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Lagoa Salgada VMS: Geochemistry Applied to Deposit Domaining, Geometallurgy, and Exploration

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The Lagoa Salgada polymetallic deposit (Zn, Pb, Cu, Au, Ag), located at northwest edge of the Iberian Pyrite Belt, comprises massive sulphide and stringer mineralization in the north sector and stacked fissural sulphide-bearing corridors in the south sector. Mineralization has been affected by structural transposition and the weathering process.

New collected downhole four-acid digestion multielement ICP coupled with ore-grade metals (oxidizing digestion) ICP has been extensively used for 1) refining the lithogeochemical character of the host volcanic rocks and their different domains and sub-domains; and 2) understanding metal zoning and mobility.

Lithogeochemically, the heterogeneous volcanic suite that hosts the different mineralized domains can be discerned by the dacitic tuffs that cap the mineralization based on differentiation trends (e.g., Eu anomaly). In terms of alteration, within the host volcanic packages, correlation between Alkalis/Al/Mg-Fe indexes (e.g., AI and CCPI) and mineralized trends exist. When properly normalized by host rocks, corridors of higher mineralization show a proportionally higher CCPI index in zones of higher strain. This qualitative feature works as a tool to delineate mineralized trends.

Metal ratios in the north sector reflect secondary processes where different metal solubility generates enrichment or depletions from a less variable primary ore. Gossan shows full depletion in Cu and Zn and residual enrichment of precious metals, V and Mo, and Transition shows enrichment of Cu and Zn depletion. RREE variations also support this classification scheme. The new Geochem-driven ore model has improved considerably the metal recoveries in current processing studies.

Metal distribution in the south sector is affected by deformation and contrasting metal solubility and sulphide rheology. In this high-strain environment, metal ratios define exploration vectors, particularly in terms of Cu, that form continuous elongated subdomains within some of the stacked fissural sulphide corridors.