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Fluid inclusion studies on auriferous quartz veins of Kudrekonda-Palavanahalli area, Shimoga Schist Belt, Dharwar craton, India: Inferences on the nature of hydrothermal fluid during mineralization

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The Kudrekonda-Palavanahalli auriferous tract is a part of late Archean Shimoga schist belt of western Dharwar craton. Ancient workings like shaft, adit and shallow pits are present in the area. The Shimoga schist belt comprises of metabasalts and metapelites (sericite chlorite schist) with abundant layers of BIF and quartzite/chert and is bounded by the peninsular gneissic complex, which forms the basement of the schist belt. The gold mineralisation is confined with quartz and quartz carbonate veins (few mm to 2m) intruding metabasalts and quartz-chlorite schists. The trend of the quartz/carbonate veins are NE-SW with moderate dip to steep dip towards NE and are parallel to general foliations of the schist belt. In the regional scale three phases of folding have been identified in the area with early isoclinal folds (F1), followed by open and isoclinal folds of F2 and late broad warps (F3). The contact of the schist belt rocks and basement Peninsula gneisses is sheared. The gold mineralisation is associated with intense wall rock alteration e.g., carbonitisation, chloritisation and sericitisation and gold occurs both as free milling native metal and enclosed within sulfides.

Fluid inclusion microthermometric studies carried out on mineralised quartz veins indicate fluid immiscibility by the coexistence of the carbonic and aqueous inclusions. Primary fluid inclusions in the quartz veins show the CO_2 dominant carbonic inclusions comparatively more than the aqueous carbonic inclusions and aqueous inclusions. The melting temperature (Tm_{CO2}) of the carbonic inclusions ranges from -56.6° C to -58.1° C indicating that the fluid dominated by CO_2 [1] and the maximum depression of melting temperature of CO_2 is -58.1°C, reveals that the fluid contains CO_2 with minor amount volatile gases such as e.g. nitrogen, methane and H_2S with CO_2, The homogenisation temperature (Th_{total}) of the aqueous carbonic inclusions and aqueous inclusions ranges from 124°C to 359°C and corresponds to a salinity between 0.17 and 10.8 wt % of $NaCl_{equivalent}$. The average salinity is-2.8 wt % of $NaCl_{equivalent}$, which is the distinctive low salinity of the gold mineralisation in the orogenic gold deposits of greenstone belts. The initial ice melting temperatures (T_e) of mineralised veins range from -29°C to -9°C with an average of -20.4°C. This implies that the major component in aqueous phase is NaCl dominated with ± KCl and H_2O in the fluid system [2].

The estimated P–T range (1.0 to 1.5 kbar at 165 to 305°C) is similar to the published P–T values of other orogenic gold deposits. Factors such as fluid phase separation and fluid–rock interaction, along with H_2O-CO_2 rich fluids of moderate density (0.92gm/cm^3) were collectively responsible for gold precipitation, from an initial low-saline metamorphic fluid. Comparison of the Shimoga schist belt ore fluid with other lode bearing gold deposits in the Dharwar reveals that fluids of low saline aqueous–carbonic composition with metamorphic parentage played the most dominant role in the formation of the Archean lode gold systems.

References

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