CLAIMS

1. A method of preparing a pharmaceutical composition comprising a drug-containing core enclosed by a combination of thin (< 100nm), conformal organic and inorganic coatings, wherein the inorganic coatings comprise one or more metal oxide materials, the method comprising the sequential steps of:

(a) loading the particles comprising the drug into a reactor;

(b) applying a vaporous or gaseous metal precursor to the particles in the reactor;

(c) performing one or more pump-purge cycles of the reactor using inert gas;

(d) applying a vaporous or gaseous oxidant to the particles in the reactor; and

(e) performing one or more pump-purge cycles of the reactor using inert gas;

wherein the organic coatings are coated through one or more of initiated (hot filament) chemical vapor deposition (iCVD), or aerosol-assisted spray deposition process (AA-CVD).

2. The method of claim 1, wherein the sequential steps (b)-(e) are repeated one or more times to increase the total thickness of the one or more metal oxide materials.

3. The method of claim 1, wherein the reactor pressure is allowed to stabilize following step (a) to less than 1 Torr, following step (b) to at least 1 Torr, and/or following step (d) to at least 1 Torr.

4. The method of claim 1, wherein the reactor contents are agitated prior to and/or during step (b), step (c), and/or step (e).

5. The method of claim 1, wherein a subset of vapor or gaseous content is pumped out prior to step (c) and/or step (e).

6. The method of claim 1, wherein the metal oxide layer has a thickness in range of 0.1 nm to 100 nm.

7. The method of claim 1, wherein the particles comprise a drug and one or more pharmaceutically acceptable excipients.

8. The method of claim 1, wherein the particles have a median particle size, on a volume average basis between 0.1 μm and 1000 μm.

9. The method of claim 1, wherein the pharmaceutical composition is removed from the reactor and admixed with a pharmaceutically acceptable diluent or carrier.

10. The method of claim 1, wherein the particles consist essentially of the drug.

11. The method of claim 1, wherein the drug is a small molecule, virus particle, polypeptide, polynucleotide, a composition comprising polypeptide and lipid, or a composition comprising polynucleotide and lipid.