



Secondary iron sulphates in AMD: a minerochemical analysis on jarosite supporting the valorization of its geoenvironmental contribution

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Currently, iron sulphates formed in abandoned sulphide-ore mines have a very negative connotation within acid mine drainage (AMD) because in general these secondary hydroxilated and/or hydrated minerals concentrate a large span of toxic elements. However, this apparently penalizing feature may occasionally turn out to be a positive contribution, once sequestering such elements under the form of stable minerals significantly reduces their spread in soils and rivers, as occurs for jarosite in what concerns lead.

The application of an exergetic analysis to resources consumption and sustainability assessment [1] provides a means of evaluating the degradation of mineral resources on Earth and a life cycle assessment (LCA) recently performed on some secondary iron sulphates has emphasized their exergetic contribution [2]. With the purpose of further exploring this positive aspect, and focusing on jarosite, a synopsis is presented on the structural features and geochemical tendencies of secondary iron sulphates liable of being exploited to promote their possible role. Jarosites (s.l.) - with general formula $AB_3(OH)_6(SO_4)_2$, where A is mainly K^+ , Na^+ , plus minor Ag^+ , Tl^+ , NH_4^+ , Pb^{2+} , Bi^{3+} , and B is essentially Fe^{3+} (jarosite s.s.) or Al^{3+} (alunite) - have a trigonal crystal structure [3] and display Kagomé-type layers of corner-sharing B octahedra, $[Fe/AlO_2(OH)_4]$, that give rise to unique magnetic properties [4]; the large cation A stays in pseudo-icosahedral coordination by 6 O-atoms from $[SO_4]$ tetrahedra and 6 hydroxyls shared with A octahedra [5].

A synopsis is presented on the crystal-chemistry and geochemical tendencies of jarosite and the geochemistry of sediments in the abandoned mine of S. Domingos (southern Portugal, Iberian Pyrite Belt of polymetallic sulphide ores), is briefly described to illustrate the positive environmental role of jarosite as energy-saver within the particularly aggressive environment of abandoned sulphide-ore mines.

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