Polymetallic sulphides and barite in Quartzite Hosts from Outer Sequence of Lesser Himalaya

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Major barite and minor polymetallic sulphides are found associated with the quartzites of Outer Lesser Himalaya sedimentary sequence. Sulphide minerals of one or more of Cu, Fe, Pb and Zn are found in quartzites either associated with thin interlayered basic metavolcanics or in the calcareous quartzites often associated with dolomitic or granite rocks. Representative occurrences are chalcopyrite, pyrite at Galpakot and chalcopyrite, galena and pyrite near Khansue. These sulphide minerals are found in veins, pockets and stringers in the host rocks, together with the secondary minerals covelite, chalcocite and malachite, and the gangue mineral is mainly quartz, minor muscovite and epidote. EPMA work shows that chalcopyrite is enriched in Mo, and Co is always higher than Ni presenting an average Co/Ni ratio of about 18 that suggest a submarine synsedimentary deposition for these sulphides. The fluid inclusions observed in mineralized quartz veins are filled with two types of fluid viz. early aqueous-carbonic and late saline- aqueous fluid. The fluid inclusions in quartzite are very small and their composition is often difficult to identify. The carbonic fluid is medium to low dense CO_2 with occasional presence of minor CH_4 as confirmed from their Raman shift. Microthermometry indicates presence of minor Mg in addition to Na+K salts in the saline aqueous fluid inclusions that homogenized at low temperature (109-207 ^{o}C). These sulphides were likely deposited in stratabound submarine sedimentary environment with exhalation influx, and their remobilization occurred during Himalayan tectonic episode.

Representative barite has been studied from Tons valley, for its fluid inclusions, strontium and sulfur isotopes signatures. Together with the barite fabric, these data helped to understand barite origin and deformation in quartzite host rocks from sedimentary sequence of Outer Lesser Himalaya. The fluid inclusions in barite porphyroclasts are: (i) Two-phase aqueous inclusions which escaped the later

modification and show primary features. Their homogenization is between 112º and 208º C, (ii) Monophase aqueous inclusions often co-exist with two phase inclusions. (iii) Rare three phase aqueous inclusions with a halite daughter crystal. In the partially deformed barite grains and subgrains widely varying phase proportion and the characteristic shapes of aqueous inclusions are seen. Abnormally high strontium isotope ratios: 0.720448± 0.000034 to 0.728637± 0.000039 are obtained from studied barite. Magmatic fluid component had not participated in the initial barite formation, as also substantiated by obtained high $\delta^{34}S$ values in barite (+26.4 and +29.5‰). The fluid inclusion reequilibration morphology points to deformation of barite during uplift and exhumation related to regional tectonics. Thus, the genesis of barite is invoked from the mixing of crustal and marine constituents whereas hydrothermally emplaced sulphides are result of primary synsedimentary exhalation fluxes, and these were not inter-related phenomenon.