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Trace Elements in Alteration Minerals: A Case Study from the Kandilka Prospect, Eastern Rhodopes, SE Bulgaria

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The Kandilka occurrence is situated 5 km westwards from the Ada Tepe open-pit gold mine in Eastern Rhodopes, SE Bulgaria. The mineralization style is alike the adjacent Surnak deposit, which is closely related to major N-S-striking sub-vertical structures and shallow-dipping to the NNE listric faults. The sulphide mineralization is hosted by the pre-Alpine basement rocks of the Rhodope Massif, presented in this part of low-grade metamorphic rocks (paragneiss, amphibolite, and marble) and in the overlying Paleocene-Eocene sedimentary rocks (polygeneous breccia, conglomerate, and sandstone).

The current study is focused on the quartz-pyrite ore-bearing veins, which crosscut the foliation of the metamorphic rocks and are spread among the sedimentary rocks. Field mapping and sampling of drill cores identified mineralized veins with elevated Au ($0\div 0.7$ ppm), Ag ($0\div 10.5$ ppm), As ($0\div 3020$ ppm), and Sb ($0\div 147$ ppm). Detailed petrography, SEM, and LA-ICP-MS analyses of the quartz-pyrite veins revealed two generations of pyrite (Py1, Py2). On surface, Qz-Py1 veins are presented by collomorph-banded texture, milky white quartz, and euhedral pyrite, while Qz-Py2 veins are mainly brecciated, with grey opaque quartz and fine-grained pyrite-marcasite aggregates. In Py1 have been detected higher concentrations of Co and Ni, up to 2%, and Cu $\sim 0.8\%$, while in the carbonate-silicate matrix (Ca-Fe-Mg carbonates, K-feldspar, plagioclase) of the sediments, Cu is ~ 200 ppm and Co and Ni enhance to ~ 200 and ~ 600 ppm, respectively. Py2 is considered as arsenian pyrite; it has approximately 4% of As and Sb, ~ 300 ppm of Ag, and traces of Au.

The presence of collomorph microcrystalline quartz in the veins suggests episodes of high degrees of supersaturation of silica. The mineral association of marcasite and arsenian pyrite relates to precipitating conditions of acidic solution. Based on textural peculiarities, mineralogical paragenesis, and trace element composition, we consider the Kandilka occurrence as a low-sulphidation epithermal prospect.