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Highly efficient and eco-friendly extraction of neodymium using, undiluted and non-fluorinated ionic liquids. Direct electrochemical metal separation.

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Abstract

A new approach for highly efficient extraction and recovery of neodymium from acidic medium by new undiluted ionic liquids (ILs) as extractants. The distribution ratio D_{Nd} and the extraction efficiency % E was measured as a function of nitric acid concentration, extraction time, nature of the IL, concentration of the aqueous feed and molar quantity of complexing agent. D_{Nd} is higher than 10^5 and % E is close to 100% when the HNO_3 concentration is greater than 6M. The extraction process follows solvation mechanism, suggesting the involvement of three molecules in the extraction of one (Nd^{3+}) -nitrate complex. The nature of bonding in the extracted complexes was investigated by various spectroscopic techniques. The recovery process, of metal was performed by direct electrodeposition from the IL phase. The electrodeposition of metal was realized by potentiostatic electrolysis at $-2V$. The current efficiency evaluated from the mass change of the anode was more than 83%. The particles were obtained as small crystallite rods with various size approximately 3–70 μm and diameters range of 0.5–30 μm . The liquid-liquid extraction and the direct electrodeposition of neodymium by these H-phosphonate based ILs, are new efficient and eco-friendly process.

Keywords: Green separation, Liquid-liquid extraction, Rares earths, Neodymium, Ionic liquids, Electrodeposition.

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