Hybrid metallic nanocomposites for extra wear-resistant diamond machining tools

The applicability of metallic nanocomposites as binder for diamond machining tools is demonstrated. The various nanoreinforcements (carbon nanotubes, boron nitride hBN, nanoparticles of tungsten carbide/WC) and their combinations are embedded into metallic matrices and their mechanical properties are determined in experiments. The wear resistance of diamond tools with metallic binders modified by various nanoreinforcements was estimated. 3D hierarchical computational finite element model of the tool binder with hybrid nanoscale reinforcements is developed, and applied for the structure-properties analysis of the binder. It is shown that the metallic nanocomposites with hybrid reinforcements ensure the highest mechanical properties and also the highest wear-resistance of the machining tools, with the nanocomposites used as binder.

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