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Potential Application of Modified Diglycolamide Resin for Rare Earth Element Extraction

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Abstract : Rare earth elements (REE) play a vital role in technological advancement due to their unique physical and chemical properties essential for various renewable energy applications. However, this increasing demand represents a challenging task for sustainability that corresponds to various research interests relating to the development of various extraction techniques, particularly on the extractant being used. In this study, TK221 (a modified polymer resin containing diglycolamide, carbamoyl methyl phosphine oxide (CMPO), and diglycolamide (DGA-N)) has been investigated as a conjugate extractant. FTIR and SEM analysis results confirmed the presence of CMPO and DGA-N being coated onto the PS-DVB support of TK221. Moreover, the kinetic rate law and adsorption isotherm batch test was investigated to understand the corresponding adsorption mechanism. The results show that REEs' (Nd, Y, Ce, and Er) obtained pseudo-second-order kinetics and Langmuir isotherm, suggesting that the adsorption mechanism undergoes a single monolayer adsorption site via a chemisorption process. The Qmax values of Nd, Ce, Er, Y, and Fe were 45.249 mg/g, 43.103 mg/g, 35.088 mg/g, 15.552 mg/g, and 12.315 mg/g, respectively. This research further suggests that TK221 polymer resin can be used as an alternative absorbent material for an effective REE extraction.

Keywords : rare earth element, diglycolamide, characterization, extraction resin
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