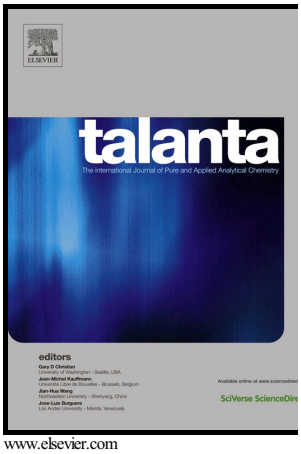

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1,4-dihydroxyanthraquinone electrochemical sensor based on molecularly imprinted polymer using multi walled carbon nanotubes and multivariate optimization method

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ABSTRACT

The present work describes development of a simple and cost-effective electrochemical sensor for determination of 1,4-dihydroxyanthraquinone (1,4-DAQ) based on molecularly imprinted polypyrrole (PPY). The molecularly imprinted polymer (MIP) was electrochemically synthesized onto surface of multi-walled carbon-nanotubes-modified pencil graphite electrode (MWCNs-PGE). A computational approach was employed to select the best functional monomer for rational design of MIP. Based on the computational results, pyrrole (PY) was selected as functional monomer. Plackett–Burman design (PBD) was used for selecting the variables which affected the analytical response (current). After screening, the main factors that affect on the MIP-MWCNTs-PGE response efficiency were also optimized using central composite design (CCD). Under the optimized conditions, calibration curve of the imprinted sensor showed a linear concentration range from 10 nmol L^{-1} to 100 µmol L^{-1}, with the limit of detection (LOD) of 4.15 nmol L^{-1}. The imprinted sensor showed the advantages of high porous surface structure, ease of preparation, good reproducibility and repeatability, high selectivity and sensitivity. Furthermore, the proposed method was successfully extended for the determination of 1,4-DAQ in serum and plasma real samples.

Keywords: Imprinting; Multivariate optimization; 1,4-dihydroxyanthraquinone; Nanotubes; Electrochemical sensor

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