Silver/graphene-modified Boron Doped Diamond Electrode for Selective Detection of Carbaryl and Paraquat from Water

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A novel silver/graphene-modified boron doped diamond electrode (BDDGRAg) was obtained to determine selectively carbaryl and paraquat pesticides from aqueous solution, based on the electrochemical oxidation of carbaryl (CR) and the electrochemical reduction of paraquat (PQ). Compared with graphene-modified boron doped diamond electrode (BDDGR), BDDGRAg exhibited excellent electrocatalytic activity towards CR electrooxidation and PQ electroreduction. Simple and fast voltammetric methodology for selective CR and PQ detection was developed based on the selection of potential range corroborated with the optimum operating conditions of the differential pulse voltammetry technique (DPV) at BDDGRAg electrode. The lowest limit of detection of 1.14 nM was determined for the selective detection of PQ within potential range of 0 to -1 V/SCE using DPV under step potential of 5 mV and the modulation amplitude of 200 mV without interference of CR presence. Also, the lowest limit of detection of 1.15 nM was found for the selective detection of CR within the potential range of 0 to +1.5 V/SCE under the step potential of 6 mV and the modulation amplitude of 800 mV. Proof-of-concept is demonstrated by the application in the real surface water sample.

Keywords: electrocatalytic activity; selective detection; pesticides; carbaryl; paraquat.

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