Hidden potential – an unconventional tungsten occurrence in the saxothuringian segment of the variscan orogenic belt

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In 2013, tungsten was assessed as critical raw material by the Commission of the European Union due to its high economic relevance market concentration and the limited supply of substitutes. Local, underexplored deposits and challenging ore types, which have been previously classified as uneconomic are now in focus of research activities.

In this context, a rather small skarn hosted tungsten occurrence in central Germany, 10 km NNW of Leipzig is under detailed petrographic investigations. The skarn ore body is overlain by a roughly 100 m thick Cenozoic cover and embedded in lower Cambrian sediments as well as bimodal volcanics. Resulting from the variscan granitoid intrusion, a complex mineral paragenesis was formed trough contact-metasomatism. The most important rock type hosting the tungsten mineralization as molybdo-scheelite are metasomatic garnet skarns.

Peculiar is the complete conversion of the primary mineralogy through intense weathering and oxidation of the upper portions (up to 40 m) of the skarn system. This was supposedly caused by exposure to subtropical climate in the Paleogene. An estimated WO_3 content of 5,3 kt is considered to be bound to this highly altered weathering horizon (~25 % of the deposits total resource base). Although hypogene ore minerals are not preserved, the tungsten content is anomalously high, between 0.3-0.9 %WO_3 in the whole rock. Iron-hydroxides and –oxides (goethite to hematite) serve as hosts for the elevated concentrations, containing between 1-5 % tungsten. Ore minerals are round, flaky to acicular crystals with sizes between 15-30 µm, that are often forming aggregates between 100-400 µm. Geochemically, these phases are highly variable in iron concentrations (45-70 %), but also in the contents of aluminium (0.5-3 %) and silicon (1-5 %). Minor amounts of tungsten are associated with specularite, which seems to be overgrown by goethite.

Future aims of this study are the exact phase determination, treatment capabilities for the liberation of tungsten from iron oxides, detailed geochemical profiles through the weathering horizon and quantitative element analysis of the host minerals by EPMA.