Online optimization system of SMB process based on a reduced-order model using cubic spline collocation method

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A novel repetitive control (RC) method for the simulated moving bed (SMB) process is proposed. The method was designed on the basis of a fundamental SMB model linearized successively around the operating trajectories in the previous period. It is assumed that the regulation is performed for extract and raffinate purities averaged over each period. While the purities were regulated at minimum specifications, on-line optimization was carried out by gradually decreasing the desorbent flow rate. The SMB model for successive linearization was derived by applying the cubic spline collocation method combined with the far-side boundary condition to the partial differential SMB equation. Through numerical studies, the proposed RC method and on-line optimization perform satisfactorily against model error and also various disturbances.