# STRATA-BOUND SCHEELITE DEPOSITS REVISITED - 50 YEARS OF FELBERTAL

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After its discovery in 1967 Felbertal has long been regarded as the type locality for strata-bound W deposits. Its discovery triggered worldwide exploration for this then new class of W deposits, but so far without any other economic counterpart. Early genetic models for the Felbertal deposit postulated a syngenetic/syndiagenetic formation by exhalative-hydrothermal processes and related mineralisation to Early Palaeozoic mafic volcanism with subsequent reworking and mobilisation during later orogenic events. Later, this model was challenged and various epigenetic, in part granite-related models of ore formation were proposed. A clear decision in favour of one of the genetic models was strongly hampered by the poly-metamorphic overprint of the deposit and lack of precise age data on mineralisation. In this presentation, it will be summarised how absolute age determination of ore minerals and associated host rocks using various isotope systems and modern in-situ dating techniques have changed our understanding on the formation of this scheelite deposit, which remains to be a major global tungsten producer since 50 years.

Some key aspects controlling formation of the Felbertal W deposit in the Eastern Alps are: (1) It is restricted to the lower parts of the Early Palaeozoic Habach Complex (amphibolites, hornblende fels, various orthogneisses) representing a rather exotic terrane in the Alpine orogen. (2) Geochemically specialised and strongly fractionated granites in the deposit („K1-K3 orthogneiss“ and equivalents) were emplaced at c. 336-341 Ma coeval with non-mineralised and granites (e.g, Felbertal Augengneis) during Variscan collision. The melts derived from Mid-Proterozoic continental crustal protoliths. (3) Four different scheelite types are distinguished; two are of magmatic-hydrothermal (types 1, 2) and two of metamorphic origin (types 3, 4). (4) The postulated pre-Variscan ore stage was not confirmed by modern in-situ dating of scheelite. The in-situ U-Pb age of c. 340 Ma for Scheelite type 1 from the finely foliated scheelite-quartz ore („scheelite-rich quartzite“) in the Eastern Ore Zone, previously thought to be c. 520 Ma old, supports the age relationship of tungsten mineralisation with Variscan magmatism. (5) Ore formation is linked with fluids, which are characterised by enrichment in LIL elements (K, Rb, Cs), Nb, Ta as well as in F etc. Mineralising fluids of magmatic-hydrothermal origin precipitated scheelite in quartz-dominated stock work veins, in shear zones and in disseminated form and caused deposit-scale alteration of the host rocks (e.g., low K/Rb; radiogenic Sr-isotope signature). (6) Finley foliated ores, previously interpreted as syngenetic (e.g., meta-exhalites), are best regarded as tectonites; i.e., mylonites. (7) The Felbertal deposit was affected by poly-phase regional metamorphism and deformation (Variscan: c. 330-340 Ma; (?) Permian: c. 270 Ma, Alpine: c. 30-40 Ma) what caused localised mobilisation of tungsten. In the Austroalpine units where a direct link of tungsten mineralisation with specialised granites is lacking only sub-economic tungsten showings were formed. It is concluded that correct genetic models are vital for successful exploration of mineral deposits.