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Fabrication of Functionalized Multi-Walled Carbon-Nanotubes Paper Electrode for Simultaneous Detection of Dopamine and Ascorbic Acid

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Abstract : A paper-based electrode devised from an array of carboxylated multi-walled carbon nanotubes (MWNTs) and poly (diallyldimethylammonium chloride) (PDDA) has been successfully developed for the simultaneous detection of dopamine (DA) and ascorbic acid (AA) in 0.1 M phosphate buffer solution (PBS). The PDDA/MWNTs electrodes were fabricated by allowing PDDA to absorb onto the surface of carboxylated MWNTs, followed by drop-casting the resulting mixture onto a paper. Cyclic voltammetry performed using 5 mM $[Fe(CN)_6]^{3-/4-}$ as the redox marker showed that the PDDA/MWNTs electrode has higher redox activity compared to non-functionalized carboxylated MWNT electrode. Differential pulse voltammetry was conducted with DA concentration ranging from 2 µM to 500 µM in the presence of 1 mM AA. The distinctive potential of 0.156 and -0.068 V (vs. Ag/AgCl) measured on the surface of the PDDA/MWNTs electrode revealed that both DA and AA were oxidized. The detection limit of DA was estimated to be 0.8 µM. This nanocomposite paper-based electrode has great potential for future applications in bioanalysis and biomedicine.

Keywords : dopamine, differential pulse voltammetry, paper sensor, carbon nanotube
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