CLAIMS

What is claimed is:

1. A cutting structure for drilling subterranean formations, comprising a cutting element including a multi-portion polycrystalline material, at least one portion of the multi-portion polycrystalline material comprising a higher volume of nanoparticles than at least another portion of the multi-portion polycrystalline material.

2. The cutting structure of claim 1, wherein the nanoparticles comprise a carbon allotrope and have an average aspect ratio of about one hundred or less.

3. The cutting structure of claim 2, wherein the nanoparticles comprise at least one of diamond nanoparticles, fullerenes, carbon nanotubes, and graphene nanoparticles.

4. The cutting structure of claim 1, claim 2, or claim 3, wherein the multi-portion polycrystalline material is functionally graded, a region of at least one of the at least one portion and the at least another portion proximate the other of the at least one portion and the at least another portion comprising a volume of nanoparticles that is intermediate the overall volumes of nanoparticles in the at least one portion and the at least another portion.

5. The cutting structure of claim 4, wherein a distinct boundary between the at least one portion and the at least another portion is not discernible.

6. The cutting structure of claim 4, wherein the region comprises an end of the at least one of the at least one portion and the at least another portion, and includes up to 10% by volume nanoparticles.

7. The cutting structure of claim 6, wherein the region includes up to 5% by volume nanoparticles.

8. The cutting structure of claim 1, wherein the at least one portion of the multi-portion polycrystalline material comprises a first average grain size and the at least another portion of the multi-portion polycrystalline material comprises a second, different average grain size.

9. The cutting structure of claim 8, wherein the second, different average grain size is greater than the first average grain size.

10. The cutting structure of claim 9, wherein the second, different average grain size is about one hundred (100) times greater than the first average grain size.

11. The cutting structure of claim 9, wherein the first average grain size is greater than five hundred nanometers (500 nm).

12. The cutting structure of claim 9, claim 8, or claim 9, wherein the multi-portion polycrystalline material further comprises a third portion having a third average grain size, the third average grain size being greater than the second average grain size.

13. The cutting structure of claim 8, wherein the first average grain size is less than about five hundred nanometers (500 nm).

14. The cutting structure of claim 1, wherein the at least one portion of the multi-portion polycrystalline material comprises a cutting face of the cutting element.

15. The cutting structure of claim 14, wherein the at least another portion extends over a top surface of the at least one portion.

16. The cutting structure of claim 15, wherein the at least another portion further extends around sides of the at least one portion.

17. The cutting structure of any one of claims 1 through 15, wherein an interface between the at least one portion and the at least another portion is non-planar.

18. The cutting structure of any one of claims 1 through 15, wherein the at least one portion of the multi-portion polycrystalline material comprises between about 0.01% to about 99% by volume nanoparticles.

19. The cutting structure of any one of claims 1 through 15, wherein the at least another portion of the multi-portion polycrystalline material is at least substantially free of nanoparticles.

20. The cutting structure of claim 1, wherein the cutting structure comprises an earth-boring tool including:

a body; and

at least one cutting element according to any of claims 1 through 17 attached to the body.

CLAIMS

1. A cutting element for drilling subterranean formations comprising a multi-portion polycrystalline diamond material, at least one portion of the multi-portion polycrystalline diamond material comprising a higher volume of nanoparticles than at least another portion of the multi-portion polycrystalline diamond material, wherein inter-granular bonds are formed between particles of the at least one portion and particles of the at least another portion of the multi-portion polycrystalline diamond material.

2. The cutting element of claim 1, wherein the nanoparticles comprise a carbon allotrope and have an average aspect ratio of about one hundred or less.

3. The cutting element of claim 2, wherein the nanoparticles comprise at least one of diamond nanoparticles, fullerenes, carbon nanotubes, and graphene nanoparticles.

4. The cutting element of claim 1, wherein the multi-portion polycrystalline diamond material is functionally graded, a region of at least one of the at least one portion and the at least another portion proximate the other of the at least one portion and the at least another portion comprising a volume of nanoparticles that is intermediate the overall volumes of nanoparticles in the at least one portion and the at least another portion.

5. The cutting element of claim 4, wherein a distinct boundary between the at least one portion and the at least another portion is not discernible.

6. The cutting element of claim 1, wherein the at least one portion of the multi-portion polycrystalline diamond material comprises a first average grain size and the at least another portion of the multi-portion polycrystalline diamond material comprises a second, different average grain size.

7. The cutting element of claim 6, wherein the second, different average grain size is greater than the first average grain size.

8. The cutting element of claim 7, wherein the second, different average grain size is about one hundred (100) times greater than the first average grain size.

9. The cutting element of claim 7, wherein the first average grain size is greater than five hundred nanometers (500 nm).

10. The cutting element of claim 7, wherein the multi-portion polycrystalline diamond material further comprises a third portion having a third average grain size, the third average grain size being greater than the second average grain size.

11. The cutting element of claim 6, wherein the first average grain size is less than about five hundred nanometers (500 nm).

12. The cutting element of claim 1, wherein the at least one portion of the multi-portion polycrystalline diamond material comprises a cutting face of the cutting element.

13. The cutting element of claim 12, wherein the at least another portion extends over a top surface of the at least one portion.

14. The cutting element of claim 13, wherein the at least another portion further extends around sides of the at least one portion.

15. The cutting element of claim 1, wherein an interface between the at least one portion and the at least another portion is non-planar.

16. The cutting element of claim 1, wherein the at least one portion of the multi-portion polycrystalline diamond material comprises between about 0.01% to about 99% by volume nanoparticles.

17. The cutting element of claim 1, wherein the at least another portion of the multi-portion polycrystalline diamond material is at least substantially free of nanoparticles.

18. An earth-boring tool, comprising:

a body; and

at least one cutting element attached to the body, the at least one cutting element comprising:

a hard polycrystalline diamond material comprising:

a first portion comprising a first volume of nanoparticles; and

a second portion comprising a second volume of nanoparticles, wherein the first volume of nanoparticles differs from the second volume of nanoparticles, and wherein inter-granular bonds are formed between particles of the first portion and particles of the second portion.

19. The earth-boring tool of claim 18, wherein the first portion comprises a first average particle size and the second portion comprises a second average particle size, the second average particle size being greater than the first average particle size.

20. The earth-boring tool of claim 19, wherein the at least one cutting element further comprises a third portion having a third average particle size, the third average particle size being greater than the second average particle size.