

Chen Z, M.E.Sc., "Microstructural Engineering of Diamond Film", The University of Western Ontario, December 1997 (co-supervised, LWM Lau as chief advisor)

Abstract

Engineering of microstructures in diamond composite coatings was studied in this thesis project through the addition of cubic boron nitride (cBN) powder and patterned gold deposit in chemical vapor deposited (CVD) diamond. The main purpose of the work is to use this microstructural engineering to enhance the adhesion and fracturing toughness of CVD diamond.

In the case of dispersed cBN powder incorporation, diamond grew homoepitaxially in the growth front which was not covered by cBN powder. However, diamond also grew on cBN powder but the diamond grain size became small with orientation different from those around the powder. In the case of gold which was deposited between two CVD diamond layers, gold cluster droplets included in CVD diamond were observed. The grain structure engineering thus achieved significantly improved the adhesion of the resultant CVD diamond composite, as shown by indentation measurements. The particulate composite formation should also improve the fracturing toughness of the CVD diamond. The confirmation of which would require further studies.