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Formation of deep hydrothermal vein-type Mo greisen and base metal mineralization at the Sweet Home mine, Colorado (USA)

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Deep hydrothermal Mo, W, and base metal mineralization at the Sweet Home mine (Detroit City portal) formed in response to magmatic activity during the Oligocene. Fluid inclusions in early-stage greisen quartz and fluorite precipitated from low- to medium-saline (1.5-11.5 wt.% equiv. NaCl), CO_2-bearing fluids at temperatures between 360 and 415°C and at depths of at least 3.5 km. Stable isotope data indicate that greisen formation and base metal mineralization at the Sweet Home mine was related to fluids of different origins. Early magmatic fluids were the principal source for mantle-derived volatiles (CO_2, H_2S/SO_2, noble gases), which subsequently mixed with significant amounts of heated meteoric water. Mixing of magmatic fluids with meteoric water is constrained by δ^2H_w-$\delta^{18}O_w$ relationships of fluid inclusions. The deep hydrothermal mineralization at the Sweet Home mine shows features similar to deep hydrothermal vein mineralization at Climax-type Mo deposits or on their periphery. This suggests that fluid migration and the deposition of ore and gangue minerals in the Sweet Home mine was triggered by a deep-seated magmatic intrusion. The findings of this study are in good agreement with the results of previous fluid inclusion studies of the mineralization of the Sweet Home mine and from Climax-type Mo porphyry deposits in the Colorado Mineral Belt.