

Recovery of thorium and rare earth elements from sludge with the aid of anionic exchanger

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Abstract During operation of a solvent extraction pilot plant for preparation of pure thorium nitrate, a thorium concentrate produced industrially from monazite processing in São Paulo containing the REE as main impurities and some minor elements like iron, titanium, lead, sodium and silica was dissolved with hot nitric acid following by digestion and addition of flocculants was filtered for the separation of some insoluble fraction. Thorium was extracted with TBP-diluent in a pulsed column. Small amount of this thorium nitrate was used for nuclear research and the gross production was supplied to some companies that manufacture thorium gas light mantle in Brazil. The raffinate still containing some thorium and the totality of REE was treated with sodium hydroxide and the hydroxides as sludge are stocked. Nowadays there is a stockpile of circa 25 ton of the mentioned material. In this work it is reported a process for separation of thorium from rare earth elements (REE) and their recovery from this accumulated sludge. It is dissolved with hot nitric acid, filtered to separate any insoluble and an excess of acid is added. The prepared solution is fed into a strong anion ion exchanger previously treated with 1mol L⁻¹ HNO₃. Thorium nitrate as an anionic complex is retained while REE and other impurities are passed to the effluent. This effluent is treated to obtain a rare earth concentrate for future work of individual separation of the elements. The resin could retain only very small amounts of cerium and lanthanum, but both are excluded when the column is saturated with thorium. Thorium nitrate is eluted with diluted nitric acid. The process is operationally simple and was developed and successfully performed keeping in mind a future installation for the recovery of thorium and rare earths from the above mentioned sludge.

Keywords: Rare earth, Thorium, Anionic exchanger