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# Fluid inclusion microthermometry and sulphur isotopic studies of the base metal mineralization in Minjhari area, Western Bastar Craton, India

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The base metal mineralization around Minjhari area, Chandrapur district, Maharashtra, which forms northern extension of the Thanewasna copper prospect, is mainly confined to NNW-SSE to NE-SW trending quartz reef that emplaced along brittle-ductile shear zone. Development of intense silicification, hydrothermal breccia and rebrecciation all along the quartz reef suggests multiphase hydrothermal activity. Chalcopyrite is the major ore mineral developed in the Minjhari quartz reef besides, minor amount of pyrite, galena and sphalerite. Petrographic studies evidence that the mineralization was developed both in earlier as well as later episodes of hydrothermal activity. In the earlier episode, mineralization is found in the form of fine disseminations where as it was localized and developed along micro-veinlets of quartz during later episodes. It substantiates that the reactivation of the shears acted a significant role in channelizing the ore fluids and thus to precipitation of the metals [1].

Fluid inclusion microthermometry results show that the homogenization of the aqueous vapor in bi-phase aqueous inclusions occurred between the temperature ranges of 125° – 226°C. The salinity of the inclusions estimated between 6.82 to 17.42 wt% NaCl equivalents (average 11.86 wt% NaCl equivalents). The wide variation in the homogenization temperature of the fluid inclusions indicates inequalities in the temperature and/or pressure during inclusion entrapment. Moreover, the multiple episodes of hydrothermal activities with inconsistent temperature & pressure might be an important cause for ample variation in homogenization temperature. The average first ice melting temperature ($T_e$) is –26.17°C which suggests that the major dissolved component in the aqueous phase is NaCl and attributes a bulk fluid composition with NaCl-$H_2O$ ± KCl ± $MgCl_2$ for the fluids. The fluid inclusions typically contain (i) two phase liquid-vapor, low salinity fluids and (ii) rare multiphase inclusions. . The coexistence of liquid-rich and vapor-rich fluid inclusions signifies the occurrence of boiling at this low-pressure environment [2]. These are the characteristic feature of the low temperature hydrothermal environment and thus it is inferred that the mineralization was evolved in epithermal system.

The $\delta^{34}S_{VCDT}$(‰) values for pure sulfide mineral estimated from sulfur isotope study varies from -2.57 ‰ to + 6.34 ‰ with an average value of 1.47 ‰. This indicates that the sulfur was originally formed from

the magmatic source which was leached out and re-precipitated under hydrothermal environment. Since, hydrothermal system is low temperature (<226°C) and low pressure environment, significant fractionation and metamorphic resetting of isotopic signatures were not anticipated. Therefore, the fluid inclusion microthermometry and sulphur isotopic studies corroborates that the mineralization in the Minjhari quartz reef was originally derived from a magmatic source and re-precipitated under epithermal environment.

*References:*

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