Anodically Generated Short-Lived Species on Boron Doped Diamond Film Electrodes

- J. Farrell (University of Arizona), P. Natishan (Naval Research Laboratory), F. Martin (Geo-Centers, Inc.), H. Martin (Case Western Reserve University), and W. O'Grady (Naval Research Laboratory)

Electrodes composed of boron doped diamond (BDD) films on metal and semiconductor substrates have a wide range of applications in electrochemistry. This research investigated short-lived species (SLS) produced by anodic polarization of BDD electrodes in 1.0 M $HClO_4$ solutions. Normal pulse voltammetry experiments were performed to identify anodically produced SLS that survive for less than 50 ms under open circuit conditions. Potential step chronoamperometry experiments were performed to investigate the steady state concentrations of SLS on the electrode surface as a function of potential. Anodic potentials greater than 1.5 V with respect to the standard hydrogen electrode (SHE) were required to generate the SLS. Increasing anodic potentials between 1.5 and 3.0 V/SHE resulted in increasing concentrations of the SLS, until a saturation point was reached at a current density of 5 mA/cm^2. Past work by other investigators suggests that the SLS likely consists primarily of $HO^{\bullet}$ radicals produced from water oxidation.