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## Kinetic Model Discrimination of Penicillin G Acylase Thermal Deactivation by Non-Isothermal Continuous Activity Assay

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### Abstract

A novel approach for the determination of a kinetic model of enzyme deactivation is presented incorporating time and temperature dependence into a single, continuous assay. A generic method for a non-isothermal, continuous activity assay is developed. Unique temperature profiles that enhance model discrimination with fewer experiments compared to linear temperature scans were used to differentiate kinetic models of penicillin G acylase (PGA) deactivation. Three models are examined in depth but the technique is generalizable to any kinetic deactivation model. Using the Akaike information criterion (AIC), the Lumry-Eyring model was found to best capture PGA deactivation behavior and the corresponding kinetic parameters are presented for the first time. Additionally, simulated experiments on lysozyme and TEM-1 beta-lactamase were used to develop temperature profiles that best differentiate the studied kinetic models. The results from the proposed approach were consistent with conventional, but tedious, isothermal batch experiments.

### Keywords

Penicillin G acylase, Enzyme deactivation modeling, Lumry-Eyring mechanism, Model discrimination, Akaike Information Criterion

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