WHAT IS CLAIMED IS:

1. A crystalline form of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile, having a powder X-ray diffraction pattern comprising peaks, in terms of 2θ, at 6.4°, 14.3°, and 17.0° 2θ ± 0.2 ° 2θ.

2. The crystalline form of claim 1, having solid state ^{13}C nuclear magnetic resonance chemical shifts selected from the group consisting of:63.1; 63.1 and 68.6; 68.6; 18.8 and 60.1; 18.8; 60.1; 63.1 and 162.1 and 162.1 ppm ± 0.2 ppm.

3. The crystalline form of claim 1, wherein the 2-propanol level is from 2.6 to 2.9 % weight.

4. The crystalline form of claim 1, wherein the water level is from 0.5 to 4.0 % weight.

5. A crystalline form of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile, having a powder X-ray diffraction pattern comprising peaks, in terms of 2θ, at 6.4°, 9.1°, and 11.1°2θ ± 0.2 ° 2θ.

6. The crystalline form of claim 5, having solid state ^{13}C nuclear magnetic resonance chemical shifts selected from the group consisting of: 63.1; 63.1 and 68.6; 68.6; 18.8 and 60.1; 18.8; 60.1; 63.1 and 162.1 and 162.1 ppm ± 0.2 ppm.

7. The crystalline form of claim 5, wherein the 2-propanol level is from 2.6 to 2.9 % weight.

8. The crystalline form of claim 5, wherein the water level is from 0.5 to 4.0 % weight.

9. A crystalline form of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile, having solid state ^{13}C nuclear magnetic resonance chemical shifts at 157.0, 151.0, 102.4, 44.8 and 32.7 ppm ± 0.2 ppm.

10. The crystalline form of claim 9, wherein the 2-propanol level is from 2.6 to 2.9 % weight.

11. The crystalline form of claim 9, wherein the water level is from 0.5 to 4.0 % weight.

12. A non-crystalline form of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile characterized by a physical or spectroscopic analysis selected from the group consisting of:

a) a solid state ^{13}C nuclear magnetic resonance spectrum comprising chemical shifts at 161.9, 152.0, 103.3, 31.8, and 26.0 ppm ± 0.2 ppm.;

b) a set of Raman bands at 1311, 1506, and 2258 cm^{-1} ± 2 cm^{-1}; and,

c) a set of infrared bands at 1407, 1554, and 1647 cm^{-1} ± 2 cm^{-1}.

13. A pharmaceutical composition comprising: 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile; one or more penetration enhancer; and, a pharmaceutically acceptable carrier.

14. The pharmaceutical composition of claim 13 wherein 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile has a crystalline form or a non-crystalline form.

15. The pharmaceutical composition of claim 13 or 14, comprising a topical formulation selected from a cream, transdermal patch, ointment, ophthalmic drops, lotion and gel.

16. The pharmaceutical composition of any of claims 13 or 14 wherein the topical formulation contains about 0.1% - 5.0% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

17. The pharmaceutical composition of claim 15 wherein the topical formulation contains about 0.5% - 2.3% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

18. The pharmaceutical composition of claim 15 wherein the topical formulation contains about 2.0% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

19. The pharmaceutical composition of claim 13 or 14, wherein said penetration enhancer is selected from saturated C10-C18 fatty alcohols, cis-unsaturated C10-C18 fatty alcohols, C10-C18 saturated fatty acids; and, C10-C18 cis-unsaturated fatty acid.

20. The pharmaceutical composition of claim 13 or 14, wherein the pharmaceutically acceptable carrier is at least 30% by weight PEG, and further comprising stabilizing excipients in an amount sufficient to achieve a chemically stable formulation such that the level of total degradants is not more that 7% by weight after 4 weeks at 40°C.

21. The pharmaceutical composition of claim 13 or 14, wherein the pharmaceutically acceptable carrier is at least 30% by weight PEG, and further comprising one or more aldehyde scavenger or anti-oxidant excipient in an

amount sufficient to achieve a chemically stable formulation such that the level of total degradants is not more that 7% by weight after 4 weeks at 40°C.

22. The pharmaceutical composition of claim 13 or 14, further comprising an aldehyde scavenger selected from glycerin and propylene glycol and an anti-oxidant selected from butylated hydroxyanisole, butylated hydroxytoluene, propyl gallate, ascorbic acid, polyphenols, tocopherols, and their derivatives.

23. The pharmaceutical composition of claim 13 or 14, wherein said penetration enhancer is selected from oleyl alcohol, linoleyl alcohol, γ-linolenyl alcohol, linolenyl alcohol, decyl alcohol, lauryl alcohol, myristyl alcohol, cetyl alcohol, stearyl alcohol, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid and arachidic acid, palmitoleic acid, oleic acid, cis-vaccenic acid, linoleic acid, γ-linolenic acid, linolenic acid, and arachidonic acid.

24. The pharmaceutical composition of claim 13, 14, 17 or 18, wherein said penetration enhancer is oleyl alcohol.

25. The pharmaceutical composition of claim 13 or 14, wherein characterized by a percutaneous flux that is equal or greater than the flux measured from a composition consisting by weight of about 2% tofacitinib free base, about 1.8% oleyl alcohol, about 17.9% glycerine, about 18% propylene glycol, about 30% PEG 400, about 30% PEG 3350, and about 0.1% BHA.

26. A pharmaceutical composition comprising: about 2.0% 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile by weight, about 2.0% oleyl alcohol, about 20.0% glycerin, at least about 30.0% polyethylene glycol, and about 0.1% butyl hydroxyanisole

27. A pharmaceutical composition for topically treating a disease in a mammal, wherein the composition is administered topically and comprises a therapeutically effective amount of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile, having a crystalline form or non-crystalline form, or a pharmaceutically acceptable salt thereof, one or more penetration enhancer; and a pharmaceutically acceptable carrier, wherein the disease is selected from the group consisting of psoriasis and dermatitis and said penetration enhancer is selected from oleyl alcohol, linoleyl alcohol, γ-linolenyl alcohol, linolenyl alcohol, decyl alcohol, lauryl alcohol, myristyl alcohol, cetyl alcohol, stearyl alcohol, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid and arachidic acid, palmitoleic acid, oleic acid, cis-vaccenic acid, linoleic acid, γ-linolenic acid, linolenic acid, and arachidonic acid.

28. The pharmaceutical composition of claim 27, wherein the disease is psoriasis, and the penetration enhancer is oleyl alcohol.

WHAT IS CLAIMED IS:

1. A topical pharmaceutical formulation comprising: 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile; a penetration enhancer; and, a pharmaceutically acceptable carrier, wherein said penetration enhancer is oleyl alcohol.

2. The topical pharmaceutical formulation of claim 1, which is in the form of a cream, ointment, lotion or gel.

3. The topical pharmaceutical formulation of claim 2, which contains about 0.1% - 5.0% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

4. The topical pharmaceutical formulation of claim 2, which contains about 0.5% - 2.3% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

5. The topical pharmaceutical formulation of claim 2, which contains about 2.0% (w/v) 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile.

6. The topical pharmaceutical formulation of claim 1, wherein the pharmaceutically acceptable carrier is at least 30% by weight PEG, and further comprising stabilizing excipients in an amount sufficient to achieve a chemically stable formulation such that the level of total degradants is not more that 7% by weight after 4 weeks at 40°C.

7. The topical pharmaceutical formulation of claim 1, wherein the pharmaceutically acceptable carrier is at least 30% by weight PEG, and further comprising one or more aldehyde scavenger or anti-oxidant excipient in an amount sufficient to achieve a chemically stable formulation such that the level of total degradants is not more that 7% by weight after 4 weeks at 40°C.

8. The topical pharmaceutical formulation of claim 1, further comprising an aldehyde scavenger selected from glycerin and propylene glycol and an anti-oxidant selected from butylated hydroxyanisole, butylated hydroxytoluene, propyl gallate, ascorbic acid, polyphenols, tocopherols, and their derivatives.

9. The topical pharmaceutical formulation of claim 1, which is characterized by a percutaneous flux that is equal or greater than the flux measured from a composition consisting by weight of about 2% tofacitinib free base, about 1.8% oleyl alcohol, about 17.9% glycerine, about 18% propylene glycol, about 30% PEG 400, about 30% PEG 3350, and about 0.1% BHA.

10. A topical pharmaceutical formulation comprising: about 2.0% 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile by weight, about 2.0% oleyl alcohol, about 20.0% glycerin, at least about 30.0% polyethylene glycol, and about 0.1% butyl hydroxyanisole.

11. A pharmaceutical formulation for topically treating a disease in a mammal, wherein the composition is administered topically and comprises a therapeutically effective amount of 3-((3R, 4R)-4-methyl-3-[methyl-(7H-pyrrolo[2, 3-d]pyrimidin-4-yl)-amino]-piperidin-1-yl)-3-oxopropionitrile or a pharmaceutically acceptable salt thereof, a penetration enhancer; and a pharmaceutically acceptable carrier, wherein the disease is selected from the group consisting of psoriasis and dermatitis and said penetration enhancer is oleyl alcohol.

12. The pharmaceutical formulation of claim 11, wherein the disease is psoriasis.

13. The pharmaceutical formulation of claim 11, wherein the disease is dermatitis.