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# Detailed characterization of vectors to ore in replacive volcanogenic massive sulphide (VMS) deposits of the northern Iberian Pyrite Belt (Spain)

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Volcanogenic massive sulphide (VMS) deposits represent a major source of base (Cu, Pb, Zn), precious (Ag, Au), and other metals of economic importance. Due to progressive exhaustion of the shallowest and most easily accessible deposits, the search for new resources faces challenges such as exploration at increasing depths or in non-conventional settings. In this context vectors to ore play a vital role. The Iberian Pyrite Belt (IPB) is an outstanding VMS district located in the SW of the Iberian Peninsula. It is arguably the largest known accumulation of sulphides on the Earth's crust (>1.6 Bt) and represents one of the main zones of base metal production in Europe. However, the characterization of vectors to ore in the IPB is far from systematic or complete. In addition, previous works have mostly focused on the study of the larger shale-hosted exhalative deposits of the southern IPB or the giant Rio Tinto deposit; but less attention has been paid to the predominantly volcanic-rock-hosted replacive deposits of the northern IPB, which, although generally smaller in size compared to southern deposits, typically present higher base metal concentrations. In this work we have performed a detailed study of the main vectors to ore to a representative volcanic-rock-hosted replacive VMS deposit located in the northern IPB, the Aguas Teñidas deposit. Investigated vectors include: (1) host sequence characterization and mineralized unit identification based on whole rock geochemistry discrimination diagrams; (2) study of the characteristics and behaviour of whole rock geochemical anomalies around the ore (e.g. alteration-related, geochemical halos of indicative elements such as Cu, Zn, Pb, Sb, Tl, and Ba around the deposit); (3) application of portable X-ray fluorescence analysis to the detection of the previous vectors; (4) mineralogical zoning; (5) mineral chemistry vectors in muscovite, chlorite and carbonate using major (EMPA) and trace (LA-ICP-MS) elements. In addition, a conceptual model has been proposed which accounts for the observed mineralogical and mineral chemistry trends across the hydrothermal footprint of the Aguas Teñidas VMS deposit. Beyond the IPB, data presented here contribute to improving our general understanding of vectors to ore in VMS deposits in general.