Five-factor Response Surface Optimisation of Hydrochloric acid Dissolution of Alumina from a Nigerian Clay

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Abstract

Abstract Certain process variables usually affect the yield of ores from clays in acid dissolution processes. Varying these variables has been identified to affect the yield of ores from clays. In order to increase the process efficiency and evaluate the interactive effects of the process variables, optimization is usually performed for the dissolution process. In this study the interactive effects of calcination temperature, leaching temperature, acid concentration, liquid-solid weight ratio and stirring speed on the yield of alumina from the local clay was investigated using the Response Surface Methodology based on the central composite rotatable design. The second order polynomial regression equation was appropriate for fitting the experimental data and 0.9209 was obtained as the correlation between the predicted and experimental responses. Calcinations temperature of 677.27oC; leaching temperature of 65.18oC; acid concentration of 1.9mol/cm3; liquid-solid weight ratio of 10.36 and stirring speed of 442.92rpm were the values of the process variables which gave the optimum alumina yield of 80.07%.

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