The Origin of Stratabound Scheelite: The Future Resource for Europe?

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Most currently mined tungsten deposits in SW Europe are high-grade, low-tonnage discordant vein systems but in recent years, the discovery of the high-tonnage San Juan and Valtreixal (10 Mt @ 0.28 WO_3) deposits opens the possibility that in the future, stratabound scheelite can become a major resource. In Iberia, there are previously quoted small stratabound scheelite prospects that have been considered metamorphosed exhalative deposits or metamorphic skarns. However, Valtreixal and San Juan seem to be a new type of mineralization rarely studied up to now.

Mineralization forms large stratabound sulfide-poor bodies enriched in clinozoisite-muscovite-quartz and interbedded in thick siliciclastic sequences of dark shale of Late Paleozoic age; cassiterite U-Pb and muscovite $^{40}Ar/^{39}Ar$ ages suggest that the mineralization formed at ca. 313 Ma, coeval with nearby discrete intrusions of mesozonal to epizonal syn-tectonic Variscan granitoids. The connection between tungsten mineralization and the source granite, which can be several kilometers away, are large quartz-rich veins with cassiterite. Sr-Nd isotope geochemistry suggests a magmatic source for metals while ore-forming fluids seem to be CO_2-poor, intermediate-density water below the two-phase surface.

Early fluid-rock reaction of high-temperature magmatic-hydrothermal fluids with the source granitoids and the dominant Fe-bearing shales was only able to saturate the system in cassiterite, but this mechanism was not effective enough to saturate the fluid in W, suggesting that the key process for W precipitation, even from very low amounts, was reaction of the magmatic-hydrothermal fluids with the Ca-bearing layers.

This largely ignored type of mineralization is perhaps equivalent to the distal Zn-rich skarns or mantos in porphyry systems but formed in relationship with collisional felsic granitoids.

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