Separation of Bioanalytes and Their Detection Using Electrically Conducting Diamond Electrodes

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Boron-doped diamond thin-film electrodes are new materials that possess a number of beneficial properties for electroanalysis. Properties, such as (i) low and stable background signal, (ii) good responsiveness for redox analytes without pretreatment, (iii) rapid response and stabilization times, (iv) microstructural and morphological stability, and (v) resistance to fouling, are typical of high quality, hydrogen-terminated polycrystalline diamond. Two types of polycrystalline films are being investigated, microcrystalline (grain size $>$ 1 micrometer)and nanocrystalline (grain size $\sim$20 nm) diamond.

The presentation will focus on our group's efforts to couple electrochemical detection, using diamond thin-film electrodes, with capillary zone electrophoresis for the separation and detection of environmentally and biologically-important analytes. Specifically, results for (i) 1- and 2-naphthol, compounds present in diesel emissions, and (ii) catecholamine neurotransmitters, with a focus on learning norepinephrine's role in controlling venomotor tone (hypertension), will be presented. Diamond provides significant improvements over other commonly used carbon electrodes in terms of limit of detection, linear dynamic range, response precision, and response stability.