SEG 2024 Conference: Sustainable Mineral Exploration and Development

Trace Element Characterization of Scheelite in the Polyphase Intrusive W-(Sn-Ta) deposit of Santa Comba, NW Spain

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The study analyzes the two distinct types of W mineralization found in the Santa Comba deposit through scheelite geochemistry. The mine is part of a polyintrusive complex that aligns with the Exogranite-Stockscheider-Endogranite model. Santa Comba is a W-(Sn) deposit characterized by the presence of cassiterite (SnO_2), wolframite (Fe, $MnWO_4$), and scheelite ($CaWO_4$). All ores are found disseminated in the endogranite associated with the typical alteration sequences in porphyry deposits and concentrated in a late quartz-vein system.

Scheelite, found in both types of deposit mineralization, is a better environment indicator than wolframite due to its ability to incorporate different elements. Discriminant analysis using elements like Mo, Sr, and Nb, along with specific ratios, can distinguish scheelite from different types of mineralization within the same deposit.

Scheelite disseminated in the endogranite (Sch I) shows low Mo and positive Eu, suggesting a relationship with reduced hydrothermal fluids. Scheelite associated with quartz veins, sulfides, and chlorite (Sch II), exhibits lower rare earth elements (REEs), high Mo, and a negative Eu anomaly. Mo concentration displays restricted ranges within each mineralization type, indicating its usefulness as a redox-sensitive element for discriminating scheelite formed in different geologic settings.

Sch II is impoverished in light REE (LREE) compared to Sch I, which allows for easy differentiation of the generations. Scheelite tends to incorporate LREE over heavy REE due to ionic radii differences. The low LREE content in Sch II may be due to hydrothermal apatite precipitation, which can remove LREE from the system.

The trace element signatures of the different types of scheelite are very distinctive and showcase important information about the fluids and genetic context of a deposit. By deepening our understanding, scheelite could become an effective tool in identifying specific types of mineral deposits in potential mineralization areas.