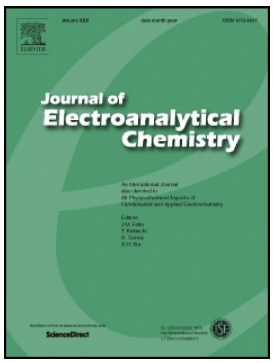

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C. Montella

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Further investigation of the equivalence of staircase and linear sweep voltammograms. IV- Averaged-current staircase voltammetry applied to electrochemical reactions involving soluble species

C. Montella[1,2,*]

[1] Univ. Grenoble Alpes, LEPMI, F-38000 Grenoble, France

[2] CNRS, LEPMI, F-38000 Grenoble, France

Abstract

This article focuses on the sampled-current and averaged-current staircase voltammetry techniques compared to linear potential sweep/cyclic voltammetry for the investigation of electrochemical reactions involving soluble species. First, based on analytical solutions of the relevant voltammetric models, theoretical investigation is carried out assuming reversible electron transfer reactions and different mass transport conditions in the electrolyte, i.e. semi-infinite or finite-length planar diffusion, and diffusion to an inlaid disk electrode. Next, solving numerically the appropriate integral-equation-based model, further investigation takes into account the electron transfer kinetics, the uncompensated resistance of the electrolyte, and the interfacial double-layer charging, under one-dimensional mass transport conditions. Main conclusion is that the averaged-current staircase voltammetry technique should provide nearly the same current data as the linear potential sweep/cyclic voltammetry technique under a variety of experimental conditions.

Keywords: Redox reactions; Potential step; Staircase voltammetry; Current sampling parameter; Averaged-current technique; Linear potential sweep voltammetry; Cyclic voltammetry.

* Tel.: + 33-4-76826582; fax: + 33-4-76826630;
e-mail: Claude.Montella@lepmi.grenoble-inp.fr;
Address: Laboratoire d'Électrochimie et de Physico-chimie des Matériaux et des Interfaces (UMR 5279), Bâtiment Recherche Phelma Campus, 1130 rue de la Piscine, Domaine Universitaire BP 75, 38402 Saint Martin d'Hères, Cedex, France