

Establishment of Kinetic Zone Diagrams via Simulated Linear Sweep Voltammograms for Soluble-Insoluble Systems

Authors : Imene Atek, Abed M. Affoune, Hubert Girault, Pekka Peljo

Abstract : Due to the need for a rigorous mathematical model that can help to estimate kinetic properties for soluble-insoluble systems, through voltammetric experiments, a Nicholson Semi Analytical Approach was used in this work for modeling and prediction of theoretical linear sweep voltammetry responses for reversible, quasi reversible or irreversible electron transfer reactions. The redox system of interest is a one-step metal electrodeposition process. A rigorous analysis of simulated linear scan voltammetric responses following variation of dimensionless factors, the rate constant and charge transfer coefficients in a broad range was studied and presented in the form of the so called kinetic zones diagrams. These kinetic diagrams were divided into three kinetics zones. Interpreting these zones leads to empirical mathematical models which can allow the experimenter to determine electrodeposition reactions kinetics whatever the degree of reversibility. The validity of the obtained results was tested and an excellent experiment–theory agreement has been showed.

Keywords : electrodeposition, kinetics diagrams, modeling, voltammetry

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