Title: POLYCRYSTALLINE COMPACTS INCLUDING NANOPARTICULATE INCLUSIONS, CUTTING ELEMENTS AND EARTH-BORING TOOLS INCLUDING SUCH COMPACTS, AND METHODS OF FORMING SUCH COMPACTS

Abstract: Polycrystalline compacts include non-catalytic nanoparticles in interstitial spaces between interbonded grains of hard material in a polycrystalline hard material. Cutting elements and earth-boring tools include such polycrystalline compacts. Methods of forming polycrystalline compacts include sintering hard particles and non-catalytic nanoparticles to form a polycrystalline material. Methods of forming cutting elements include infiltrating interstitial spaces between interbonded grains of hard material in a polycrystalline material with a plurality of non-catalytic nanoparticles.
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AMENDED CLAIMS
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1. A polycrystalline compact, comprising:
a plurality of grains of hard material, the plurality of grains of hard material being
interbonded to form a polycrystalline hard material; and
a plurality of non-catalytic nanoparticles disposed in interstitial spaces between the
grains of hard material, wherein the nanoparticles of the plurality of non-
catalytic nanoparticles comprise generally spherical nanoparticles or generally
platelet-shaped nanoparticles.

2. The polycrystalline compact of claim 1, wherein the plurality of grains of hard
material comprises grains of diamond.

3. The polycrystalline compact of claim 1 or claim 2, wherein the nanoparticles of
the plurality of non-catalytic nanoparticles comprise at least one of a metal, a metal
alloy, an intermetallic compound, and a ceramic.

4. The polycrystalline compact of claim 3, wherein the nanoparticles of the
plurality of non-catalytic nanoparticles comprise at least one of a carbide, a nitride, and
an oxide.

5. The polycrystalline compact of claim 1 or claim 2, further comprising a catalyst
material in the interstitial spaces between the grains of hard material.

6. The polycrystalline compact of claim 1 or claim 2, wherein the plurality of
grains of hard material comprises:
a plurality of smaller grains of hard material having a first average grain size; and
a plurality of larger grains of hard material having a second average grains size that is
at least about one hundred and fifty (150) times larger than the first average

grain size.
7. The polycrystalline compact of claim 6, wherein the second average grains size is between two hundred and fifty (250) times and seven hundred and fifty (750) times larger than the first average grain size.

8. The polycrystalline compact of claim 6, wherein the first average grain size is between about one nanometer (1 nm) and about one hundred and fifty nanometers (150 nm), and the second average grain size is between about five microns (5 µm) and about forty microns (40 µm).

9. The polycrystalline compact of claim 1 or claim 2, wherein a total volume occupied by the plurality of non-catalytic nanoparticles in the polycrystalline hard material is in a range extending from about 0.01% to about 50% of a total volume occupied by the grains of hard material in the polycrystalline hard material.

10. A cutting element, comprising:
    a substrate; and
    a polycrystalline compact as recited in claim 1 or claim 2 on the substrate.

11. An earth-boring tool comprising a body and a polycrystalline compact as recited in claim 1 or claim 2 carried by the body.

12. A method of forming a polycrystalline compact, comprising sintering a plurality of hard particles and a plurality of non-catalytic nanoparticles to form a polycrystalline hard material comprising a plurality of interbonded grains of hard material, wherein the nanoparticles of the plurality of non-catalytic nanoparticles comprise generally spherical nanoparticles or generally platelet-shaped nanoparticles.

13. The method of claim 12, further comprising selecting each the hard particles of the plurality of hard particles to comprise diamond,

14. The method of claim 12 or claim 13, further comprising selecting the nanoparticles of the plurality of non-catalytic nanoparticles to comprise at least one of a metal, a metal alloy, an intermetallic compound, and a ceramic.

AMENDED SHEET (ARTICLE 19)
15. The method of claim 12 or claim 13, wherein sintering a plurality of hard particles and a plurality of non-catalytic nanoparticles comprises sintering the plurality of hard particles and the plurality of non-catalytic nanoparticles in an HTHP process.

16. The method of claim 12 or claim 13, further comprising adhering the nanoparticles of the plurality of non-catalytic nanoparticles to exterior surfaces of the hard particles of the plurality of hard particles prior to sintering the plurality of hard particles and the plurality of non-catalytic nanoparticles.

17. The method of claim 16, further comprising functionalizing at least one of the plurality of hard particles and the plurality of non-catalytic nanoparticles to promote adhesion of the nanoparticles of the plurality of non-catalytic nanoparticles to the exterior surfaces of the hard particles of the plurality of hard particles.

18. A method of forming a cutting element, comprising infiltrating interstitial spaces between interbonded grains of hard material in a polycrystalline material with a plurality of non-catalytic nanoparticles, wherein the nanoparticles of the plurality of non-catalytic nanoparticles comprise generally spherical nanoparticles or generally platelet-shaped nanoparticles.

19. The method of claim 18, further comprising selecting the grains of hard material to comprise diamond grains.

20. The method of claim 18 or claim 19, further comprising selecting the nanoparticles of the plurality of non-catalytic nanoparticles to comprise at least one of a metal, a metal alloy, an intermetallic compound, and a ceramic.
STATEMENT UNDER ARTICLE 19(1) (RULE 46.4)

Applicant has amended claims 1, 9 through 12, and 18. The amendments to claims 1, 9 through 12, and 18 are more fully described in the Letter Accompanying the Article 19 Amendments, which is also submitted herewith. The amendments have no impact on the description and the drawings.