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Nanomechanical and *I–V* characterization of a conductive coating on an HPHT diamond substrate

ABSTRACT. Single crystal diamonds were grown under high pressure and high temperature (HPHT) using the temperature gradient method. HPHT diamond plates coated withTi and Ti/Pt/Au layerswere prepared and annealed at temperatures ranging from 600 to 900 °C for periods ranging from 10 to 60 min. A multifunctional STM with a three-sided pyramidal Berkovich conductive diamond tip was used for nanomechanical characterization of the samples. The same apparatus was equipped with a gold tip to measure current–voltage (*I–V*) characteristics without moving the sample. Nanoindentation was used to study carbide formation in the Ti film due to the diffusion of carbon from the diamond with various annealing parameters. Nanoscratching experiments were used to evaluate the mechanical adhesion of metallization. Measurements of the current–voltage characteristics revealed a relation between the adhesion of the coatings to the substrate and the shape of the *I–V* curve. It was found that annealing at 800 °C for 50 min is the best for ensuring strong adhesion and ohmicity of a Ti/Pt/Au coating on HPHT diamond.

Keywords: annealing, current–voltage characteristics, HPHT diamond, mechanical properties, metallization, STM

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