Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5830

Rare earth origin in the mine waters of the Iberian Pyrite Belt: preliminary results based on leaching tests.

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Acid Mine Drainages (AMD) are acid leachates, produced by sulfides exposure to environmental conditions, which generate a great concern worldwide due to metal(loid)s release. On the other hand, AMD has also recently been considered a strategic alternative as a secondary source of rare earths (REE), due to the high concentration of these elements and their preferential enrichment in middle REE (MREE), which have a higher economic potential [1]. However, the source of REE and MREE enrichment in AMDs remains uncertain, although recent studies indicate that it must be derived from the water-rock interaction [2]. In this sense, our objective is focused on studying this interaction in the Iberian Pyrite Belt (IPB), a large metallogenic province of sulfides where around 1 m^3/s of AMD are generated during the dry season, as a result of poor management of the mining that has historically occurred in the region. Batch experiments that simulate acid leaching on the lithologies of two geologically different mines within the framework of the IPB has been made (Perrunal and Poderosa), of which a historical series of AMD data is available. Before these tests, an intensive field study of both mines was carried out with the aim of mapping and taking representative samples of the different lithologies. In the results obtained, it has been observe that during acid leaching of rocks, changes occur in the REE pattern normalized to NASC. Thus, in certain rocks there is an MREE enrichment similar to that of AMDs, being possible sources of REE in the leachates. However, there are differences with the original REE pattern of the waters, which seems to indicate that the dissolution of these elements and their enrichment pattern do not occur during the water-rock interaction with a single lithology, but rather from a combined leaching on various rocks. The results obtained are the basis for tracing the source of REE in the AMDs, which will be studied in depth through future analysis of the rocks and leachate of the IPB.

[1] León et al., (2021). J. Geochem. Explor., 106742.

[2] Wallrichet al., (2020). Geochim. Cosmochim. Acta, 269, 465-483.