Preliminary Fluid Inclusion Study from Chigargunta Gold Deposit at South Kolar Greenstone Belt, Eastern Dharwar Craton, India

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Kolar Gold Deposit
- World famous-World class deposit
- Produced >800 t of Au
- Typical Archean greenstone-hosted structurally controlled, orogenic-type lode gold deposit
- Metamorphism: Middle Amphibolite facies >500 °C (Rajamani et al. 1981)
- It is a refolded syncline with N-S trending axial planar fabric.
- Low to moderate salinity with H₂O-CO₂-NaCl fluid
- Mineralizing P-T conditions (from fluid inclusion studies) ~0.7 to 1.8 kbar/205-280 °C (Mishra and Panigrahi, 1999).
- Kolar mine closed in 2000

Chigargunta Gold Deposit-Geology
- Host rock:
  - Meta-mafic volcanics (Amphibolites)
  - Meta-felsic volcanics (Champion gneiss)
- Metamorphism:
  - Lower Amphibolite facies ~4.6 kbar &
- Mineralization:
  - Two main lodes separated by ~150-200m
  - Mineralized lodes are at Amphibolite/ Champion gneiss contact in the west and within the Champion gneiss in the East.
- Total reserve: 12 t of Au with an avg grade of 5.66 g/t

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Structure

Tight isoclinal folds with axial planar fabric trending N-S to NNW-SSE dipping both E and W with mean orientation →177/87W.

Greenstones away from the mineralized zone

Champion Gneiss away from the mineralized zone

Champion Gneiss in the mineralized zone

Champion Gneiss away from the mineralized zone

Amphibolite away from the mineralized zone

Quartz-Calcite veins

Myrmecite
Perthite
Kfs
Pl
Qtz
Biotite alteration
Muscovite alteration

Amph
Hbl+Pl
Hbl+Pl
Pl
200 \( \mu m \)
500 \( \mu m \)
500 \( \mu m \)
1000 \( \mu m \)

Qtz + Kfs
Bt
Ms
Kfs
Qtz
Cal
Qtz
Cal
**Ore Mineralogy**

**Gold Occurrences**

**Fluid Inclusions**

Type-I: Carbonic Inclusions

Type-II: Aqueous Biphase Inclusions

**Microthermometry**

Type-I: Carbonic Inclusions

Microthermometry Type-II: Aqueous Biphase Inclusions

**Microthermometry**

Type-I: Carbonic Inclusions

**Microthermometry**

Type-II: Aqueous Biphase Inclusions

**P-T Conditions**

Isochore Intersection method of Roedder and Bodnar (1980)

**Salinity** → 2.2 to 12.3 wt. % NaCl eqv.
Summary

- **Gold** at Chigargunta is concentrated in the **quartz-calcite veins** as well as in the altered **Champion gneiss** that is intensely sheared and altered.
- **Alterations** include: biotitization, sericitization, silicification, carbonatation.
- **Gold** occurs in the main ore zone in association with **sulfides** as a consequence of **mineral-fluid interaction**, sulfidation of oxides/silicates in the host rock, thus reducing the ore fluid ΣS and precipitating gold and sulfides.
- **Fluid composition**: low to moderate salinity H2O-NaCl-CO2 (± CH4).
- Precipitation of quartz-calcite and gold took place at 0.9 to 2.3 kbar and 185°C to 362°C.

Summary

- The P-T value is similar with the broad P-T regime of gold precipitation in the **Dharwar Craton** but there is **wide variation** in pressure and also in temperature.
- Fluid inclusion petrography and microthermometry, from both the inclusion types, clearly indicates that **there are two groups of inclusions** from each type.
- Relatively **high dense inclusions** occur as **isolated/clustered** and the **low dense** inclusions occur along **intra granular trails** indicating a possible fluid evolution during gold mineralization (7).
- However, this is to be verified by further more rigorous and **detailed fluid inclusion study** coupled with other investigation tools such as stable isotopes (O,C & S).