Analysis of parameter uncertainty in a batch polymerization process

유하은, 이재형†
KAIST
(jayhlee@kaist.ac.kr†)

Batch processes are widely used in chemical and biological industry for productions of various polymers, pharmaceuticals, bio-based products, and other commodities. Many control strategies such as a PID and model predictive control have been studied for the batch processes. However, the precise control of the batch process can hardly be achieved using the conventional control strategies due to uncertain parameters of the system and its inherent nonlinear dynamics. In practice, the estimation of model parameters is often ill-conditioned with large variances of the estimates. Therefore, a systematic analysis of the effects of uncertain parameters is essential before developing an advanced control strategy. In this study, an uncertainty analysis is performed for a batch polymerization process. For this, distributions of uncertain parameters, e.g., model parameters and disturbances, are identified. Based on this, the quantity of uncertainty in outputs and degree of constraint violation are assessed through Monte Carlo simulations. As a result, significant uncertain parameters can be selected for future development of an advanced control strategy for a batch polymerization process.