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Abstract

Development of Electrochemical Sensors Based on Electrosynthesized Imprinted Polymers for Cobalt (Co^{2+}) Ion Determination in Water †

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Abstract: Preliminary results on an electrosynthesized ion-imprinted polymeric (IIP) film for the development of a Co^{2+} sensor are reported herein. The sensor was prepared by CV electropolymerization of 2-aminophenol (2-AP) monomer in the presence of Co^{2+} ions, which acted as the template. The screen-printed carbon electrodes (SPCEs) were used as transducers during sensor development, whereas the cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were used for the electrochemical characterization of sensors and for Co^{2+} ion sensing, respectively. The CV (potential range −0.2 and 1.2 V) and EIS measurements were performed in PBS (pH 7.8 , 0.1 M) containing 0.1 mol L^{-1} KCl solution and 5.0 mmol L^{-1} of $Fe(CN)_6^{3-}/^{4-}$ as the redox probe ; for EIS an open circuit and data were settled through a sinusoidal potential perturbation of 0.01 V amplitude and 57 as frequency values that were logarithmically distributed over a range of frequencies between 0.01 Hz and 100 kHz. A not imprinted polymer (NIP) was prepared as a control under the same protocol, but without adding the template into the polymerization mixture. In these preliminary tests, the electropolymerization patterns of IIP polymers were found to be consistent with the findings previously reported. After electropolymerization, rinsed electrodes were incubated in different Co^{2+} concentrations of ions to be tested through EIS showing a response in the range 1–8 µM. A multivariate optimization based on the design of experiment (DOE) was employed to study the effect of parameters on electrochemical performances of the sensor.

Keywords: ion-imprinted polymer; 2-AP; electrochemical sensor; Co^{2+} ions; electropolymerization

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