

Sensitivity analysis with optimal input design and model predictive control for microalgal bioreactor systems

유성진, 오세규, 이종민*
서울대학교
(jongmin@snu.ac.kr*)

Microalgae are photosynthetic microorganisms, which have an ability to produce large amounts of oil that can be used directly as a high value bioactives or be used to synthesize biodiesel. The oil production rate in microalgae is strain dependent, it has several advantages as a feedstock for biodiesel because of high growth rate and the ability of producing large amounts of lipid. In this study, a first principles ODE model for microalgae growth and neutral lipid synthesis related with photo effect is investigated for the purpose of maximizing the growth rate and the amount of neutral lipid. The model follows the assumption of Droop model which explains the growth as a two-step phenomenon. In this study, optimal experimental design using D-optimality criterion is performed to compute the system input profile and sensitivity analysis is also performed to determine which parameters have a negligible effect on the model predictions. Furthermore, model predictive control based on successive linearization is implemented to maximize the amount of neutral lipid contents.