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Raman Microscopic Analysis of Internal Stress in Boron-Doped Diamond EMMA SUNDIN, Department of Physics, University of Texas at El Paso, KEVIN BENNET, Division of Engineering, Mayo Clinic, KENDALL LEE, Department of Neurologic Surgery, Mayo Clinic, JONATHAN TOMSHINE, Division of Engineering, Mayo Clinic, WILLIAM DURRER, Department of Physics, University of Texas at El Paso, FELICIA MANCIU, Department of Physics, Border Biomedical Research Center, University of Texas at El Paso, MAYO CLINIC, ROCHESTER, MN TEAM, UNIVERSITY OF TEXAS AT EL PASO, EL PASO, TX TEAM —
Boron-doped diamond (BDD) thin films are of interest in neurosurgical applications due to the superior stability of BDD-coated electrodes compared to that of carbon-fiber electrodes. BDD film stability is therefore relevant, as delamination and dislocation of films, which can occur during surgical electrode implantation, negatively impact biosensing by fast-scan cyclic voltammetry. This study investigated induced stress in both undoped and BDD-doped diamond thin films using confocal Raman mapping. In addition to dopant quantity, sample chemical composition and substrate effects were also compared. Electrodes were fabricated by chemical vapor deposition in a custom-built reactor, on cylindrical tungsten substrates. Results of the spectroscopic mapping and stress-analysis revealed a correlation between regions of pure diamond and enhanced stress, while greater boron incorporation coincided with stress release throughout the film. Preferential boron incorporation into the diamond lattice was also observed. Sp2-type carbon impurities may also have contributed to high values of compressive stress.

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