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Micas as Tracers of Tungsten Mineralization Case Study: Santa Comba and Fontao Deposits NW Spain

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The study focuses on the use of micas as tracers for tungsten mineralization in the Santa Comba and Fontao mines located in NW Spain. These mines are each situated within a poly-intrusive epizonal complex, conforming to the Endogranite-Stockscheider-Exogranite model. The deposits show evidence of multiple mineralizing events, each characterized by unique paragenesis and geochemical conditions. In addition to tungsten ores, muscovite and quartz are prevalent minerals across all types of mineralization.

To understand the differences in the mica composition from each mineralization and from barren intrusions, we have assessed the geochemical variations in the muscovite. Variations in trace element content, such as Li, Rb, Cs, and W, reveal differences in the sources, temperatures, and fluid composition of the fluids involved as well as the effect of fluid-rock interaction. These differences can help distinguish between mica formed in mineralized zones and those found in barren intrusions, potentially leading to a better understanding of the formation and localization of ore deposits.

Using LA-ICPMS, a systematic approach based on mica trace chemistry was used to delineate various events leading to mineralization. Three distinct mica groups were identified in each deposit, each distinguished by specific petrographic features and/or location. Analysis of their trace element composition revealed significant variations between mica groups, although homogeneous signatures were identifiable within each group.

The study highlights the relevance of trace element analysis in ubiquitous minerals such as micas as a potent tool for understanding the mineralizing processes and alteration within complex geologic settings. Moreover, it suggests the potential of this method in relating distal veins to a main magmatic body. Igneous micas were found to harbor notable concentrations of W and Sn, which could be mobilized during later hydrothermal alteration, potentially leading to ore deposit formation.