

TRIASSIC AND CRETACEOUS Ni-Co ORE MINERALIZATIONS WITH SIMILAR MINERALOGY IN DIFFERENT SUPERUNITS OF THE WESTERN CARPATHIANS

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Introduction

Hydrothermal mineralizations in the Western Carpathians span a wide range of ages from Variscan to late Alpine, in parallel with the tectonothermal evolution of the Variscan and Alpine orogens. The main superunits (Tatric, Veporic, Gemeric) underwent different degree of Alpine metamorphic overprint but contain texturally and chemically similar ore mineralizations. One simple explanation would be the formation of these mineralizations after the Alpine metamorphic peak that attained the amphibolite-facies conditions in some parts, especially in the southern Veporic Superunit. Hence, we performed mineralogical and geochemical study and radiometric determination of selected ore bodies from each superunit. Parts of the results were already published by KIEFER *et al.* (2020), parts are being prepared for publication at the moment. In this work, Ni-Co minerals gersdorffite, skutterudite and pararammelsbergite were dated by the ¹⁸⁷Re/¹⁸⁷Os method. In some samples, the concentration of the initial Os was negligible and an age from extracted from a single sample. At Čierna Lehota, an isochron was constructed to determine the age of the ores.

The studied ore bodies are located near Dobšiná (Gemic Superunit), Ľubietová-Kolba (Veporic Superunit), and Čierna Lehota (Tatric Superunit). All these occurrences are dominated by Ni-Co-Fe arsenides and sulfarsenides.

Results and discussion

At Dobšiná and Kolba, the main mineral is gersdorffite, with subordinate amount of nickeline and arsenopyrite. The mineralization commenced with small amount of NiAs₂, probably krutovite. The mineralization is hosted in discordant veins with dominant carbonate (siderite-magnesite), albite, and quartz. At Čierna Lehota, the strata-bound mineralization in black shales contains mostly skutterudite and pararammelsbergite, with lesser amounts of other ores; sulfide-richer minerals appear only at the end of the mineralization process.

The principal ore mineralization at Dobšiná occupies structures that can be assigned to the Cretaceous large-scale fan, generated by the northward progression of the Alpine orogenic activity. In agreement with this observation, gersdorffite was dated to 93 Ma, time coincident with the partial exhumation of the Gemic Superunit after the Alpine metamorphic peak. Additional radiometric (U/Pb, K/Ar) data support these conclusions and agree with the textural evidence at this site.

The mineralizations at Kolba and Čierna Lehota yielded Triassic ages between 230 and 240 Ma. These ages are interesting inasmuch that this time is considered to be a period of quiescence between the fading Variscan orogeny and the later Alpine orogeny. Earlier Pb/Pb model ages (e.g., KOHÚT, 2002) gave similar ages for further small localities Nižné Matejkovo and Čavojs, indicating that such ages are no outliers or results from isotopically disturbed systems. We propose that these hydrothermal systems were fueled by the latest pulses of Variscan magmatic activity (POLLER *et al.*, 2005). Ongoing determination of δ³⁴S values of these ores should pinpoint the source of sulfur and possibly metals.

This work documents regional ore-forming Triassic activity in the Western Carpathians. It formed numerous ore bodies, even though only with small volumes. In the Gemic Superunit, such mineralizations seem to be missing, likely because these rocks experienced Alpine greenschist-facies that was able to destroy them, even if they existed. Here, the ore mineralizations are of Alpine (Cretaceous) age.

References

- KIEFER, S., ŠTEVKO, M., VOJTKO, R., OZDÍN, D., GERDES, A., CREASER, R. A., SZCZERBA, M. & MAJZLAN, J. (2020): *Journal of Geosciences*, 65: 229–247.
- KOHÚT, M. (2002): *Mineralia Slovaca*, 34: 1–18.
- POLLER, U., KOHÚT, M., ANDERS, B. & TODT, W. (2005): *Lithos*, 82: 113–124.