# Comparison of Axial Dispersion and Tanks-in-Series Models for Simulating the Performance of Enzyme Reactors.

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## Abstract

A comparison of two modeling approaches for simulating the performance of enzyme reactors using the axial dispersion and tanks-in-series models is described. The two modeling approaches are compared for the steady-state performance of enzyme reactors assuming Michaelis-Menten kinetics with competitive product inhibition. The performance of the reactors is described in terms of substrate conversion and yield. The equation Pe = 2(N - 1) is used to correlate the parameter of the dispersion model (Pe) with that of the tanks-in-series model (N) for the entire range of dispersion from plug flow to CSTR. The predictions of the two models agree well, esp. at low dimensionless residence times and high Peclet nos. Practically, the predictions of the two models are essentially equiv. when the above equation is used to relate their two parameters. However, the tanks-in-series model is simpler and has computational advantages over the dispersion model, although its phys. basis is not as clear as that of the dispersion model. Lactose hydrolysis by the enzyme β-galactosidase, which exhibits Michaelis-Menten kinetics with competitive product inhibition, is used as a model system in this study. The kinetic parameters for lactose hydrolysis are obtained from the literature.