

## **Rare Earth Elements and Yttrium geochemistry in Acid Mine Drainage neutralization**

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Rare Earth Elements and Yttrium (REY) are raw materials of increasing importance for modern technological developments. Most of production is concentrated in China, and finding alternative sources of REY has become a need for the rest of countries. Acid Mine Drainage (AMD) is commonly considered an environmental pollution. However, AMD may contain REY in concentration various orders of magnitude higher than the rest of waters. AMD neutralization upon mixing with alkalinity-bearing streams causes precipitation of REY with Al and Cu when the resulting stream shows pH values higher than 5.5. Moreover, the traditional AMD passive remediation systems are based on its reaction with calcite-based permeable substrates followed by decantation ponds. There, schwertmannite and basaluminite successive fronts precipitate as the AMD is neutralized by calcite. Observations from both stream and passive remediation systems demonstrate that schwertmannite does not allocate REY, which in turn are retained in basaluminite. Although REY rates in the treatment residue may be competitive, the annual reserves for an entire region such as the Iberian Pyrite Belt are low and only comparable to the more modest producing countries. However, in addition to the environmental benefits of its treatment, AMD is expected to run for hundreds of years and therefore, total reserves are unlimited.