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4:00-5:00pm in W330

Host: Bob Brown

Refreshments served at 3:45pm

Boron-Doped Diamond Electrodes – An Electrochemist's Best Friend
What Can One Do With This Material?

Carbon electrodes are routinely used for electrochemical detection and sensing applications to quantify electroactive analytes in a variety of media. By electroactive, one is referring to molecules that are easily oxidized or reduced at an electrode surface. Generally speaking, electrochemical measurements often involve measurement of the current that flows in response to the potential perturbation, which is reflective of the local analyte concentration. Carbon is one of the most abundant elements found on the planet and, from a materials perspective, is unique because of the microstructurally-distinct allotropes it forms. These range from single and polycrystalline diamond, to the stacked sheets of graphite, to the microstructurally-disordered glassy carbon, to nanotubes and fullerenes, and finally to the single sheet graphene. All of these carbon materials are used in electrochemical measurements as well as other technologies, in part, because of some common attributes: high mechanical strength, good thermal conductivity and stability, chemical inertness, high carrier mobility and good electrical conductivity, and rich surface chemistry.

Boron-doped diamond (BDD) is a type of carbon electrode that perform well in electroanalytical measurements, often providing superior detection figures of merit compared with conventional carbon electrodes like glassy carbon. In addition, BDD can function as an optically transparent electrode for transmission spectroelectrochemical measurements. In this presentation, some of the basic material and electrochemical properties of this electrode material will be reviewed and a couple of examples of how BDD has been used (i) for the determination of trace metal ions in solution by anodic stripping voltammetry and (ii) as an optically transparent electrode for transmission spectroelectrochemical measurements will be highlighted. The latter measurements make use of optically transparent diamond electrodes (*i.e.*, thin films of conducting diamond deposited on quartz).

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