

*Title:* **Rare Earth Elements extraction from Acid Mine Drainage from the Iberian Pyrite Belt**

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Rare earth elements (REEs) are key for modern technologies, but there is shortage of supply worldwide. Acid mine drainage (AMD) contains higher concentrations of REEs than any other natural water source, making this mine residue of economic interest. Treatment of AMD produces schwertmannite, a Fe (III) hydroxosulfate, and basaluminite, an Al hydroxosulfate, as waste. These minerals are responsible of retaining the REEs present in AMD. The objective of the present work is to study the precipitation conditions of both minerals to separate them during the treatment and to study the adsorption behavior of REEs on them, thus making the recovery of these elements easier.

Samples from three different open pits in the Iberian Pyrite Belt were neutralized with NaOH and analyzed, showing precipitation of schwertmannite at pH below 3.5 and precipitation of basaluminite at pH above 3.5, making its segregation possible.

Scandium shows partial adsorption on schwertmannite by pH 3.5, but most of it is adsorbed on basaluminite at a higher pH. The rest of REEs show sorption on basaluminite starting at pH 4.5 up until pH values of 6 for most of them, although some are not completely adsorbed until reaching pH 8. Experimental results were modeled using a thermodynamic model based on the adsorption of a strong sulfate aqueous complex by exchanging a proton with the surface of the mineral.

**Keywords:** Scandium, Yttrium, Lanthanides, Sorption model, Basaluminite, Schwertmannite