Electrochemical Oxidation of the Paracetamol in its Commercial Formulation on Platinum and Ruthenium Dioxide Electrodes

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Pt and RuO₂ electrodes have been prepared thermally at 400°C on titanium substrates. The physical and electrochemical characterization showed that the surface of the platinum electrode is smooth, compact and almost homogeneous and that of RuO₂ is rough with a mud cracked structure. The voltammetric investigations revealed that the oxidation of the paracetamol occurs on both the prepared electrode. That organic oxidation occurs via a process that involves a direct electron transfer at the surface of the electrode and by an indirect oxidation process via OH[•] species and possibly via other in situ redox species. On both the electrodes, the paracetamol oxidation process is diffusion controlled. In the presence of Cl⁻, NO₃⁻ or PO₄³⁻ the oxidation of paracetamol still occurs via a direct electron transfer in the water stability domain and via an indirect oxidation routes in the higher potential domain by oxidative species resulting from the oxidation of Cl⁻, NO₃⁻ or PO₄³⁻. The addition of such ions in the electrolyte increases the kinetic of the paracetamol oxidation. This increase is low for all the ions on RuO₂ electrode but it is high with Cl⁻ or NO₃⁻ on Pt and low with PO₄³⁻. pH studies have revealed that the protonation form of the molecule undergoes a rapid oxidation than the deprotonated form on Pt. On RuO₂, the pH influence is very low compared to platinum electrode.

Keywords: platinum, ruthenium dioxide, cyclic voltammetry, paracetamol oxidation.

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