# Optimization of wormlike micelles production via model predictive control using a case study of CTAB/NaCl system

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In polar solvents, amphiphiles self-assemble to produce wormlike micelles (WLMs), which have gained attention in various areas due to their unique viscoelastic properties. However, the industrial production of WLMs has rarely been discussed. Moreover, considering that the system hardly achieves the desired viscosity within a reasonable operation time without appropriate control actions, a model-based controller has been implemented. Specifically, a semi-batch reactor for CTAB/NaCl was adopted as a case study. For this, a high-fidelity model which integrated the thermodynamic, kinetic, and rheology model was developed and validated with experimental results. Subsequently, the developed high-fidelity model was reduced to alleviate the computational burden. As a result, the reduced-order model was readily utilized in the formulated model predictive control (MPC) system. Herein, surfactant volume fraction, salt concentration, and temperature were selected as manipulated variables to drive the system to reach the desired WLM length of 3700 nm. Consequently, the developed MPC scheme successfully predicted optimal input sequences to achieve the set-point within practical constraints.