Direct oxidation peaks relating to proteins have been clearly observed by exploiting H-terminated boron-doped diamond (BDD) electrodes. Hydrogen generation by reduction treatment was enabled to provide the possibility of using BDD. The pH dependence of bovine serum albumin (BSA) oxidation suggested that the oxidation involved of at least three redox-active amino acid residues (cysteine, tryptophan and tyrosine). Furthermore, the electrochemical detection of not only BSA but also immunosuppressive acidic protein (IAP, a cancer marker) was demonstrated by using cyclic voltammetry and flow injection analysis. A linear dynamic in the concentration range of 5 and 3000 mg/dl ($r^2 = 0.9$) with a lower detection limit (LOD) of 5 mg/dl was achieved for BSA. In the case of IAP, the calibration curve was linear over the concentration range from 200 to 800 µg/ml, with an experimental LOD of 100 µg/dl. Excellent reproducibility was also demonstrated, suggested that direct electrochemical detection using BDD electrodes can be performed with advantages in terms of simplicity, sensitivity and stability.

Keywords: Protein; Immunosuppressive acidic protein; Bovine serum albumin; Direct electrochemical detection; H-terminated boron-doped diamond electrode