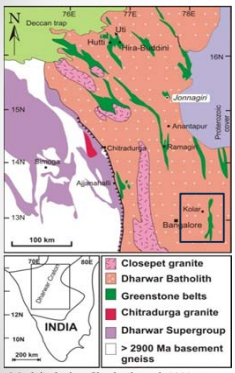
Preliminary Fluid Inclusion Study from Chigargunta Gold Deposit at South Kolar Greenstone Belt, Eastern Dharwar Craton, India

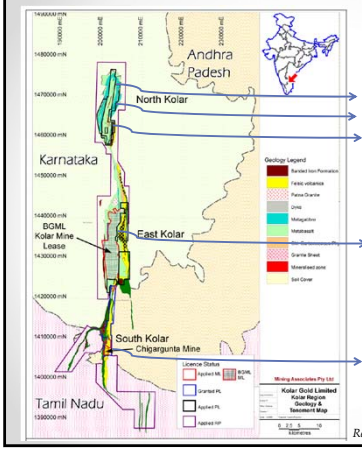
Sakthi Saravanan Chinnasamy
National Institute of Technology Rourkela
India
chinnasamys@nitrkl.ac.in

Kolar Gold Deposit



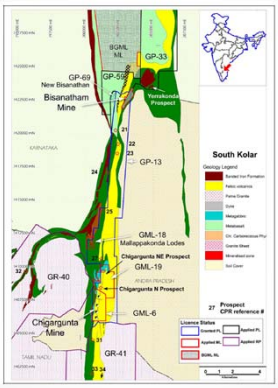
Modified after Chadwik et al. 2000

- 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 H_2O-CO_2-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



Reproduced from CPR, KGL, December 2010

Chigargunta Gold Deposit-Geology



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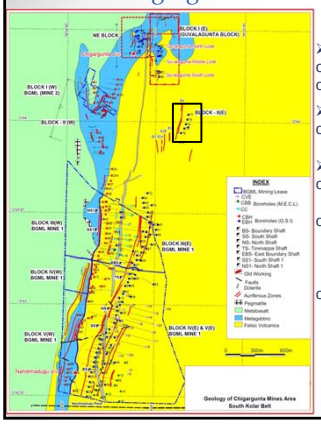
Chigargunta Gold Deposit-Geology



- Host rock:
  - Meta-mafic volcanics (Aamphibolites)
  - 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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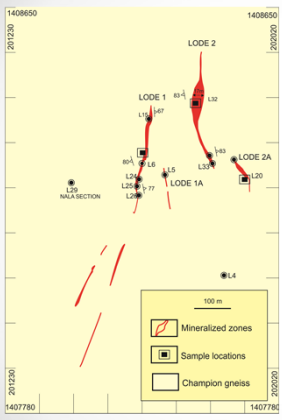
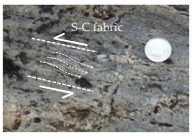
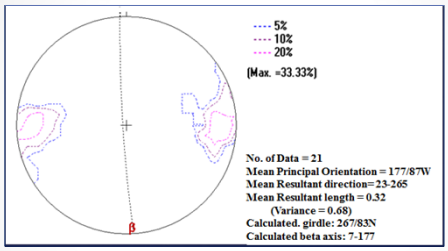




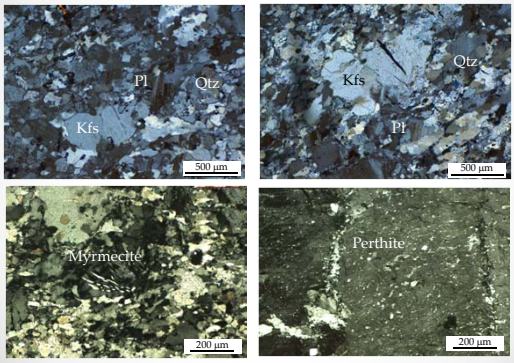
Structure



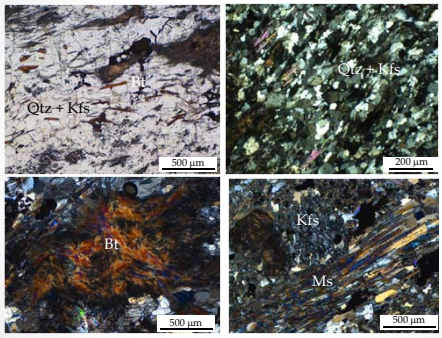
Tight isoclinal folds with axial planar fabric trending N-S to NNW-SSE dipping both E and W with mean orientation →177/87W

Greenstones away from the mineralized zone

Champion Gneiss away from the mineralized zone



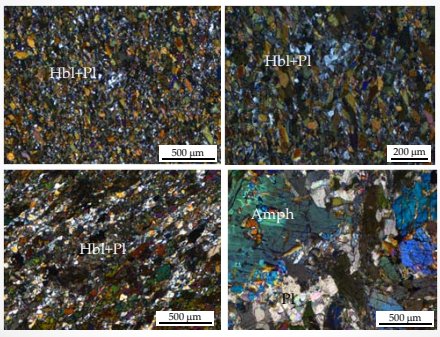
Champion Gneiss in the mineralized zone



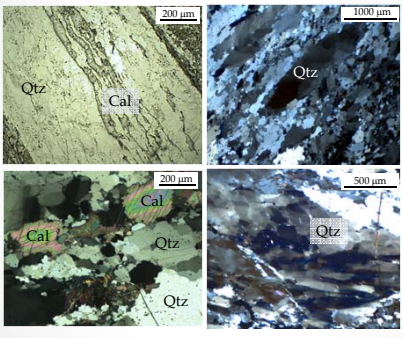
Biotite alteration

Muscovite alteration

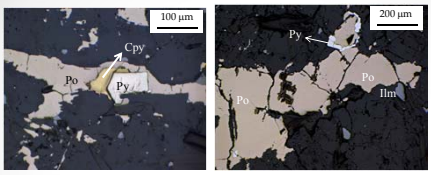
Amphibolite away from the mineralized zone



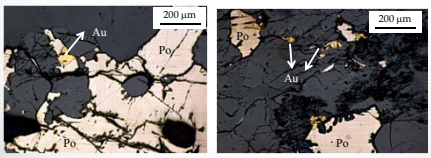
Quartz-Calcite veins



Ore Mineralogy



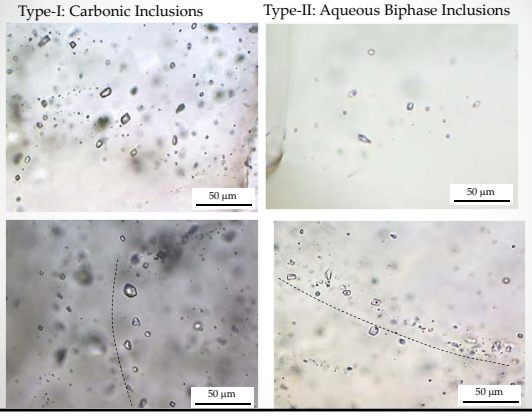
Gold Occurrences



Fluid Inclusions

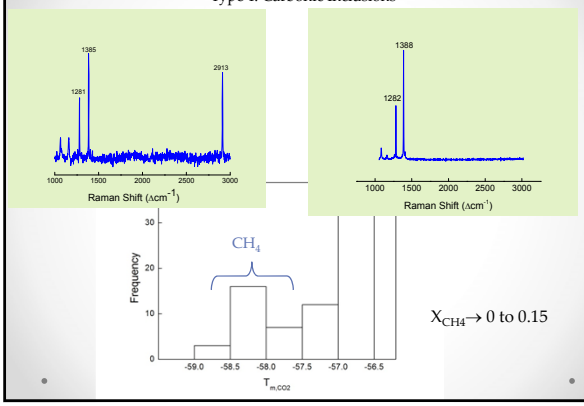
Type-I: Carbonic Inclusions

Type-II: Aqueous Biphase Inclusions



Microthermometry

Type-I: Carbonic Inclusions



$X_{CH4} \rightarrow$ 0 to 0.15

Microthermometry

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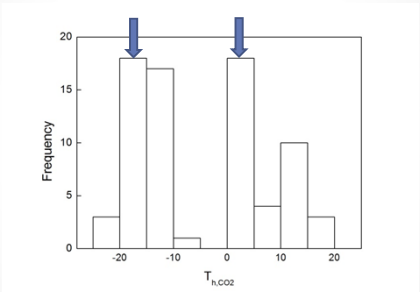
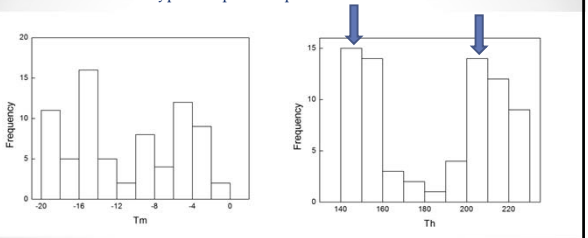


Microthermometry

Type-II: Aqueous Biphase Inclusions

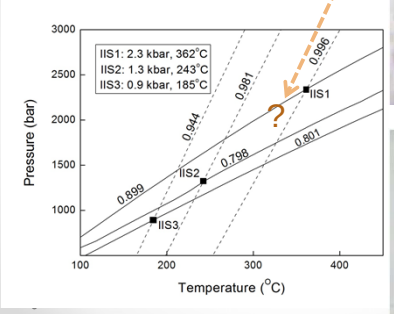


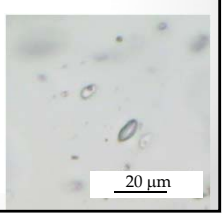
Salinity → 2.2 to 12.3 wt. % NaCl eqv.

P-T Conditions

600 °C/4.6 kbar

Isochore Intersection method of Roedder and Bodnar (1980)





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 H_2O-NaCl-CO_2 (± CH_4).
- 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 (?).
- 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).