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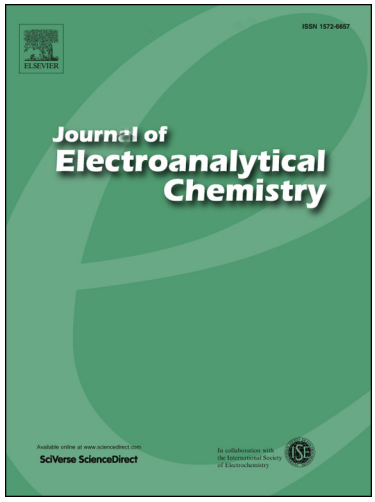

Short communication

Re-examination of steady-state concentration profile near a uniformly accessible rotating disk electrode

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ACCEPTED MANUSCRIPT

Re-examination of steady-state concentration profile near a uniformly accessible rotating disk electrode

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Abstract

In this article we re-examine the steady-state concentration profile of electroactive-dissolved species near a uniformly accessible rotating disk electrode (RDE), using both symbolic and numerical computation procedures. First, the one-dimensional diffusion-convection equation pertaining to RDE is solved numerically in order to get highly-accurate benchmark data. Next, the analytical solution of mass-transport problem is derived under the assumption of infinite Schmidt number (Sc). Finally, series expansion of concentration profile with respect to $Sc^{-1/3}$ is performed at finite values of Schmidt number. Both analytical and series solutions are compared to the numerical data. Series expansion of the limiting current density pertaining to RDE follows directly from the above derivations.

Keywords: Rotating disk electrode; Steady-state concentration profile; Limiting current density.

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