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Electrochemically Reduced Graphene Oxide Modified Boron-Doped Diamond Paste Electrode on Paper-Based Analytical Device for Simultaneous Determination of Norepinephrine and Serotonin

Authors : Siriwan Nantaphol, Robert B. Channon, Takeshi Kondo, Weena Siangproh, Orawon Chailapakul, Charles S. Henry

Abstract : In this work, we demonstrate a novel electrochemically reduced graphene oxide (ERGO) modified boron-doped diamond paste (BDDP) electrode on paper-based analytical devices (PADs) for simultaneous determination of norepinephrine (NE) and serotonin (5-HT). The BDD paste electrode was easily constructed by filling BDD paste in small channels, which made in transparency film sheets using a CO_2 laser etching system. The counter and reference electrodes were fabricated on paper by in-house screen-printing and then combined with BDD paste microelectrode. The electrochemical characterization of the device was investigated by cyclic voltammetry (CV). Differential pulse voltammetry (DPV) was employed for the simultaneous determination of NE and 5-HT. The ERGO-modified BDDP electrode displayed excellent electrocatalytic activities toward the oxidation of NE and 5-HT and strong function for resolving the overlapping voltammetric responses of NE and 5-HT into two well-defined voltammetric peaks. This device was capable of simultaneously detecting NE and 5-HT in wide concentration ranges and with a low limit of detections. In addition, it has the advantages in terms of ease of use, low cost, and disposability.

Keywords : boron-doped diamond paste electrode, electrochemically reduced graphene oxide, norepinephrine, paper-based analytical device, serotonin
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