J Chromatogr Sep Tech 2018, Volume 9
DOI: 10.4172/2157-7064-C3-047

Liquid membrane in Taylor flow regime: Lactic acid removal

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Emulsion liquid membranes have high selectivity and mass transfer, and they are one of the most interesting liquid membrane processes for industrial applications but usually, stability problems are involved. In this work, Taylor flow regime has been used as a way of contact for a liquid membrane and to overcome the problems found with liquid membranes. Taylor flow enhances mass transfer of a solute from a source phase to a stripping phase by using a third inmiscible organic or membrane phase. Lactic acid (LA) removal degree was measured at several hydrodynamic conditions using a tube of 2.5 mm of diameter and 3.48 m in length. As membrane phase, it was used a mixture of tri-iso-octylamine, dodecanol, and dodecane. The source phase was aqueous LA at 10 g/L and the stripping phase was sodium carbonate at 2.5 g/L that reacts with LA transported from the source phase. LA removals from 50% to 90% were measured and a high LA removal is found for short times of injection of both stripping and receiving drops (6 s) and at high flow rates of the membrane phase (9.9 mL/min). If long times of injection are used, the driving force for mass transfer between the source phase and the membrane phase is reduced due to the high LA concentration in the membrane phase, while when short times are used the LA concentration in the membrane phase is low allowing a high driving force between the phases.

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