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NEW ISOTOPE (U-Pb, Lu-Hf, $^{87}Sr/^{86}Sr$) AND TRACE ELEMENT DATA FROM FELBERTAL SCHEELITE DEPOSIT: CONSTRAINTS ON EARLY CARBONIFEROUS TUNGSTEN MINERALIZATION

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Combined in-situ U-Pb, Lu-Hf and trace element data on zircons from the W-mineralized K1-K3 orthogneiss in the Felbertal scheelite deposit provide new constraints on the genetic link between the Early Carboniferous K1-K3 orthogneiss and scheelite mineralization at Felbertal. The isotopic record of zircon from the mineralized K1-K3 orthogneiss is compared to that from the barren Felbertauern augengneiss. In addition, the Sr isotope systematics of scheelite were studied and compared with $^{87}Sr/^{86}Sr$ ratios of magmatic and metamorphic apatite from the K1-K3 orthogneiss. The new U-Pb concordia ages of zircons from four samples of the K1-K3 orthogneiss and one sample of a related aplitic gneiss confine the emplacement period of the highly fractionated granitic melt between 341.0 Ma and 336.6 Ma. The corresponding apparent εHf_t are constantly below the chondritic values and range from -7.6 to -4.9, indicating a crustal source. Both the U-Pb and the Lu-Hf data of zircon are comparable to those from the Felbertauern augengneiss; the latter yielding a U-Pb concordia age of 338.5±1.3 Ma and apparent εHf_t values between -6.8 and -5.3. In addition to geochemical whole rock data, the U-Pb and Lu-Hf zircon data support a common petrogenetic evolution of the W-mineralized K1-K3 orthogneiss and the barren Felbertauern augengneiss. Based on cathodoluminescence images and trace element compositions, magmatic and hydrothermal zircon can be distinguished in the K1-K3 orthogneiss. Characteristic for magmatic zircons are systematically decreasing Zr/Hf ratios and increasing trace element concentrations (U, W, Nb, Ta, Hf) from core to rim. In contrast, hydrothermal zircons feature anomalous high B concentrations and the highest level of trace element enrichment, indicative for crystallization in the presence of a metal- and volatile-rich magmatic-hydrothermal fluid/vapour phase related to the crystallization of the K1-K3 orthogneiss protolith. These fluids also caused an incongruent release of ^{87}Sr from Rb-rich minerals (e.g. biotite, muscovite) during interaction of the mineralizing fluid with the various Early Palaeozoic host rocks of the Habach Complex. Magmatic apatite from the K1-K3 orthogneiss re-equilibrated with ^{87}Sr-rich fluids, what is reflected in highly radiogenic and considerable scattering $^{87}Sr/^{86}Sr$ ratios of apatite (0.7204-0.7451). The inhomogeneous Sr isotope composition is already typical for the early magmatic-hydrothermal scheelite generations (Scheelite 1 and 2) with $^{87}Sr/^{86}Sr$ ratios ranging from 0.7208 to 0.7642 and from 0.7072 to 0.7683, respectively. Metamorphic Scheelite 3, formed by recrystallization and local mobilization of older scheelite, is characterized by even more radiogenic $^{87}Sr/^{86}Sr$ ratios between 0.74331 and 0.80689, matching the $^{87}Sr/^{86}Sr$ ratios of the metamorphic apatite generation (0.7456-0.7794). The further increase in $^{87}Sr/^{86}Sr$ ratios in Scheelite 3 and apatite rims is attributed to Young Alpine (?) metamorphic recrystallization and redistribution of ^{87}Sr in metamorphic fluids.