

Design of experiments and sensitivity analysis for microalgal bioreactor systems

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Microalgae have been suggested as a promising feedstock for producing biofuel because of their potential of lipid production. In this study, a first principles ODE model for microalgae growth and neutral lipid synthesis which is proposed by Surisetty et al. is investigated for the purpose of maximizing the growth rate and the amount of neutral lipid. The model has 12 parameters and follows the assumption of Droop model which explains the growth as a two-step phenomenon; the uptake of nutrients is first occurred in the cell, and then use of intracellular nutrient to support cell's growth. In this study, optimal experimental design (OED) using the D-optimality criterion is performed to compute the system input profile and find optimal parameters of the model. Sensitivity analysis is also performed to determine which parameters have a negligible effect on the model predictions.