POLYSTAGE TUNGSTEN MINERALIZATION AT LIENZER SCHLOSSBERG, EASTERN TYROL, AUSTRIA: EVIDENCE FROM MICRO-TEXTURES AND LA–ICP–MS ANALYSES OF SCHEELITE

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At Lienzer Schlossberg, scheelite mineralization comprises several styles: (1) disseminations in pyrrhotite-dominated massive Fe-Cu sulfide ores, (2) structurally controlled scheelite in a fault zone within altered host rocks, (3) "wallpaper"-like coatings on joints and fractures as well as (4) scheelite in small quartz veinlets. Scheelite has been studied by combining micro-textures visualized by cathodoluminescence (EPMA-CL) with LA-ICP-MS trace element analysis. Mineralization occurs within the contact aureole but also in magmatic rocks of the Oligocene Lienz/Edenwald tonalite intrusion. Host rocks in the contact metamorphic aureole include metapelitic hornfels grading distally into regional metamorphic mica schists and gneisses. Minor marbles, calc-silicate rocks and an up to 3 m thick massive sulfide horizon (FUCHS, 1982) are exposed in abandoned mine workings at Edenwald. Scheelite crystals (Scheelite 1 and 2) were found in the underground workings disseminated in the sulfide layer and in a fault zone associated with strongly altered host rocks. Subsequent stages (Scheelite 3, 4?) are restricted to the tonalitic intrusive rocks. The hypothesis that scheelite mineralization at Lienzer Schlossberg is of magmatic-hydrothermal origin is tested by comparing the scheelite chemistry with geochemical data of the Oligocene tonalite intrusion.

CL revealed internal micro-textures in scheelite which are dominated by oscillatory zoning that reflects fluctuating fluid conditions in hydrothermal systems (POULIN et al., 2018). Continuing hydrothermal activity is indicated by dissolution-replacement and overgrowth textures affecting the primary zonation. The correlation of CL-textures, trace element contents and Eu anomalies (Eu_A = Eu/Eu*) were examined along profiles in scheelite. The distribution of rare earth elements (REE) from Scheelite 1 to 4 comprise convex (i.e., MREE-enriched) fractionation patterns with distinct negative Eu anomalies, which grade into relatively flat REE profiles with variable Eu_A that are replaced by similar flat patterns but lower ΣREE at the outermost rims. In contrast, younger scheelites illustrate a HREE-depleted profile with negative Eu_A.

Scheelite at Lienzer Schlossberg has by far one of the highest ΣREE concentrations in the Eastern Alps but contains minor Mo and the least Sr. High Nb contents and the positive correlation of REE-Eu+Y vs. Nb+Ta suggest that the main exchange vector for REE incorporation in scheelite is via the coupled substitution of $Ca^{2+} + W^{6+} = REE^{3+} + Nb^{5+}$ (GHADERI et al., 1999).

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