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# Electrocatalytic detection of dopamine at single-walled carbon nanotubes–iron (III) oxide nanoparticles platform

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ABSTRACT

Electrochemical sensors using edge-plane pyrolytic graphite electrode (EPPGEs) modified with singlewall carbon nanotubes–iron (III) oxide (SWCNT/$Fe_2O_3$) nanoparticles for the sensitive detection of dopamine (DA) are described for the first time. The surface of the EPPGE-SWCNT–$Fe_2O_3$ was characterized using field emission scanning electron microscopy, atomic force microscopy and energy dispersive X-ray spectroscopy while the electrochemical properties were investigated using the cyclic voltammetry, square wave voltammetry and electrochemical impedance spectroscopy techniques.Whencompared with the bare electrode or electrodes without the $Fe_2O_3$ nanoparticles, the EPPGE-SWCNT–$Fe_2O_3$ gave best response (7 times more than bare EPPGE and 2-fold more than the other two modified electrodes) towards the detection of DA. Also, the EPPGE-SWCNT–$Fe_2O_3$ showed the best analytical performance for DA with an electron transfer rate constant of ~0.26cms$^{-1}$, a sensitivity of 3.44μAμM$^{-1}$, a limit of detection of 0.36μM, a catalytic rate constant of $8.7\times10^5$ cm$^3$ mol$^{-1}$ s$^{-1}$, and a diffusion coefficient of $3.5\times10^{-5}$ cm$^2$ s$^{-1}$. This electrode can be reliably used to assay DA in its real drug composition.