transformation is accelerated in the presence of cobalt through a combination of mechanical and chemical effects. For example, the shear resistance of the cobalt drops rapidly, and the grains are not strongly held, leading to additional damage to the surface. It is also known that the real area of contact depends on the velocity with which plastic strains are propagated in the metal binder. The shearing occurs so rapidly that full plastic yielding under the normal load is not possible.

[0014] In addition, there is a significant difference between the thermal expansion coefficients of cobalt and diamond. During heating, cobalt expands at a higher rate than diamond. The amount of thermal stress in the diamond table increases, and the structure breaks down. The cobalt between the diamond crystals expands and breaks the diamond-to-diamond bonds, allowing for chipping and cracking of the diamond grains from the PD table.

[0015] PDC cutters can be categorized by their abrasion resistance, impact resistance and thermal stability, and it is difficult to achieve all three properties maximized in one cutter variant. In general, a cutter that is highly abrasion resistant is characterized by fine diamond particle/grain size, and a cutter that is highly impact resistant is characterized by a coarse particle/grain size.

[0016] Accordingly, there remains a need in the art for a fixed cutter bit with a cutting structure capable of enhancing bit ROP, and bit durability. Such cutting structures would be particularly well-received if they included PD material with enhanced bonding between diamond grains to provide improved resistance to mechanical failure and thermal properties. As such, embodiments disclosed herein address the requirement for improved thermal stability in PDC cutting elements, and further embodiments provide PDC cutting elements with characteristics to impart high abrasive resistance and high impact strength as compared to certain conventional cutters known in the art.

BRIEF SUMMARY OF THE DISCLOSURE

[0017] In an ~~embodiment~~aspect, there is provided a method for making a cutter element for a drill bit, the method comprising: forming a suspension comprising nanocrystalline diamond particles and a solvent; forming a blend comprising a first plurality of polycrystalline diamond particles and a second plurality of polycrystalline diamond particles, wherein each of the first plurality of polycrystalline diamond particles has a size that is greater than a size of each of the second plurality of polycrystalline diamond particles and mixing the blend and the suspension to form a mixture, wherein the mixture comprises less than 5 wt. % of the nanocrystalline diamond particles, ~~The embodiment~~ further comprising: spray drying the mixture to form a dry mixture,

wherein the dry mixture comprises a plurality of nanocrystalline diamond coated polycrystalline diamond particles (NDCPD), wherein the plurality of nanocrystalline diamond particles are homogenously distributed around each of the plurality of polycrystalline diamond particles; and sintering the dry mixture to form the cutter element.

[0018] In an alternate ~~embodiment~~aspect, there is provided a method of making a cutter element for a drill bit, the method comprising: forming a suspension comprising a plurality of nanocrystalline diamond particles and a solvent, wherein the solvent is a polar liquid, and wherein each of the plurality of nanocrystalline diamond particles has a size of 1 nm – 10 nm and disposing a plurality of polycrystalline diamond particles in the suspension to form a mixture, wherein a plurality of the plurality of nanocrystalline diamond particles are homogenously distributed about each of the plurality of polycrystalline diamond particles in the mixture, and wherein the plurality of polycrystalline diamond particles are distributed homogenously throughout the mixture, and wherein each of the plurality of polycrystalline diamond particles has a size of 15 μm - 50 μm; wherein the zeta potential of at least one of the suspension and the mixture is from ±30 to ±100mV, ~~T~~the ~~embodiment~~ method further comprising drying the mixture using a solgel process; forming a dried mixture after drying the mixture, wherein the dried mixture comprises the plurality of nanocrystalline diamond particles homogenously distributed about each of the plurality of polycrystalline diamond particles, and wherein the plurality of polycrystalline diamond particles are distributed homogenously throughout the dried mixture; and sintering the dry mixture to form the cutter element.

[0019] In an alternate ~~embodiment~~aspect, there is provided a method of making a cutter element for a drill bit, the method comprising: forming a suspension comprising a plurality of nanocrystalline diamond particles and a solvent, wherein the solvent is a polar liquid; disposing a plurality of polycrystalline diamond particles in the suspension to form a mixture, wherein a plurality of the plurality of nanocrystalline diamond particles are homogenously distributed about each of the plurality of polycrystalline diamond particles in the mixture, and wherein the plurality of polycrystalline diamond particles are distributed homogenously throughout the mixture; and wherein the zeta potential of at least one of the suspension and the mixture is from ±30 to ±100mV, ~~T~~the ~~embodiment~~ method further comprising: drying the mixture using one of a spray-drying or a solgel process, wherein the dry mixture comprises a plurality of nanocrystalline diamond coated polycrystalline diamond particles (NDCPD), wherein the plurality of nanocrystalline diamond particles are homogenously distributed around each of the plurality of polycrystalline diamond particles; forming a dried mixture after drying the mixture, wherein the dried mixture comprises the plurality of plurality of nanocrystalline diamond particles homogenously