

Liquid-Liquid Extraction of Rare Earths Elements by Use of Ionic Liquids

Authors : C. Lopez, S. Dourdain, G. Arrachart, S. Pellet-Rostaing

Abstract : Ionic liquids (ILs) are considered a good alternative for organic solvents in extractive processes; however, the higher or lower extraction efficiency in ILs remains difficult to predict because a lack of understanding of the extraction mechanisms in this class of diluents, making their application difficult to generalize. We have studied the extraction behavior of La(III) and Eu(III) from aqueous solution into n-dodecane and two ionic liquids (ILs), 1-ethyl-1-butylpiperidinium bis (trifluoromethylsulfonyl)imide [EBPip⁺] [NTf₂⁻] and 1-ethyl-1-octylpiperidinium bis (trifluoromethylsulfonyl)imide [EOPip⁺] [NTf₂⁻], at room temperature using N,N'- dimethyl- N,N'-dioctylhexylethoxymalonamide (DMDOHEMA) as extractant. Fe(III) was introduced to the aqueous phase in order to study the selectivity toward La(III) and Eu(III) and the effect of variation of PH was investigated by using of several HNO₃ concentrations. We found that the ionic liquid with shorter alkyl chain [EBPip⁺] [NTf₂⁻] showed a higher extraction ability than [EOPip⁺] [NTf₂⁻] and that the use of ILs as organic solvent instead n-dodecane, greatly enhanced the extraction percentage of the target metals with a good selectivity. Cation ([EBPip⁺] or [EOPip⁺]) and anion ([NTf₂⁻]) concentration in the aqueous phase, has been determined in order to elucidate the extraction mechanism.

Keywords : extraction mechanism, ionic liquids, rare earths elements, solvent extraction

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