Modeling of a fermentation reactor integrated with adsorption columns for continuous biobutanol production

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Biobutanol is one of the most promising renewable energy sources due to its high energy content, low volatility, and low water solubility. During fermentationin the bioreactor, the butanol has to be separated from the broth since the butanol inhibits the cell growth when its concentration is higher than some critical limits. For attenuating the inhibition, the batch recovery process which the fermentation and the adsorption occur in one batch bioreactor has been used previously. In this study, we propose continuous recovery process having two parts;fermentation reactor and adsorption column. By using this process design, both yield and volumetric productivity can be raised.Furthermore, the commercialization can be achieved by developing robust model for scale-up, finding optimal operation conditions, and designing control methods.As a first step,the unstructured kinetics and the Langmuir theory are chosen to model the simultaneous fermentation and adsorption processes. And we find that those models explain the dynamics of the system well even for different experimental conditions via the least-squaresparameter estimation.