Linking ore deposit mineral assemblages with metamorphism: a case study from the Pb-Zn ore deposit of St. Martin, Schneeberg (South-Tyrol, Italy)

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The deposit at Schneeberg has been one of the major Pb-Zn mining districts throughout the K.u.K dynasty. The Schneeberg is the highest deposit of Europe as well as the largest mining region in Tyrol whereas the peak of mining activities has been in the 15.-16. century, also known as the "argentic tyrolian age", when thousands of miners work in the mines at St. Martin, Schneeberg (South-Tyrol, Italy). In the course of the special research project HiMAT (history of Mining in Tyrol and the adjacent areas), a thorough investigation, concerning the relation between metamorphism and selected ore deposits from the western part of the Eastern Alps is currently underway.
Geologically the Pb-Zn-Cu ore deposits are mainly stratabound, layerbound, cleavage concordat as well as disconcordat within the pre-Variscian metasediments (paragneises and mica schists) acid and basic metavolcanics (augengneisses and amphibolites) of the Ötztal Complex. At the foot wall the ore deposit is surrounded by the "Variegated-Series" of the Schneeberg Complex containing garnet micaschists, amphibolites, and paragneisses. The hanging wall consists of metamorphic verrucano and fragments of the Brenner Mesozoic. The ore-hosting rocks strike with 60°-70° ENE-WSW and dip with 30-35°NNW.
Although the area around Schneeberg is a polymetamorphic crystalline complex, with at least two (Variscan, Eo-Alpine) main episodes of metamorphism, in the ore deposits, only one metamorphic event, Eo-Alpine metamorphic overprint, was detected so far.
The ore paragenesis of the Schneeberg is highly variable and includes native elements such as Au, Ag and Bi, as well as Pb-, Zn-, Cu-, Fe-sulphides such as galena, sphalerite, pyrrhotite, chalkopyrite, sulfosalts as boulangerite, bounonite, pyrargyrite and Ag-tetraedrite, and mainly Fe-oxides like magnetite. The gangue is composed of quartz, calcite, siderite, andradite, manganophyllite, Antigorite as well as biotite and grossular. In the course of this investigation, it is planned to perform a detailed mineral chemical survey of the ore minerals with the electron microprobe analyser.
The α-β transformation lamellae in chalcopyrite is an evidence for minimum temperatures of 547° $\pm$5°C. Another evidence for a high-*T* hydrothermal formation are star-shaped sphalerite exsolutions in chalcopyrite indicating a temperature of 500°C $\pm$10°C. These T-estimates are in agreement with Eo-Alpine T-estimates from the southern ÖC and the adjacent Schneeberg Complex, indicating a strong remobilisation as well as recrystallization during the Eo-Alpine metamorphic event.

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