Simulated moving bed adsorptive reactor

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SYNOPSIS

The Simulated Moving Bed (SMB) technology is a mature one with above 100 applications in chemical industry (UOP Sorbex processes). Now it is finding applications in fine chemistry and pharmaceuticals (chiral separations). In this work, separation is coupled with reaction. The test system is enzymatic inversion of sucrose coupled with glucose/fructose separation using a Ca²⁺-resin as adsorbent. Modeling, simulation and operation of a pilot plant is addressed.

NOTATION

\( A \) column area, \( m^2 \)
\( c_i \) liquid phase concentration of component \( i \) in section \( j \), mole \( m^3 \)
\( Da_j \) Damköhler number, dimensionless
\( D_{ij} \) axial dispersion coefficient in section \( j \), \( m^2 \ s^{-1} \)
\( d_p \) particle diameter, m
\( k \) mass transfer coefficient, \( s^{-1} \)
\( L_j \) length of section \( j \) in the TMB, m
\( n_j \) number of columns in the section \( j \) in the SMB
\( P \) purity
\( Pe \) Pécel number, dimensionless
\( \dot{Q}_l \) liquid flow rate, \( m^3 \ s^{-1} \)
\( \dot{Q}_s \) solid flow rate; \( m^3 \ s^{-1} \)
\( q_{fe} \) average adsorbed phase concentration of component \( i \) in section \( j \), mole \( m^3 \)