ADHESION IMPROVEMENT OF DIAMOND COATING DEPOSITED ON WC-CO SUBSTRATES

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Keywords: Chemical vapor deposition, Diamond

Abstract

The obstacle which limits the commercialization of the diamond coated cutting tools is associated with the poor adhesion strength of diamond films. Film deposited on WC-Co substrate is very easy to delaminate due to non-diamond formation favored by Co leaching and high residual stress inherent in the film as a result of the high temperature deposition process. In our study, we have developed a two step surface pretreatment involving the diffusion barrier implantation and the nucleation enhancement by sandblasting the sample surface with diamond powder to improve the adhesion strength. Polycrystalline diamond films were synthesized from hydrogen and methane gas mixture by microwave plasma enhanced chemical vapor deposition (MPECVD) system. Fig.1 shows the scanning electron microscopy (SEM) micrograph of the diamond coating. Residual stress in diamond film grown on the substrate has been investigated as a function of the deposition parameters. The stress was determined by different methods including the curvature method using Stoney's equation and peak shift measured by x-ray diffractometer (XRD) and Raman spectroscopy [1]. The adhesion strength was characterized by Rockwell indentation tests and the mechanical properties of the film were obtained by nanoindentation and pin-on-disk tests.

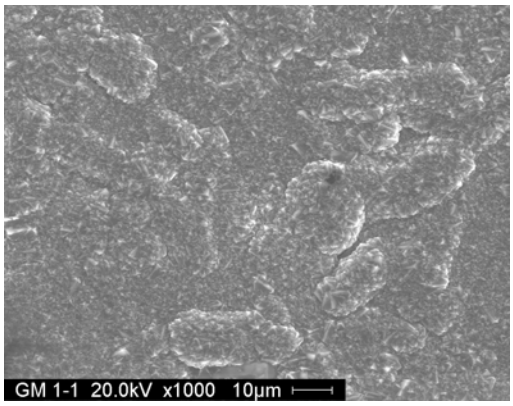

Figure* 1. *SEM micrograph of diamond coating deposited on WC-Co substrat.e

REFERENCES

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