Nonlinear Mass Transfer at the Electrodes with Reversible Homogeneous; Reactions: Taylor's Series and Hyperbolic Function Method

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The mathematical model for mass transfer with reversible homogeneous reactions is discussed. Estimation of mass transfer to and from electrodes for this reaction needs the analytical solution of nonlinear reaction-diffusion equations. Taylor's series method and hyperbolic function method are used to solve the system of nonlinear reaction-diffusion equations. Approximate closed-form of analytical expression of the concentration of substrate, reactant and product are derived for all values parameters. The empirical results are compared with the simulation results, and there is noticeable agreement. The effect of various parameter on aqueous carbonate-species concentration are also discussed. The current density and homogeneous equilibrium constant are also obtained.

Keywords: Mathematical Modeling; Non-linear equations; Taylor's Series Method; Hyperbolic Function Method; Steady-state.

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