RARE METAL MOBILITY IN A METAMORPHOSED BASE METAL DEPOSIT: THE SCHNEEBERG / MONTE NEVE Zn-Pb-(Cu-Ag) SHMS

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Sphalerite, (Zn,Fe)S, is an important ore mineral in many types of base metal sulphide deposits. A number of elements can substitute for Zn and Fe in sphalerite, thus this sulphide is an economically important carrier of rare metal by-products Ga, Ge, In, Co, (also Sn, Sb, Ag, Cd). Metamorphism, deformation, and metasomatic remobilisation as partitioning processes for trace metals in sphalerite are not thoroughly investigated, even though a good understanding of mobility and partitioning of rare metals in ore will advance our knowledge on metal cycling in nature, on ore genesis and metallurgy, as well.

We present evidence for rare metal (Ga, In, Co, Ag) mobility at the sample and mineralogical scale in the metamorphosed, sedimentary massive sulphide (SHMS) deposit Schneeberg, the largest metal deposit in the Ötztal-Stubai crystalline block (VAVTAR, 1988). Stratiform, massive Zn-Pb±Cu±Ag sulphide ore bodies are interbedded with biotite ± muscovite ± garnet gneisses and in places ore is hosted in biotite-garnet-amphibole-siderite schists (the so-called "Filone Facies" *sensu stricto)*. While gneisses represent the unmineralised sedimentary strata above and below ore, the Filone Facies is a distinct, Mn-Mg-Fe-richer and partly mineralised rock type. Textures in the Filone Facies suggest a remobilised nature: garnets are mostly one-phases in contrast to two-phase garnets in regional gneisses, fibrous amphiboles crosscut metamorphic fabrics, and sulphides lack coarse granoblastic textures that are commonly associated with peak-metamorphic overprint.

Minor elements that are predominantly in solid solution within sphalerite are Fe, Cd, Mn, Cu, Hg, Co, In, Ga. Other detected metals (Pb, Ag, As, Sb, Sn, Bi) are predominantly controlled by sulphosalt inclusions (ANGERER et al., 2017). Sphalerite in the remobilised Filone Facies ore shows distinct depletion of Cu, Co, In, Ga, Ge, Sn, Bi and enrichment of Cd, Mn, Hg, Pb, Ag, As, Sb compared with primary massive ore. Associated biotite is a secondary host for Ga, Co, and Sn, which suggests a metamorphic fractionation between sphalerite and biotite. Amphiboles and garnet, on the other hand, are no significant hosts in the Filone Facies.

Sphalerite deformation textures include three types: coarse granoblastic, medium retrograde static annealed, and fine retrograde dynamic recrystallised. Metal partitioning associated with these deformation textures, based on EMPA and Nano-SIMS mapping, will be presented.

The evidence for complex mobility of rare metals impacts on genetic studies of sphalerite-rich ore and also may improve technical beneficiation of trace metals from sulphide concentrates.

ANGERER. T., ONUK, P., VAVTAR, F. (2017): Goldschmidt Abstracts, 2017, 110.
VAVTAR F. (1988): Archiv für Lagerstättenforschung Geol. B.-A., 9, 103-153.