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CVD synthesis of polycrystalline superhard diamond-cBN composite coatingsStepan Linnik¹, Alexander Gaydaychuk², Sergei Zenkin³¹Tomsk Polytechnic University, Tomsk, Russia ²Tomsk polytechnic university, Tomsk, Russian Federation ³gaydaychuk@tpu.ru, Tomsk, Russian Federation

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We report about the CVD synthesis and characterization of superhard composite diamond-cBN coatings with superior chemical inertness over polycrystalline diamond and higher hardness than crystal cBN. The CVD synthesis of the coatings was carried out by hot filament CVD and in abnormal glow discharge plasma. The microstructure of the coatings could be controlled from microcrystalline to ultra-nanocrystalline. The thickness of the coatings in our experiments reached 50 μm. The hardness of this composite reached values of 80 GPa. Microstructure and phase composition were investigated with SEM, TEM, X-ray diffraction and Raman spectroscopy. The process of coating oxidation in the air was investigated depending on phase composition in the temperature range 400-1000 °C. The results of high-temperature nanotribotests in the range 20-800 °C in air atmosphere are also presented.

Keywords

CVD coatings

diamond

cubic boron nitride

superhardness

chemical inertness