

Thermal Simulated Moving Bed Concentrator

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The separation obtained in a simulated moving bed (SMB), which was developed for the separation of binary mixtures, can be improved by gradient techniques such as a thermal gradient. Modifying the thermal SMB to produce one product concentrated in solutes and another product that is almost pure solvent results in the thermal SMB concentrator. This concentrator can continuously and efficiently concentrate dilute liquid systems with no addition of desorbent. Thermal SMB concentrators with two, three, and four zones are developed and a design method based on triangle theory is introduced to determine the operating conditions for maximum enrichment. The enriched concentration increases as the number of zones increases. Detailed Aspen Chromatography simulations including mass transfer resistances and axial dispersion were done for concentration of salicylic acid in water. Thermal energy consumed in this process was much lower than thermal energy of an equivalent single-stage evaporator.