

## GEOCHEMISTRY OF TETRAHEDRITE GROUP MINERALS FROM THE JANJEVO Cu-Bi-Ag(Pb,W) LOCALITY, KOSOVO: RESULTS OF EPMA AND LA-ICP-MS INVESTIGATIONS

MEDERSKI, S.<sup>1</sup>, PRŠEK, J.<sup>1</sup> & DIMITROVA, D.<sup>2</sup>

<sup>1</sup>AGH University of Science and Technology, Krakow, Poland

<sup>2</sup>Geological Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria

E-mail: mederski@agh.edu.pl

Members of the tetrahedrite group are the most widespread sulfosalts of base metal deposits, where they coexist with common base metal sulfides (BMS) such as sphalerite, galena, and chalcopyrite. In recent years, intensive mineralogical research on tetrahedrite group minerals (TGM) has resulted in a new nomenclature and classification (BIAGIONI *et al.*, 2020). Besides, studies on minor and trace elements in TGM using LA-ICP-MS have presented the phenomenon of element partitioning among BMS (GEORGE *et al.*, 2017). Despite the widespread prevalence of TGM in hydrothermal systems, there is insufficient data in the literature on trace elements in TGM measured by the LA-ICP-MS technique.

EMPA and LA-ICP-MS techniques were used to analyze major and trace element concentrations in TGM from polymetallic ores from Janjevo (Kosovo) located in the southern part of the Hajvalia-Badovc-Kizhnica ore field, Vardar zone. Contact metasomatic-type Cu-Bi-Ag(Pb,W) mineralization occurs on the contact of the Cretaceous flysch series and Neogene andesites. Members of tetrahedrite group minerals are associated with arsenopyrite, chalcopyrite, pyrite, galena, sphalerite, löllingite, native Bi, ferberite, siderite, quartz, and several sulfosalts containing Cu, Bi, Pb, Ag, Sb, and As such as aikinite, bismuthinite, krupkaite, bournonite, gustavite, cosalite, pearceite, and wittichenite.

TGM from Janjevo form massive aggregates up to a few cm with chalcopyrite and aikinite, as well as idiomorphic crystals up to 1 cm, which are characterized by the oscillatory zonation visible in BSE images. The presence of four members of TGM has been confirmed

in Janjevo: tetrahedrite-(Fe), tetrahedrite-(Zn), tennantite-(Fe), and tennantite-(Zn). Complete Sb ↔ As substitution is observed, while Zn ↔ Fe substitution is restricted and is more widespread in tetrahedrite series. Ag ↔ Cu substitution is also constrained, Ag enrichment (up to 1.24 apfu) principally relates to tetrahedrite series (the correlation between Sb and Ag is 0.97). Apart from Fe and Zn, Hg and Cd are the two most abundant divalent cations present in the TGM (up to 340 ppm Hg and up to 530 ppm Cd), while Mn content is up to 50 ppm. TGM host up to 7700 ppm Bi, up to 48 ppm Sn, up to 19 ppm Ge, and up to 9 ppm Tl. Tin, germanium, and thallium have a strong positive correlation with As and Cu (tennantite series). Interestingly, TGM from Janjevo are enriched in In (~40 ppm, up to 69 ppm), which preferentially partition into the co-crystallized sphalerite and chalcopyrite, and was rarely noted in TGM worldwide. Other trace element contents (Ga, Mo, Se, and Te) are below detection limits. Fluctuation in the content of the major and trace elements in TGM allowed tracing changes in the character of fluids that led to the formation of hydrothermal mineralization in Janjevo.

### References

- BIAGIONI, C., GEORGE, L. L., COOK, N. J., MAKOVICKY, E., MOËLO, Y., PASERO, M., SEJKORA, J., STANLEY, C. J., WELCH, M. D. & BOSI, F. (2020): *Journal of Earth and Planetary Materials*, 105(1): 109–122.  
 GEORGE, L. L., COOK, N. J. & CIOBANU, C. L. (2017): *Minerals*, 7(2): 17.