

288d Single-Column Simulated-Moving-Bed Process with Recycle Lag

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In several applications of Simulated-Moving-Bed (SMB) technology, it would be advantageous to work with the limiting case of a single column. Because only one column would have to be repacked, switching from one mixture to another would be easier and take less time than with SMB. This is especially important for the pharmaceutical industry, where SMBs are seen as multipurpose units that can be applied to different separations in all stages of the drug-development cycle [1].

We have developed a novel single-column chromatographic process with recycle, which mimics a four-zone simulated moving bed (SMB) [2]. The new system has one chromatographic column connected in a loop to a plug-flow tube with a piston placed at one of its ends. The spring is continuously pushing the piston against the fluid. The self-adjusting movement of the piston compensates for the difference in the inlet and outlet flow rates of the recycle tube.

We show that our process is an efficient implementation of an ideal single-column chromatographic process which has the following characteristics:

- Its outlet stream is partially, or fully, recycled to the chromatographic column with a lag of $(N-1) \cdot \tau$ time units, where N is the number of columns of the equivalent SMB process and τ is the switching time;
- It preserves the specific productivity and periodic state of the equivalent SMB process.

We show experimentally that the single-column chromatographic process proposed here is an inexpensive and flexible alternative to elution chromatography and SMB that, with the correct plug-flow recycle tube, achieves the same purities as the equivalent SMB process.

References. [1] Juza et al., Trends in Biotech. 18, 108, 2000. [2] Patent pending.