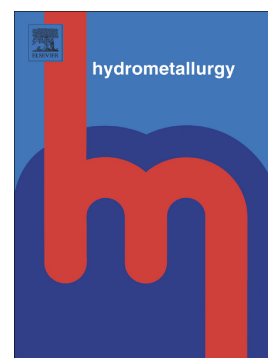


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RECOVERY OF URANIUM, THORIUM AND RARE EARTH FROM INDUSTRIAL RESIDUES

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ABSTRACT

This paper addresses the development of a process to recovery uranium, thorium and rare earth elements from an industrial residue, with a subsequent removal of U and Th from the liquor generated. Sulfuric acid digestion followed by water leaching was found to be the best method to solubilise the metals. The acid digestion was carried out with an acid sample ratio of 700 kg t⁻¹ and a reaction time of 2hours, without temperature control. The water leaching step was performed at room temperature (25 ± 2°C), with 1 hour of mechanical stirring and 20% of solids. Under these conditions, a metal dissolution of 94%, 81% and 97% was reached for the REE, Th and U, respectively. After the metal solubilisation, a sulfuric liquor containing 0.08 g L⁻¹ Th, 0.35 g L⁻¹ U, 9.1 g L⁻¹ REE, 16 g L⁻¹ Al, 7.8 g L⁻¹ Fe, 0.47 g L⁻¹ Ca, 0.75 g L⁻¹ Zn and 0.1 g L⁻¹ Si was formed. This liquor was used in the solvent extraction stage in order to separate Th and U from the REE, as well as from other metals. The effect of the type and extractant concentration, acidity of the liquor and type and concentration of the stripping solution were investigated. The results showed that 97% of the uranium and 94% of the thorium were extracted by a mixture of 0.05 mol L⁻¹ of Primene JM-T and 0.1 mol L⁻¹ of Alamine 336, in a single stage. The stripping from the loaded organic phase for the simultaneous removal of U and Th can be effectively done by using 1.7mol L⁻¹ NaCl solution at pH 1.2.

Keywords: Rare earth elements, Thorium, Uranium, Industrial Residues, Amines extractants.

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