Paper Number: 2733

Mineralogy and Chemistry of an Alteration Zone Associated with Massive Sulphide ores on the Ariab District, Red Sea Hills, Sudan

Samia, A.I.[1], Elsheik, M.A.[2], and Murad A.[3]

[1]University of Khartoum, Faculty of Science. Department of Geology, Sudan

Email: samiaibrahim125@gmail.com

[2]Ministry of Minerals & Al Neelain University Faculty of Petroleum and Minerals, Sudan

[3]Department of Geology, University of Taiz, Yemen

The Ariab district, Red Sea Hills region of NE Sudan comprises numerous Late Proterozoic polymetallic sulphide bodies of exhalative origin. Major minerals making the massive sulphide ore bulks show diversity in textures and, accordingly, the sulphide minerals are divided in general into facies that reflect environments of deposition that differ in space and time. The sequence of ore textures suggests depositional growth in a hydrothermal system with increasing thermal intensity that continued outward displacing facies 1 and 2 sulphides. Chlorite-sulphide-oxides equilibria, the mineral paragenesis, and fabric of massive sulphide phases all show the sulphide ores to have been affected by greenschist regional metamorphism at temperature between 315° and 350 °C, and pressures 2.6 to 3.2 kb range.

The hydrothermal alteration has converted more than 80 percent of the wall rocks in the Ariab mining district into quartz-sericite-chlorite-albite assemblage (quartz-sericite zone). In this zone chlorite is Fe-rich (Fe/(Fe+Mg) = 0.30-0.40). The alteration temperatures estimated with the chlorite geothermometer are in the 240°- 286° C range for quartz-sericite zone. Chlorite ± quartz or tourmaline occur as simple assemblage detected in the footwall and on the flanks of the orebodies signaling chlorite zone that compared to quartz-sericite zone has Fe-rich chlorite (Fe/(Fe+Mg) = 0.4-0.6) and estimated alteration temperature of 300° to 394°C. Moreover the REE data indicate that the following changes took place during hydrothermal alteration: 1) enrichment in the REE from La to Tb, with increases in La_N/Yb_N in the quartz-sericite zone; 2) immobility of Lu and Yb during all stages of alteration; 3) largest additions of LREE and minor depletions of MREE in chlorite zone. Recognition of these zones may be useful in mineral exploration in determining proximity to an exhalative center, as may also steepened La_N/Yb_N slopes and enhanced negative Eu/Eu* anomalies. The obtained results illustrate zonation in intensity and type of hydrothermal alteration in volcanic-hosted massive sulphide ores of Ariab area. Thus, the finding of previous authors regarding the lack of zonation is refuted.