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Application of graphite screen printed electrode modified with dysprosium tungstate nanoparticles in voltammetric determination of epinephrine in the presence of acetylcholine

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Abstract: The current work focuses on the development of a sensitive and selective electrochemical device based on a graphite screen printed electrode modified with $Dy_2(WO_4)_3$ nanoparticles (DWO/SPE) for the analysis of epinephrine in samples also containing acetylcholine. The study proves that the sensor has excellent electron-mediating behavior in the oxidation of epinephrine in a 0.1 mol/L phosphate buffer solution (PBS) (pH 7.0). The application of the DWO/SPE in differential pulse voltammetry (DPV) is found to lead to distinct response for the oxidation of epinephrine and acetylcholine, with the potentials of the epinephrine and acetylcholine peaks (ΔE_p) to be 550 mV apart. The detection limits of the method for epinephrine and acetylcholine are 0.5 and 0.7 μmol/L (S/N=3) and the responses were found to be linear in the concentration ranges of 1.0 to 900.0 μmol/L and 1.0 to 1200.0 μmol/L in a PBS buffer (pH=7.0) respectively. The modified electrode was used for the detection of epinephrine and acetylcholine in real samples and found to produce satisfactory results. These results can be a proof that $Dy_2(WO_4)_3$ nanoparticles can find promising applications in electrochemical sensors to be used for the analysis of (bio) chemical species.

Keywords: Epinephrine**;** Acetylcholine; $Dy_2(WO_4)_3$ nanoparticles**;** Graphite screen printed electrode; Rare earths