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## Recovery of Light and Heavy Rare Earth Elements from Apatite Ore Using Sulphuric Acid Leaching, Solvent Extraction and Precipitation

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### ABSTRACT

Apatite is one of the important host minerals of the rare earth elements (REEs). Separation of REEs from apatite has not been studied extensively compared with other main minerals such as monazite, bastnasite and xenotime. Therefore, it is essential to develop an effective method for recovery of REEs from apatite-based ores.

This paper presents the results of laboratory studies for the recovery of rare earth elements from an apatite ore sample by using sulfuric acid leaching, solvent extraction, and precipitation processes. Results showed that the most effective dissolutions of light REEs (> 85%) and heavy REEs (>89%) from the apatite ore sample were achieved with a dilute sulfuric acid solution (1 M H<sub>2</sub>SO<sub>4</sub>) at a temperature of 20 °C in an hour. The heavy REEs present in the pregnant leach solution were almost entirely extracted using 1.2 M di-(2-ethylhexyl) phosphoric acid (D2EHPA) as a cation exchanger, while the most light REEs remained in the raffinate. The heavy REEs loaded into the organic phase was stripped completely by 3 M H<sub>2</sub>SO<sub>4</sub> solution. REEs in raffinate and strip solutions were precipitated as RE oxalates with the addition of 0.08 M oxalic acid.

**Keywords:** rare earth elements, fluorapatite, leaching, solvent extraction, precipitation

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