

Statistical Optimization of Distribution Coefficient for Reactive Extraction of Lactic Acid Using Tri-n-octyl Amine in Oleyl Alcohol and n-Hexane

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Abstract : The distribution coefficient, KD for the reactive extraction of lactic acid from aqueous solutions of lactic acid using 10-30% (v/v) tri-n-octyl amine (extractant) dissolved in n-hexane (inert diluent) and 20% (v/v) oleyl alcohol (modifier) was optimized by using response surface methodology (RSM). A three level Box-Behnken design was employed for experimental design, analysis of the results and to depict the combined interactive effect of seven independent variables, viz lactic acid concentration (cl), pH, TOA concentration in organic phase (ψ), treat ratio (ϕ), temperature (T), agitation speed (ω) and batch agitation time (τ) on distribution coefficient of lactic acid. The regression analysis recommended that the quadratic model is significant (R^2 and adjusted R^2 are 98.72 % and 98.69 % respectively) for analysis. A numerical optimization had resulted in maximum lactic acid distribution coefficient (KD) of 3.16 at the optimized values for test variables, cl, pH, ψ , ϕ , T, ω and τ as 0.15 [M], 3.0, 22.75% (v/v), 1.0 (v/v), 26°C, 145 rpm and 23 min respectively. A good agreement between the predicted and experimentally obtained values for distribution coefficient using the optimized conditions was exhibited.

Keywords : Distribution coefficient, tri-n-octylamine, lactic acid, response surface methodology

Conference Title : ICCSE 2015 : International Conference on Chemical Science and Engineering

Conference Location : Zurich, Switzerland

Conference Dates : July 29-30, 2015