TRACE ELEMENT CONTENT OF SPHALERITE FROM EASTERN ALPINE PALEOZOIC SEDIMENT-HOSTED LEAD-ZINC-COPPER DEPOSITS

ONUK, Peter*; MELCHER, Frank

Universität Leoben, Austria

peter.onuk@unileoben.ac.at

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Silver-bearing Pb-Zn-(Cu) sulphide mineralization hosted within Paleozoic units of the Eastern Alps is known since Medieval times. Mining stopped due to the small size and the economic situation after the Second World War. The renewed interest in Pb-Zn deposits is driven by the incorporation of critical metals like Ge, Ga and In into the sphalerite lattice.

In the Austroalpine nappe system, SEDEX-type deposits occur in the Graz Paleozoic and the Gurktal nappe. In the Graz Paleozoic, Pb-Zn-Ba ores formed during the Lower Devonian in an euxinic basin structure associated with submarine alkaline volcanism. In-situ LA-ICP-MS measurements of sphalerite collected from five ancient mining sites and one exploration adit reveal a large variation of trace element concentrations with median values of 4.67 wt% Fe, 1832 ppm Cd, 138 ppm Co, 18 ppm Ag, 9 ppm Ga, 1 ppm In and 5 ppm Sb. Maximum values reach 220 ppm for Ge, 399 ppm for Ag and 83 ppm for In. Stratiform Pb-Zn-mineralization at Meiselding located in the Gurktal Nappe is classified as a metamorphically overprinted SEDEX-type deposit. Sphalerite carries up to 1900 ppm In, 250 ppm Ge, 65 ppm Ga, 282 ppm Co and 2.9 wt% Cd. The Pb-Zn mineralisation of Vellach-Metnitz in the same tectonic unit shows vein-like NW-SE striking tectonic structures. Sphalerite carries up to 65 ppm In, 924 ppm Ge, 381 ppm Ga, 679 ppm Co and 4380 ppm Cd. The Zn-Cu-Pb ores hosted by Paleozoic metavolcanic rocks next to Koprein (Karawanken Range) also represent a vein-type deposit of unknown age. LA-ICP-MS analyses of sphalerite gives up to 373 ppm In, 177 ppm Ga and 457 ppm Co; Cd ranges from 1495-3180 ppm, and Fe from 1.1-7.7 wt%.

Numerous small to medium-sized copper and “Kies” (pyrite) mineralizations are located in the Penninic and Austroalpine nappe systems. Literature data and preliminary LA-ICP-MS analyses indicate elevated concentrations of In, Sn, Sb, Co and Cu. The detailed study of trace element geochemistry in sulphide minerals from a large number of metal accumulations in different geological settings will add to the understanding of the complex metallogenetic evolution of the Eastern Alps.