

Chlorite Thermometry and Its Implication to the Genesis of Gold Mineralization at Paramanahalli, Dharwar Craton, India

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Gold mineralization at Paramanahalli, Chitradurga Greenstone Belt (CGB) in Dharwar Craton (DC) of Peninsular India is shear zone controlled and confined to altered metabasalt and Banded Iron Formation (BIF). Chlorite (Fe-rich) + quartz + ankerite + rutile + monazite ± pyrite ± gold is the mineral association found in the mineralized zone. Chloritization, carbonitization, silicification, and sulfidation are the major alteration processes inferred in the area and can be attributed to wall rock-fluid interaction. Detailed petrographic studies, textural association and mineral chemistry of the altered wall rocks indicate three different types of chlorite phases. *Chlorite-1* is an Mg-rich (clinochlore) found in schistose metabasalt, whereas *Chlorite-2* is an Fe-rich (chamosite) and closely associated with gold in carbonated metabasalt. *Chlorite-3* has higher FeO content (i.e., brunsvigite), found to be with pyrite and gold, and occurs only in mineralized BIF. The concentration of Mg, Fe, and Al (IV) in chlorite may vary according to the geological settings. The close association of hydrothermal chlorite (2 and 3), pyrite and gold grains revealed their cogenetic nature. Thus, chlorite thermometry was chosen to estimate the temperature of formation of minerals developed during hydrothermal activity. *Empirical methods* based on tetrahedral Al content and amount of octahedral vacancy (Mg, Fe³⁺ and Fe²⁺) and *thermodynamic methods* based on intra-crystalline exchange reactions among the chlorite components were used. The results indicate a temperature range of ~310-360°C and this can be proposed as the temperature of hydrothermal fluids responsible for gold mineralization at Paramanahalli. The temperature of formation of chlorites have also been found to be similar to fluid inclusion micro-thermometry (~280-382°C) of gold bearing quartz vein from the study area. Hence, the above methods of study are useful to understand the gold metallogeny with the discovery and development of new gold deposits/prospects in the similar geological setting.