Mineralogical, geochemical characteristics and mass changes in the alteration zone at the Elmaalan (Trabzon) VMS mineralization in NE Turkey

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Elmaalan (Trabzon) volcanogenic massive sulfide (VMS) mineralization lies primarily within the immediate footwall of mineralized Upper Cretaceous dacitic pyroclastics, and overlain by barren dacite and pyroclastics at hanging wall in the northern zone of the Eastern Pontide Orogenic Belt in Northeastern Turkey. Main ore minerals are pyrite, chalcopyrite, sphalerite, galena, fahlers, bornite and in less amount chalcosine and covellite together with digenite; quartz, barite, carbonates and clay minerals, sericite and gypsum are exist as gangue.

The footwall dacitic pyroclastics exposed to extreme hydrothermal alterations. The observed alterations of silisification, sericitization, Ca/Mg-rich carbonation, Fe/Mg-rich chloritization and smectization with minor scale hematization and limonitization extend outward from ore zone. The hydrothermal alteration is divided into five zones for mass change calculation toward the ore zone. The mass change calculations of these zones show that, carbonation has 13% mass loss, sericitization-carbonation (Mg)-chloritization 9% mass gain, sericitization 21% mass loss, sericitization-silisification 29% mass gain and silisification 62% mass gain. According to these results, both mass gain and mass loss occurred in footwall dacitic pyroclastics during the hydrothermal alteration. The mass change results indicate that the rate of Si, Fe, and K elements increases, whereas that of Ca, Na and Al decreases toward the ore zone.

The δ18O values of solutions equilibrated with quartz, illite and chlorite vary between -0,3‰ and +5,7‰ and that of with illite/simectit and simectit are in between +24,6‰ and +26,5‰. Illite/simectit and simectit values are supposed to form low tempature and surface conditions, but quartz, illite and chlorite values may indicate that fluids become effective on mineralazition and hydrothermal alteration are magmatic in origin and affected with dilution of surficial water.

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Trace-element fingerprints of chromites link ultramafic massifs of the Bulgarian Rhodopes

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The ultramafic massifs of Yakovitsa and Dobromirtsi contain chromitites hosted in dunites-harzgurgites are affected by amphibolite/greenschist-facies metamorphism. These massifs are interpreted as portions of a meta-ophiolitic mantle, now widespread within the crustal units of the Central and Eastern parts of the Rhodope Crystalline Massif (SE Bulgaria). Although their age is still unknown, it is very likely that the massifs were thrust over Paleozoic (570 Ma [2]) para-gneisses with flysch characteristics during the Jurassic (>170-160 Ma [1]).

We report LA-ICP-MS analysis of unaltered chromite cores in chromitites from these massifs. Minor- and trace-element (Ga, Ti, Ni. Zn, Co, Mn, V, Sc) patterns of these cores from Yakovitsa and Dobromirtsi are similar to other well-characterised Cr-rich chromites in chromitite bodies hosted in the mantle sections of ophiolites. This supports (1) the ophiolitic origin of these ultramafic bodies, (2) a genetic link between the Yakovitsa and the Dobromirtsi massifs. The trace elements of the chromites strongly indicate that the chromitites crystallised from melts that originated in an arc setting. The similarity of the nature of their parental melts suggest that these massifs probably correspond to two fragments of the same portion of oceanic lithosphere developed in a back-arc setting . We plan to investigate Hf-isotope data on zircon and Os-isotope data from platinum-group minerals in the chromitites of both massifs to provide additional tests of this hypothesis.

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