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Evaluation of the Tungsten Potential in the Eastern Alps – New Insights from Geological, Mineralogical and Chemical Data on Scheelite

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Tungsten deposits and showings were investigated from different geological units of the Eastern Alps using a combination of cathodoluminescence (CL), electron probe micro-analyzer, SEM-based automated mineralogy and laser ablation-inductively coupled plasma-mass spectrometry. In the Eastern Alps, scheelite (CaWO_4) is the main carrier of tungsten, one of the prominent raw materials highlighted by EU criticality assessments for future technologies. The W-Alps project aims to develop assessment criteria for the evaluation of regional tungsten potentials in Austria and includes field-based and chemical investigations of several tungsten occurrences reflecting different types of mineralization to constrain their genesis. Among these, the world-class Felbertal W-deposit is the economically most important. The petrography and mineral chemistry of its scheelite is compared to scheelite from other occurrences to indicate the tungsten endowment. Our data demonstrate that the quest for “primary” scheelite signatures is complicated by coupled dissolution-reprecipitation and recrystallization processes during hydrothermal formation but also subsequent regional metamorphism, causing multiple types of scheelite with a broad chemical composition in most occurrences. It becomes clear that a few random scheelite analyses are insufficient to unravel the origin of an ore deposit and can lead to wrong interpretations. Thus, scheelite types in all occurrences were chronologically sorted by combining geological information, CL-textures and distinct trace element patterns. The distribution of trace elements in scheelite is mainly controlled by the fluid chemistry, element fractionation during crystallization of scheelite and co-existing phases and is also significantly modified during subsequent metamorphic mobilization of pre-existing scheelite. We will point out this temporal evolution of scheelite textures and chemistry and its importance for genetic implications and mineral exploration.