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Diclofenac extraction from aqueous solution by an emulsion liquid membrane: parameter study and optimization using the response surface methodology

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Abstract

In this work, extraction of diclofenac (DCF) ions from aqueous solution by emulsion liquid membrane (ELM) was studied. The ELM process by experimental work and response surface methodology (RSM) based on central composite design (CCD) was carried out. The liquid membrane phase of the ELM consisted of tetrabutylammonium bromide (TBAB) as a carrier, Span 80 as a surfactant, dichloromethane (CH_2Cl_2) as diluent and sodium hydroxide (NaOH) solution as the internal phase. The transport of DCF ions from the aqueous solution was evaluated from yield of extraction as the analytical response. The process parameters such as surfactant concentration, carrier concentration, extraction time, feed concentration, treat ratio (volume ratio of the external phase to the emulsion phase), and agitation speed were optimized. The contours and 3D response surfaces of DCF extraction efficiency were obtained. A quadratic polynomial model was fitted with a high coefficient of determination ($R^2 = 0.9946$, $n=32$) to predict the extraction yield of DCF. The comparison between the

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