

## Startup and Shutdown Strategies of Simulated Moving Bed for Insulin Purification

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A tandem simulated moving bed (SMB) process, which consists of two SMBs in series, has been developed for insulin purification in a previous study. Conventional startup procedure required a period of 12 hours for the first SMB and 46 hours for the second SMB to reach cyclic steady state. In this study, a novel startup strategy with pre-loading and pre-elution steps has been developed to reduce the startup period to 2 hours for the first SMB and 5 hours for the second SMB, respectively. The transient dynamics of the SMB shutdown process is also studied for the first time. A new shutdown strategy has also been developed to recover more than 99% of the remaining insulin during shutdown. The startup and shutdown strategies are proved with results from computer simulations and validated with experimental data.