Chlorite from Elatsite PCD, as a mineral vector

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The Elatsite porphyry copper deposit (PCD), part of the Apuseni-Banat-Timok-Srednogorie copper belt, is one of the biggest and well-studied PCDs in Europe. Its ore mineralization is related to the Upper Cretaceous magmatism. A small porphyritic intrusion (Q-monzodiorite to Granodiorite) elongated in E-W direction and many porphyritic dikes are intruded in the rocks of the basement (the Vezhen Variscan granodiorite pluton and the variegated Paleozoic greenschist degree schists). Studies on the ore mineralization reveal 5 ore mineral parageneses. The hydrothermal rock alterations are determined as propylitic, high temperature K-silicate alteration, K-silicate-sericitic, Q-sericitic and quartz-adularia-carbonatic (QAC) alteration.

Chlorites in Elatsite have been established through: a) propylitic alteration-with chlorite (Chl-1) replacing magmatic biotite and amphiboles; b) K-silicate-sericitic alteration - with Chl-2 replacing the hydrothermal black mica (phlogopite); c) Q-sericitic and QAC alterations where Chl-3 participates in the formation of nests (simultaneous) and veinlets (subsequent to the alterations).

The propylitic chlorites are formed at 240-340°C – clinochlore to pycnochlorite with higher values of the Fe/(Fe+Mg) ratio. These chlorites show the highest contents of V, Cr, Co, Cu, Zn and Rb, and the lowest contents of Ni, Sc, La, Ce and U.

The chlorites replacing the hydrothermal phlogopites in the K-silicate alteration (predominantly pycnochlorite - Fe/(Fe+Mg) = 0.2-0.4) are formed at 160-340°C. They have the lowest contents of all ore elements, but the highest of U.

Chlorites associating with ore minerals form two distinct groups: a)one emplaced in the Q-Ser alteration (Chl-3-1), represented by fine-grained aggregates of pycnochlorite - crystallization temperature 260°C, Fe/(Fe+Mg)=0.475; b)one related to the QAC alteration (Chl-3-2), represented by clinochlore to sheridanite-260-300°C, Fe/(Fe+Mg)=0.15-0.2. They have the highest contents of Sc, Ce, La and Ni.

The chloritization of the hydrothermal phlogopites is the result of the later stage of fluid release from the magma that had occurred in a deeper level in the crust. The twice refined mineralogy of these rocks is the cause of the depleated trace elements in the Chl 2 from the K-silicate-sericitic alteration.