

Application of Taylor's series with Ying Buzu Shu algorithm for the nonlinear problem in amperometric biosensors

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The enzyme combines with an electroinactive substrate to produce an electroactive product that is oxidised or reduced rapidly at the electrode/film interface in this method. This model is built on nonlinear reaction-diffusion equations containing a nonlinear factor related to the enzyme reaction's Michaelis-Menten kinetics. In this paper, the Taylor's series method with the ancient Chinese algorithm (Ying Buzu Shu algorithm) is applied to derive an analytical solution for the nonlinear problems in amperometric biosensors. Finally, simple and closed-form analytical expressions for the steady-state concentration profiles and their related current response in enzyme immobilized into a planar film onto an electrode are derived. The analytical concentration profiles are compared with the simulation and gave a satisfactory agreement.

Keywords: Michaelis–Menten kinetics; Amperometric biosensor; Nonlinear reaction-diffusion equations; Taylor's series method; Ying Buzu Shu algorithm

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