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Voltammetric determination of piroxicam using a screen-printed electrode modified with Printex L6 and polyaniline activated carbon

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Keywords: SPE; PAC-PL6C; Piroxicam; Electrochemical sensor; SWAdASV.

Highlights

- ✓ Screen-printed electrode modified with Printex L6 carbon and polyaniline-based activated carbon;
- ✓ Voltammetric determination of piroxicam;
- ✓ Piroxicam detection in urine and water river samples;
- ✓ Disposable electrochemical sensor.

Abstract

This research describes the development and application of a simple, rapid, and cost-efficient voltammetric method for piroxicam (PIR) detection at nanomolar concentrations in biological and environmental samples. The technique uses a screen-printed electrode (SPE) modified with a blend of Printex L6 carbon (PL6C) and polyaniline-based activated carbon (PAC) on a chitosan film crosslinked with epichlorohydrin (CTS:EPH). Detection is performed through square-wave adsorptive anodic stripping voltammetry (SWAdASV) in a 0.10 mol L⁻¹ phosphate buffer solution at pH 6.0. The method demonstrates a low detection limit of 4.5×10^{-9} mol L⁻¹ and a linear detection range from 5.0×10^{-8} to 8.8×10^{-6} mol L⁻¹ ($r = 0.999$). The PAC-PL6C-CTS:EPH/SPE sensor was successfully used for PIR detection in synthetic urine and river water samples, with validation through addition and recovery tests. The results obtained were in close agreement with those from high-performance liquid chromatography (HPLC), which served as a reference method. These findings indicate that the proposed technique is a straightforward, fast, and highly efficient alternative for PIR detection in biological and environmental samples.

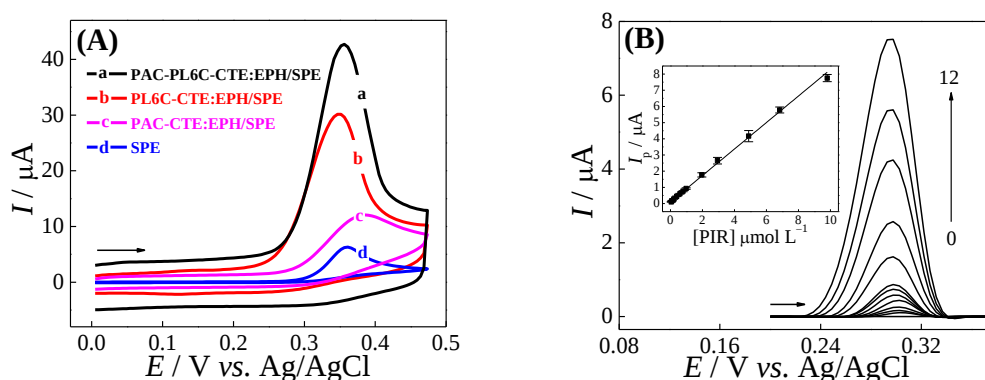


Fig. 1 – (A) Cyclic voltammograms ($v = 50 \text{ mV s}^{-1}$) obtained for 0.20 mmol L^{-1} PIR in 0.10 mol L^{-1} phosphate buffer solution (pH 6.0) using SPE (–), PAC-CTS:EPH/SPE (–), PL6C-CTS:EPH /SPE (–) and PAC-PL6C-CTS:EPH/SPE (–). **(B)** SWAdAS voltammograms obtained using the PAC-PL6C-CTS:EPH/SPE sensor in 0.10 mol L^{-1} phosphate buffer solution (pH 6.0) containing different concentrations for PIR: $0.050 - 8.8 \text{ μmol L}^{-1}$ and analytical curve (inserted).

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