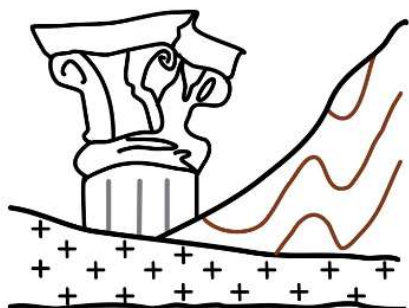




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Geochemical and mineralogical characterization of manganese deposits in the Iberian Pyrite Belt - preliminary study

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Resumo

The Iberian Pyrite Belt (IPB), traditionally recognized for its extensive volcanogenic massive sulfide deposits, also hosts a diverse set of manganese (Mn) occurrences whose genesis remains comparatively less explored. These deposits, distributed across distinct stratigraphic and structural contexts, represent an important record of the paleoenvironmental evolution and metallogenetic processes that shaped the region. In this preliminary study, several typologies of Mn deposits were sampled and analyzed, including stratiform levels interbedded within volcano sedimentary sequences, hydrothermal alteration zones peripheral to VMS systems, and horizons enriched through supergene processes associated with intense sulfide weathering. This diversity of geological settings allowed the assessment of internal variability within the deposits and the identification of the main geological controls governing Mn concentration. Mineralogical characterization revealed the presence of multiple primary and secondary phases, including oxides, hydroxides, carbonates, silicates and amorphous Mn-Fe-rich materials, as well as alteration products formed under oxidizing conditions. This mineralogical complexity indicates that Mn deposits in the IPB do not result from a single process, but rather from the interaction between hydrothermal, sedimentary and supergene mechanisms. From a geochemical perspective, the samples exhibit high Mn contents accompanied by significant concentrations of Fe, Ba and Si, in addition to trace elements that act as sensitive indicators of paleoenvironmental conditions. The observed geochemical relationships point to depositional environments influenced by low temperature hydrothermal circulation, accumulation in restricted basins under reducing conditions, and subsequent enrichment through oxidation and supergene leaching. These patterns are consistent with hybrid metallogenetic models characteristic of Mn enriched VMS systems. Overall, the results highlight the substantial typological variability and the mineralogical and geochemical complexity of Mn deposits in the IPB, reinforcing both their scientific relevance and their economic potential in the context of the energy transition. Future work should integrate isotopic analyses and high-resolution textural investigations to further elucidate the evolution of these deposits and their potential for resource development.

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