ULTRANANOCRYSTALLINE DIAMOND/AMORPHOUS CARBON COMPOSITE FILMS SYNTHESIS ON CEMENTED CARBIDE SUBSTRATE BY COAXIAL ARC PLASMA DEPOSITION

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Abstract: *Ultrananocrystalline diamond/amorphous carbon composite films, wherein a larger number of diamond grains with diameters of less than 10 nm are embedded in an amorphous carbon matrix, were deposited on cemented carbide (WC-6wt.% Co) substrates by using coaxial arc plasma deposition at different repetition rates and deposition temperatures. The hardness and Young's modulus were measured by nanoindentation. The film deposited at a repetition rate of 1 Hz and room temperature exhibited the maximum hardness of 51 GPa and modulus of 520 GPa. This implies that catalytic effects of Co in the WC-Co substrates, which induce the graphitization of the films, can be suppressed by the low deposition temperature, since the catalytic effects are enhanced with increasing temperature.*

Key words: *Nanodiamond, Hard coating, Coaxial arc plasma deposition, CAPD, Nanoindentation, Cutting tools*