CLAIMED:

1. Diketopiperazine microparticles having a specific surface area of less than about 67 m^2/g as determined by adsorption of nitrogen.

2. The diketopiperazine microparticles according to claim 1, in which said specific surface area is from about 35 m^2/g to about 67 m^2/g.

3. The diketopiperazine microparticles according to claim 1, wherein said microparticles comprise a drug or active agent.

4. The diketopiperazine microparticles according to claim 3, wherein said specific surface area is less than about 62 m^2/g.

5. The diketopiperazine microparticles according to claim 4, wherein said drug or active agent is a peptide or protein.

6. The diketopiperazine microparticles according to claim 5, wherein said peptide is an endocrine hormone.

7. The diketopiperazine microparticles according to claim 6, wherein said endocrine hormone is insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide 1, oxyntomodulin, an analog or active fragment of said endocrine hormone.

8. The diketopiperazine microparticles according to claim 1, wherein said diketopiperazine is fumaryl diketopiperazine.

9. A dry powder comprising the diketopiperazine microparticles of claim 7.

10. A method for forming diketopiperazine microparticles having a specific surface area of about 35 m^2/g to about 67 m^2/g as determined by adsorption of nitrogen within a 95% confidence limit comprising:

a) dissolving a diketopiperazine in a water-based solution;

b) adding an acid solution to the water-based solution to form a mixture;

c) adjusting manufacturing conditions to target production microparticles with a specific surface area of about 52 m^2/g;

d) precipitating the diketopiperazine microparticles formed out of the solution by adding aqueous ammonia to the microparticle suspension, and

e) collecting the precipitate after several washings with deionized water; wherein the precipitate comprises FDKP microparticles having a specific surface area of about 35 m^2/g to about 67 m^2/g.

11. The method according to claim 10, further comprising the step of incubating the suspension at a temperature of about 14°C to about 18°C.

12. A method of forming fumaryl diketopiperazine microparticles with a specific surface area of about 35 m^2/g to about 67 m^2/g within a 95% confidence limit comprising, feeding equal masses of about 10.5 wt% acetic acid and about 2.5 wt% fumaryl diketopiperazine solutions at about 14°C to about 18°C through a high shear mixer.

13. The method of claim 12, further comprising increasing the pH of a reaction comprising a suspension of diketopiperazine microparticles to pH 4.5 with an aqueous ammonia solution.

14. The method according to claim 12, wherein said adjusting comprises increasing the concentration of ammonia in the suspension to yield a pH of from about pH 3.5 to about pH 4.5.

15. Use of a dry powder comprising the microparticles of claim 5 in the manufacture of a medicament for delivering an active agent to a patient in need thereof.

16. The use of claim 15, wherein the active agent is an endocrine hormone selected from the group consisting of insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide-1, oxyntomodulin, and an analog or active fragment of said endocrine hormone.

17. The use of claim 15, wherein the patient has been diagnosed with diabetes.

18. An inhalation system comprising a breath powered inhaler and a dry powder comprising the microparticles of claim 5.

WHAT IS CLAIMED:

1. Diketopiperazine microparticles having a specific surface area of less than about 67 m^2/g.

2. The diketopiperazine microparticles according to claim 1, in which said specific surface area is from about 35 m^2/g to about 67 m^2/g.

3. The diketopiperazine microparticles according to claim 1, wherein said microparticles comprise a drug or active agent.

4. The diketopiperazine microparticles according to claim 3, wherein said specific surface area is less than about 62 m^2/g.

5. The diketopiperazine microparticles according to claim 4, wherein said drug or active agent is a peptide or protein.

6. The diketopiperazine microparticles according to claim 5, wherein said peptide is an endocrine hormone.

7. The diketopiperazine microparticles according to claim 6, wherein said endocrine hormone is insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide 1, oxyntomodulin, an analog or active fragment of said endocrine hormone.

8. The diketopiperazine microparticles according to claim 1, wherein said diketopiperazine is fumaryl diketopiperazine.

9. A dry powder comprising the diketopiperazine microparticles of claim 7.

10. A method for forming diketopiperazine microparticles having a specific surface area of about 35 m^2/g to about 67 m^2/g within a 95% confidence limit comprising:

a) dissolving a diketopiperazine in a water-based solution;

b) adding an acid solution to the water-based solution to form a mixture;

c) adjusting manufacturing conditions to target production microparticles with a specific surface area of about 52 m^2/g;

d) precipitating the diketopiperazine microparticles formed out of the solution by adding aqueous ammonia to the microparticle suspension, and

e) collecting the precipitate after several washings with deionized water; wherein the precipitate comprises FDKP microparticles having a specific surface area of about 35 m^2/g to about 67 m^2/g.

11. The method according to claim 10, further comprising the step of incubating the suspension at a temperature of about 14°C to about 18°C.

12. A method of forming fumaryl diketopiperazine microparticles with a specific surface area of about 35 m^2/g to about 67 m^2/g within a 95% confidence limit comprising, feeding equal masses of about 10.5 wt% acetic acid and about 2.5 wt% fumaryl diketopiperazine solutions at about 14°C to about 18°C through a high shear mixer.

13. The method of claim 12, further comprising increasing the pH of a reaction comprising a suspension of diketopiperazine microparticles to pH 4.5 with an aqueous ammonia solution.

14. The method according to claim 12, wherein said adjusting comprises increasing the concentration of ammonia in the suspension to yield a pH of from about pH 3.5 to about pH 4.5.

15. Use of a dry powder comprising the microparticles of claim 5 in the manufacture of a medicament for delivering an active agent to a patient in need thereof.

16. The use of claim 15, wherein the active agent is an endocrine hormone selected from the group consisting of insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide-1, oxyntomodulin, an analog or active fragment of said endocrine hormone.

17. The use of claim 15, wherein the patient has been diagnosed with diabetes.

18. An inhalation system comprising a breath powered inhaler and a dry powder comprising the microparticles of claim 5.