

Extraction of Dyes Using an Aqueous Two-Phase System in Stratified and Slug Flow Regimes of a Microchannel

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Abstract : In this work, analysis of an Aqueous two-phase (polymer-salt) system for extraction of sunset yellow dye is carried out. A polymer-salt ATPS i.e.; Polyethylene glycol-600 and anhydrous sodium sulfate is used for the extraction. Conditions are chosen to ensure that the extraction results in a concentration of the dye in one of the phases. The dye has a propensity to come to the Polyethylene glycol-600 phase. This extracted sunset yellow dye is degraded photo catalytically into less harmful components. The cloud point method was used to obtain the binodal curve of ATPS. From the binodal curve, the composition of salt and Polyethylene glycol -600 was chosen such that the volume of Polyethylene glycol-600 rich phase is low. This was selected to concentrate the dye from a dilute solution in a large volume of contaminated solution into a small volume. This pre-concentration step provides a high reaction rate for photo catalytic degradation reaction. Experimentally the dye is extracted from the salt phase to Polyethylene glycol -600 phase in batch extraction. This was found to be very fast and all dye was extracted. The concentration of sunset yellow dye in salt and polymer phase is measured at 482nm by ultraviolet-visible spectrophotometry. The extraction experiment in micro channels under stratified flow is analyzed to determine factors which affect the dye extraction. Focus will be on obtaining slug flow by adding nanoparticles in micro channel. The primary aim is to exploit the fact that slug flow will help improve mass transfer rate from one phase to another through internal circulation in dispersed phase induced by shear.

Keywords : aqueous two phase system, binodal curve, extraction, sunset yellow dye

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