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Mineralogy and geochemistry of trace and Rare Earth Element from the Manaila massive sulphide deposit (Eastern Carpathians, Romania)

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The present paper deal with the mineralogy and trace elements geochemistry of sulphide deposits from Mănăila mine field located in NE area of Eastern Carpathians Mountains (Romania). The mineralization occurs within metamorphic rocks of Tulgheş terrane, part of Crystalline-Mezozoic zone of the Eastern Carpathians. The metamorphic rocks in Mănăila area consist of felsic metavolcanics rocks with quartzites and quartz-feldspathic rocks as prevailing types. The P-T metamorphic conditions are typical of greenschis facies with biotite and garnet (Mn-Grt) in mineral assemblage.

The mineralogical study was performed using reflected light microscope and Scanning Electron Microscopy (SEM) methods. Thus, the both methods show that the main sulphides minerals are represented by pyrite and chalcopyrite, being followed by sphalerite, galena and little amount of Cu sulphosalts (tetrahedrite and bournonite) and also by gangue minerals (quartz and carbonates). Pyrite occurs as large euhedral to subhedral grains in quartz and small rounded inclusion in chalcopyrite.

The trace elements analysis was achieved on whole-rock samples and involved the determination of REE, LIL (Rb, Ba, Sr) and HFS (Y, Zr, Hf, U, Th, Nb, Ta) by ICP-MS method. The concentration of LIL and HFS trace elements in mineralized rocks decrease as follows:

Ba > Bi > As > Sb > Co > Ga > Ni > Cd.

Even if the barium contents in Mănăila ore is high, baritina (BaSO4) was not identified throught the mineralogical analyses carried out so far.

The total rare earth element content (REE) of the samples from Mănăila range from 26.84 to 246.46 ppm. Chondrite – normalized REE patterns of the mineralized rocks show that the LREE are enriched in relation to the HREE. Also a positive Ce anomalies and negative Eu anomalies are present. Y/Ho and Zr/Hf ratios are close to the chondritic ratios indicating Charge-and-Radius-Controlled (CHARAC) behavior of these elements in pure silicate melts.

The REE patterns of the ores are highly variable and do not appear to be related to the mineral compositions. This feature may reflect contributions from several factors involved in fluid formation, ore mineral deposition and post-depositional processes. The lack of a relation between major mineral composition and REE patterns suggests complex REE fractionation processes during the ore formation.

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