Modeling of In-Situ Butanol Recovery Bioreactor

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There has been a growing interest in the fermentative production of 1-butanol because its wide application to chemical and fuel industries. Several technical challenges caused by severe inhibition and toxicity of 1-butanol limit the commercialization of bio 1-butanol production processes. Extractive fermentation is considered as a solution to overcoming the toxicity problem by 1-butanol. In this study, we developed the unstructured mathematical models to describe the kinetics of cell growth, product formation, and substrate consumption in the in-situ 1-butanol recovery fermentation, combining adsorption, of Clostridium acetobutylicum. The Blackman model supplemented with terms describing noncompetitive product inhibition were employed to describe cell growth, product formation, and glucose consumption, respectively. All parameters in the models were estimated with the experimental data. The developed model will contribute to design of a novel extractive fermentation process.