Paper Number: 381

Fluid inclusion characteristics of Agargaon Tungsten deposit*s* in the Sakoli fold belt, Nagpur District, Maharashtra, India

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The Sakoli fold belt in Central India forms a triangular shape and comprises of metasediments, felsic and mafic volcanics with metabasalts bounded by the gneissic-migmatitic terrain of Archaean age. The metasediments are quartz-chlorite-mica schist, magnetite-chlorite-mica schist, calc schist, phyllites with minor quartzite interbanded with bimodal volcanic suites of felsic (rhyolite, tuffs), basic volcanics and meta exhalites of middle Proterozoic age. The last pulse of granitic activity in the form of quartz lenses intrude the metasediments and are associated with tungsten mineralisations. Most of the mineralised quartz veins are trending N60-65ºE -S60-65°W and are parallel to regional structural foliations confined within the quartz-chlorite mica sercite schists, quartz tourmaline mica schists and phyllite and to some extent in the surrounding granites/gneissic migmatites. The important minerals in the area are wolframite, scheelite with minor molybdenite, native bismuth, galena, pyrite and chalcopyrite along with tourmalines and fluorite.

EPMA studies of Wolframite and scheelite within the quartz veins were carried out. The Wolframite contains inclusions of Scheelite, whereas molybdenite, native bismuth and galena are occurring as late fracture filling. The Wolframite mineral contains 63 to 68% of WO_3, 18 to 22% of Fe_2O_3, 4 to 5% of MnO and compositionally, it is iron-rich variety-Ferberite. Ferberite crystals assume fairly large dimensions and some of the crystals are euhedral in outline and occasionally they are anhedral. Fine grained ferberite is sometimes disseminated in sercite phyllites as thin blades and rods. Scheelite mostly formed due to alteration of wolframite especially along the margins and cracks, typical of replacement texture. However, some crystals of free scheelite are also occurring in the area.

Fluid inclusion studies indicates aqueous as well as aqueous carbonic fluids, of low salinity (4 to 12 wt% NaCl equiv.) and high salinity (14 to 22.48 wt% NaCl equiv.) inclusions are noticed with homogenization temperature ranging from 180ºC to 323ºC. The high salinity inclusions are liquid rich aqueous inclusions with halite mineral, whereas the low-salinity inclusions are dominantly aqueous carbonic and vapour-rich inclusions. The first ice melting temperature ranging from -30ºC to -65ºC suggest the presence of $FeCl_2$/$MgCl_2$ and more likely $CaCl_2$ in the fluid system. The carbonic inclusions show depression in $Tmco_2$ due to the presence of traces of methane (CH_4) with CO_2 which is confirmed by Raman spectroscopy studies. The halite-bearing inclusions represents reducing and oversaturated fluid system resulting form fluid boiling and coexists with the liquid-rich and vapor rich aqueous inclusions, which have contrasting salinities.

Fluids with high and low salinities in aqueous media with less CO_2 component and the presence of chlorides such as $FeCl_2$/$MgCl_2$ and $CaCl_2$ indicates the involvement of chlorine complexes in transportation of tungsten to the fluid system. The evolution of the ore-forming fluids either by simple cooling, immiscibility or by mixing between a high-temperature, high-salinity magmatic water and a low-temperature, low-salinity fluid such as dilution of magmatic hydrous fluid by influx of meteoric water may explain the anomalously low salinity. Fluid inclusion characteristics of the deposit indicate the involvement of fluids, which were enriched by wolframite and scheelite with minor sulphides, molybdenite, bismuth and lead. These vein-type wolframite and scheelite deposits of the study area represent an endogranite vein system to proximal-intermediate vein systems of magmatic-hydrothermal origin.