CLAIMS:

1. A reactor for forming a plurality of fully coated particles having solid cores, the reactor comprising:

a reactor vessel configured to receive particles;

a gas phase coating mechanism configured to selectively introduce pulses of gas phase materials that form a coating on the particles;

a sieve located within the reactor vessel; and

a forcing means configured to force the particles through the sieve in use,

wherein the sieve is configured to deagglomerate any particle aggregates formed in the reactor vessel upon forcing of the particles by the forcing means through the sieve.

2. A reactor according to Claim 1 wherein the forcing means is or includes: shaking, tapping, oscillating, tumbling, horizontal rotation, periodic displacement of the sieve, centrifugal force, sonic vibration, ultrasonic vibration, vacuum, air column, pressure gradient, gas flow, brushing, gravitational or a combination thereof.

3. A reactor according to Claim 1 or Claim 2 wherein the forcing means is integrated with the reactor vessel and is or includes ultrasonic vibration such that the vessel and sieve act as a sonic sifter.

4. A reactor according to any preceding claim wherein the forcing means includes a forcing aid to aid in forcing the particles through the sieve in use.

5. A reactor according to Claim 4 wherein the forcing aid is or includes: brush, balls, scraper, spatula, paddle, air jet, or a combination thereof.

6. A reactor according to any preceding claim wherein the ratio of the size of particles to the sieve mesh size is about 1:2.

7. A reactor according to any preceding claim further including a plurality of sieves located within the reactor vessel, each sieve having progressively finer meshes in the direction of forceable movement of the particles.

8. A reactor according to any preceding claim wherein the reactor vessel includes more than one reactor chamber, the sieve being located between each neighbouring reactor chamber, the gas phase coating mechanism being configured to selectively

introduce one or more pulses of gas phase material to the particles in one or each reactor chamber.

9. A reactor according to Claim 8 further including a particle position changing means configured to action movement of the particles from one physical space in the reactor to another to permit subsequent forcing of the particles through the sieve.

10. A reactor according to Claim 9 wherein the particle position changing means is a movement member configured to physically move each of the reactor chambers so as to switch places of the reactor chambers.

11. A reactor according to Claim 10 wherein the movement member is configured to rotate the reactor chambers along a single axis to switch places of the reactor chambers.

12. A reactor according to Claim 10 wherein the movement member is configured to switch places of the reactor chambers without rotation of the reactor chambers.

13. A reactor according to any one of Claims 10 to 12 wherein each reactor chamber includes a sieve located on an intermediate surface, the intermediate surface being located between neighbouring reactor chambers upon switching of their places so that a sieve is located between the reactor chambers at any given time.

14. A reactor according to Claim 9 wherein the particle position changing means is a particle transport mechanism configured to transport the particles between each of the reactor chambers.

15. A reactor according to Claim 14 wherein the particle transport mechanism is or includes: airflow, physical transportation mechanism or a combination thereof.

16. A reactor according to Claim 9 wherein the particle position changing means includes a movement member according to any one of Claims 10 to 13 and a particle transport mechanism according to Claim 14 or Claim 15.

17. A reactor according to any one of Claims 8 to 16 further including a stop means positioned relative to the or each sieve to selectively prevent passing of the particles through the sieve into a neighbouring reactor chamber.

18. A reactor according to Claim 17 wherein the stop means is or includes: a physical stop, an airflow, or a combination thereof.

19. A reactor according to any preceding claim wherein the forcing means is configured to force the particles through the sieve after each pulse or cycle of pulses of gas phase materials provided by the gas phase coating mechanism.

20. A reactor according to any one of Claims 1 to 18 wherein the forcing means is configured to force the particles through the sieve after a plurality of pulses of gas phase materials is provided by the gas phase coating mechanism.

21. A reactor according to any preceding claim wherein the gas phase coating mechanism incorporates one of the following gas phase coating techniques: atomic layer deposition (ALD), atomic layer epitaxy (ALE), molecular layer deposition (MLD), molecular layer epitaxy (MLE), chemical vapor deposition (CVD), atomic layer CVD, molecular layer CVD, physical vapor deposition (PVD), sputtering PVD, reactive sputtering PVD, evaporation PVD, binary reaction sequence chemistry.

22. A method of forming fully coated particles comprising the steps of:

i) providing a plurality of particles into a gas phase coating reactor;

ii) subjecting those particles to pulses of gas phase materials by a gas phase coating technique so as to coat the particles;

iii) forcing the coated particles through a sieve within the reactor to deagglomerate any particle aggregates formed during step ii); and

iv) repeating steps ii) and iii) to form particles with a solid core, the solid core being fully enclosed by the coating formed by the gas phase coating technique.

23. A method according to Claim 22 wherein step ii) includes applying a single pulse or cycle of pulses of gas phase material to form an initial layer on the particles and step iii) includes forcing the particles through the sieve after each pulse or cycle of pulses of gas phase material applied in step ii).