51. The use according to claim 43, wherein the cancer is metastatic cancer.

52. The use according to claim 43, wherein the cancer is associated with overexpression of STAT3.

CLAIMS

1. A polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern (XRPD) including peaks that are substantially the same as the XRPD peaks shown in Figure 3.

2. A polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern including one or more peaks selected from the group consisting of peaks at least at about 7.5, 9.9, 12.3, 15, 23, 23.3, 24.6, and 28.4 degrees 2θ.

3. The polymorph of claim 2, wherein the polymorph is characterized by an X-ray diffraction pattern including two or more peaks from a peak at least at about 7.5 degrees 2θ, a peak at least at about 9.9 degrees 2θ, a peak at least at about 12.3 degrees 2θ, a peak at least at about 15 degrees 2θ, a peak at least at about 23 degrees 2θ, a peak at least at about 23.3 degrees 2θ, a peak at least at about 24.6 degrees 2θ, and a peak at least at about 28.4 degrees 2θ.

4. A polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 3, wherein the polymorph is in a particle form, and wherein the particle has a diameter equal to or below about 20 micrometers.

5. A pharmaceutical composition comprising particles of the polymorph according to any one of claims 1 to 4, wherein the particles have a D_{50} equal to or below about 20 μm.

6. The pharmaceutical composition of claim 5, wherein the particles have a D_{50} equal to or below about 5 μm.

7. The pharmaceutical composition of claim 5, wherein the particles have a D_{90} equal to or below about 50 μm.

8. A composition comprising a purified form of a polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione according to any one of claims 1 to 4, wherein the composition has a purity greater than or equal to 95.0%.

9. The composition of claim 8, wherein the composition has a purity greater than or equal to 99%.

10. A process of preparing a polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione comprising:

slurrying 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione in ethyl acetate to form a polymorph of 2-acetyl-4H,9H-naphtho[2,3-b]furan-4,9-dione characterized by an X-ray diffraction pattern (XRPD) including peaks that are substantially the same as the XRPD peaks shown in Figure 3.

11. A polymorph according to any one of claims 1 to 4 for use in the treatment of cancer in a human subject.

12. A polymorph according to any one of claims 1 to 4 for use in prolonging progression free survival (PFS) in a cancer patient.

13. Use of a therapeutically effective amount of a polymorph according to any one of claims 1 to 4 in the manufacture of a medicament for the treatment of cancer in a human subject.

14. Use of a therapeutically effective amount of a polymorph according to any one of claims 1 to 4 in the manufacture of a medicament for prolonging progression free survival (PFS) in a cancer patient.

15. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is selected from the group consisting of colorectal adenocarcinoma, breast cancer, ovarian cancer, head and neck cancer, melanoma, angiosarcoma, gastric adenocarcinoma, colon cancer, rectal cancer, lung cancer, pancreatic cancer, GEJ, esophageal cancer, leukemia, lymphoma, multiple myeloma, brain cancer, chondrosarcoma, renal cancer, endometrial cancer, bladder cancer, hepatocellular carcinoma, and adrenocorticoid.

16. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is colorectal adenocarcinoma.

17. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is ovarian cancer.

18. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is breast cancer.

19. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is lung cancer.

20. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is refractory cancer.

21. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is recurrent cancer.

22. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is metastatic cancer.

23. The polymorph according to claim 11 or 12 or the use according to claim 13 or 14, wherein the cancer is associated with overexpression of STAT3.