CLAIMS

What is claimed is:

1. A coated particle, comprising:

a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm;

a coating material adhered to and covering at least a portion of an outer surface of the core particle, the coating material comprising an amine terminated group; and

a plurality of nanoparticles selected from the group consisting of carbon nanotubes, nanographite, nanographene, non-diamond carbon allotropes, surface modified nanodiamond, nanoscale particles of BeO, and nanoscale particles comprising a Group VIIIA element adhered to the coating material.

2. The coated particle of claim 1, wherein the outer surface of the core particle comprises a first net charge, the coating material comprises a second net charge opposite the first net charge, and an outer surface at least some nanoparticles of the plurality of nanoparticles comprises a third net charge opposite the second net charge.

3. The coated particle of claim 1, further comprising at least a second coating material adhered to and covering at least a portion of the plurality of nanoparticles.

4. The coated particle of claim 3, further comprising at least a second plurality of nanoparticles selected from the group consisting of carbon nanotubes, nanographite, nanographene, non-diamond carbon allotropes, surface modified nanodiamond, nanoscale particles of BeO, and nanoscale particles comprising a Group VIIIA element adhered to the at least a second coating material.

5. The coated particle of claim 4, wherein the plurality of nanoparticles comprises a material different from the material of the at least a second plurality of nanoparticles.

6. The coated particle of claim 4 or claim 5, wherein the core particle, the coating material, the plurality of nanoparticles, the at least a second coating material, and the at least a second plurality of nanoparticles comprise a net charge opposite a net charge of their adjacent components.

7. The coated particle of claim 4 or claim 5, further comprising a plurality of other coating materials and other pluralities of nanoparticles successively disposed on and adhered to one another.

8. The coated particle of claim 1, wherein the coating material comprises at least one of polyallylamine and branched polyethylenimine.

9. A method of coating a particle, comprising:

at least partially coating a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm with a coating material comprising an amine terminated group;

adhering the coating material to an outer surface of the core particle;

disposing the at least partially coated core particle in a dispersion comprising a plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the plurality of nanoparticles to the coating material.

10. The method of claim 9, further comprising:

imparting a first net charge opposite a second net charge of the coating material to the outer surface of the core particle; andimparting a third net charge opposite the second net charge to an outer surface of at least some nanoparticles of the plurality of nanoparticles.

11. The method of claim 9, further comprising:

at least partially coating the at least some nanoparticles of the plurality of nanoparticles with a coating material comprising an amine terminated group; and

adhering the coating material to the at least some nanoparticles of the plurality of nanoparticles.

12. The method of claim 11, further comprising:

disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the another plurality of nanoparticles to the coating material.

13. The method of claim 12, wherein disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material comprises disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material different from the material of the at least some nanoparticles of the plurality of nanoparticles.

14. The method of claim 12 or claim 13, further comprising repeating the acts of at least partially coating, adhering, disposing in a dispersion, and adhering a predetermined number of times.

15. The method of claim 9, further comprising derivatizing the outer surface of the core particle before at least partially coating the core particle.

16. The method of claim 9, further comprising derivatizing an outer surface of the plurality of nanoparticles before disposing the at least partially coated core particle in the dispersion comprising the plurality of nanoparticles.

17. The method of claim 9 or claim 16, further comprising:

disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising a plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material, wherein the plurality of nanoparticles comprises a charge opposite a charge of the at least some of the nanoparticles; and

adhering at least some other nanoparticles of the plurality of nanoparticles to the at least some nanoparticles of the nanoparticles.

18. The method of claim 9 or claim 16, further comprising cross-linking the coating material.

19. The method of claim 9 or claim 16, wherein at least partially coating a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm with a coating material comprising an amine terminated group comprises at least partially coating the core particle with at least one of polyallylamine and branched polyethylenimine.

20. A method of forming a polycrystalline compact, comprising:

at least partially coating a plurality of core particles comprising a superhard material and having an average particle size of between 1 μm and 500 μm with a coating material comprising an amine terminated group;

adhering the coating material to an outer surface of the plurality of core particles;

disposing the at least partially coated plurality of core particles in a dispersion comprising a plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material;

adhering at least some nanoparticles of the plurality of nanoparticles to the coating material; and

interbonding at least some at least partially coated core particles of the at least partially coated plurality of core particles by subjecting them to a high temperature/high pressure process to form a polycrystalline material.

21. The method of claim 20, further comprising:

imparting a first net charge opposite a second net charge of the coating material to the outer surface of the plurality of core particles; and

imparting a third net charge opposite the second net charge to an outer surface of at least some nanoparticles of the plurality of nanoparticles.

22. The method of claim 20, further comprising at least partially coating the at least some nanoparticles of the plurality of nanoparticles with a coating material comprising an amine terminated group.

23. The method of claim 22, further comprising:

disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the another plurality of nanoparticles to the coating material.

24. The method of claim 23, wherein disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material comprises disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material different from the material of the at least some nanoparticles of the plurality of nanoparticles.

CLAIMS

What is claimed is:

1. A coated particle, comprising:

a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm;

a coating material adhered to and covering at least a portion of an outer surface of the core particle, the coating material comprising an amine terminated group; and

a plurality of nanoparticles selected from the group consisting of carbon nanotubes, nanographite, nanographene, non-diamond carbon allotropes, surface modified nanodiamond, nanoscale particles of BeO, and nanoscale particles comprising a Group VIIIA element adhered to the coating material, at least a portion of the plurality of nanoparticles comprising a different material than the superhard material of the core particle.

2. The coated particle of claim 1, wherein the outer surface of the core particle comprises a first net charge, the coating material comprises a second net charge opposite the first net charge, and an outer surface of at least some nanoparticles of the plurality of nanoparticles comprises a third net charge opposite the second net charge.

3. The coated particle of claim 1, further comprising at least a second coating material adhered to and covering at least a portion of the plurality of nanoparticles.

4. The coated particle of claim 3, further comprising at least a second plurality of nanoparticles selected from the group consisting of carbon nanotubes, nanographite, nanographene, non-diamond carbon allotropes, surface modified nanodiamond, nanoscale particles of BeO, and nanoscale particles comprising a Group VIIIA element adhered to the at least a second coating material.

5. The coated particle of claim 4, wherein the plurality of nanoparticles comprises a material different from the material of the at least a second plurality of nanoparticles.

6. The coated particle of claim 4, wherein the core particle, the coating material, the plurality of nanoparticles, the at least a second coating material, and the at least a second plurality of nanoparticles comprise a net charge opposite a net charge of their adjacent components.

7. The coated particle of claim 4, further comprising a plurality of other coating materials and other pluralities of nanoparticles successively disposed on and adhered to one another.

8. The coated particle of claim 1, wherein the coating material comprises at least one of polyallylamine and branched polyethylenimine.

9. A method of coating a particle, comprising:

at least partially coating a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm with a coating material comprising an amine terminated group;

adhering the coating material to an outer surface of the core particle;

disposing the at least partially coated core particle in a dispersion comprising a plurality of nanoparticles, at least a portion of the plurality of nanoparticles comprising a material different than the superhard material of the core particle and selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the plurality of nanoparticles to the coating material.

10. The method of claim 9, further comprising:

imparting a first net charge opposite a second net charge of the coating material to the outer surface of the core particle; and

imparting a third net charge opposite the second net charge to an outer surface of at least some nanoparticles of the plurality of nanoparticles.

11. The method of claim 9, further comprising:

at least partially coating the at least some nanoparticles of the plurality of nanoparticles with a coating material comprising an amine terminated group; and

adhering the coating material to the at least some nanoparticles of the plurality of nanoparticles.

12. The method of claim 11, further comprising:

disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the another plurality of nanoparticles to the coating material.

13. The method of claim 12, wherein disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material comprises disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material different from the material of the at least some nanoparticles of the plurality of nanoparticles.

14. The method of claim 12, further comprising repeating the acts of at least partially coating, adhering, disposing in a dispersion, and adhering a predetermined number of times.

15. The method of claim 9, further comprising derivatizing the outer surface of the core particle before at least partially coating the core particle.

16. The method of claim 9, further comprising derivatizing an outer surface of the plurality of nanoparticles before disposing the at least partially coated core particle in the dispersion comprising the plurality of nanoparticles.

17. The method of claim 9, further comprising:

disposing the core particle, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising a plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material, wherein the plurality of nanoparticles comprises a charge opposite a charge of the at least some of the nanoparticles; and

adhering at least some other nanoparticles of the plurality of nanoparticles to the at least some nanoparticles of the nanoparticles.

18. The method of claim 9, further comprising cross-linking the coating material.

19. The method of claim 9, wherein at least partially coating a core particle comprising a superhard material and having an average diameter of between 1 μm and 500 μm with a coating material comprising an amine terminated group comprises at least partially coating the core particle with at least one of polyallylamine and branched polyethylenimine.

20. A method of forming a polycrystalline compact, comprising:

at least partially coating a plurality of core particles comprising a superhard material and having an average particle size of between 1 μm and 500 μm with a coating material comprising an amine terminated group;

adhering the coating material to an outer surface of the plurality of core particles;

disposing the at least partially coated plurality of core particles in a dispersion comprising a plurality of nanoparticles, at least a portion of the plurality of nanoparticles comprising a different material than the superhard material of the core particles and selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material;

adhering at least some nanoparticles of the plurality of nanoparticles to the coating material; and

interbonding at least some at least partially coated core particles of the at least partially coated plurality of core particles by subjecting them to a high temperature/high pressure process to form a polycrystalline material.

21. The method of claim 20, further comprising:

imparting a first net charge opposite a second net charge of the coating material to the outer surface of the plurality of core particles; and

imparting a third net charge opposite the second net charge to an outer surface of at least some nanoparticles of the plurality of nanoparticles.

22. The method of claim 20, further comprising at least partially coating the at least some nanoparticles of the plurality of nanoparticles with a coating material comprising an amine terminated group.

23. The method of claim 22, further comprising:

disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material; and

adhering at least some nanoparticles of the another plurality of nanoparticles to the coating material.

24. The method of claim 23, wherein disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material selected from the group consisting of graphite, graphene, a non-diamond allotrope of carbon, surface modified diamond, BeO, and a Group VIIIA element dispersed in a continuous phase material comprises disposing the plurality of core particles, the coating material, and the at least some nanoparticles of the plurality of nanoparticles in a dispersion comprising another plurality of nanoparticles comprising a material different from the material of the at least some nanoparticles of the plurality of nanoparticles.