EGU23-7599, updated on 29 Mar 2024
https://doi.org/10.5194/egusphere-egu23-7599
EGU General Assembly 2023

Base metal ore mineralization in the upper crust of the Moldanubian Domain, Bohemian Massif, CZ: generation and source, a question of fluid flow

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Cycling of fluids and their carried metals in the continental crust results in the local enrichment of certain elements, such as Pb, Zn, Cu, at upper crustal levels. Upper crustal ore deposits play a significant role for the advance of our core technologies facilitating communication and transportation. Determining where and how metals are cycled at crustal scale is crucial to infer potential ore deposits.

This study focuses on base metal (Pb, Zn, Cu) quartz vein mineralization in the Moldanubian Domain in central Czech Republic. During the waning stages of the Variscan orogeny, the Moldanubian was affected by MP-HT metamorphism due to underplating of the Saxothuringian Domain and the Brunia microplate [1, 2]. The continuous compressional stress regime led to the collapse and subsequent uplift of the central Moldanubian Domain. This rapid uplift triggered decompressional melting, leading to the formation of a batholith known as the Moldanubian pluton [2]. Collapse occurred along two large scale fault systems perpendicular to the prevailing stress regime [2, 3]. We suggest tectonic movement led to fluid infiltration of the migmatized upper crust preserved as quartz veins with Pb-Zn-Cu mineralization. Once the Moldanubian Domain reached upper crustal levels, rehydration of the rocks and passive enrichment of metals in the fluid occurred.

Petrographic observations show that the composition of fluids changed over time. The first generation of fluids generated translucent quartz with comparable few and small (5 - 30 µm) inclusions whereas the second generation of fluids produced more and bigger (10 - 70 µm) fluid inclusions that incorporate solid phases in 10 % of observed inclusions. The last phases to precipitate in cavities are the base metal sulfides which appear as pyrite, galena, and sphalerite.

Microthermometry data supports a gradual change of fluid composition as first-generation fluid inclusions show $NaCl_{equiv}$ values lower than 1 wt.-%, while second-generation fluid inclusions are significantly higher in salinity with 3 - 7 wt.-% $NaCl_{equiv}$. Raman spectroscopy of fluid inclusions of second-generation quartz show enrichment of CH_4 and N_2 in the gaseous phase, representing a reducing environment. LA-ICPMS data of single fluid inclusions will be used to generate a

geochemical fingerprint of the fluids responsible for ore generation.

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