



EGU21-12132

Ore fluid characteristics at Gadag Gold Field, Dharwar Craton, southern India: Evidences from tourmaline chemistry and fluid inclusion study

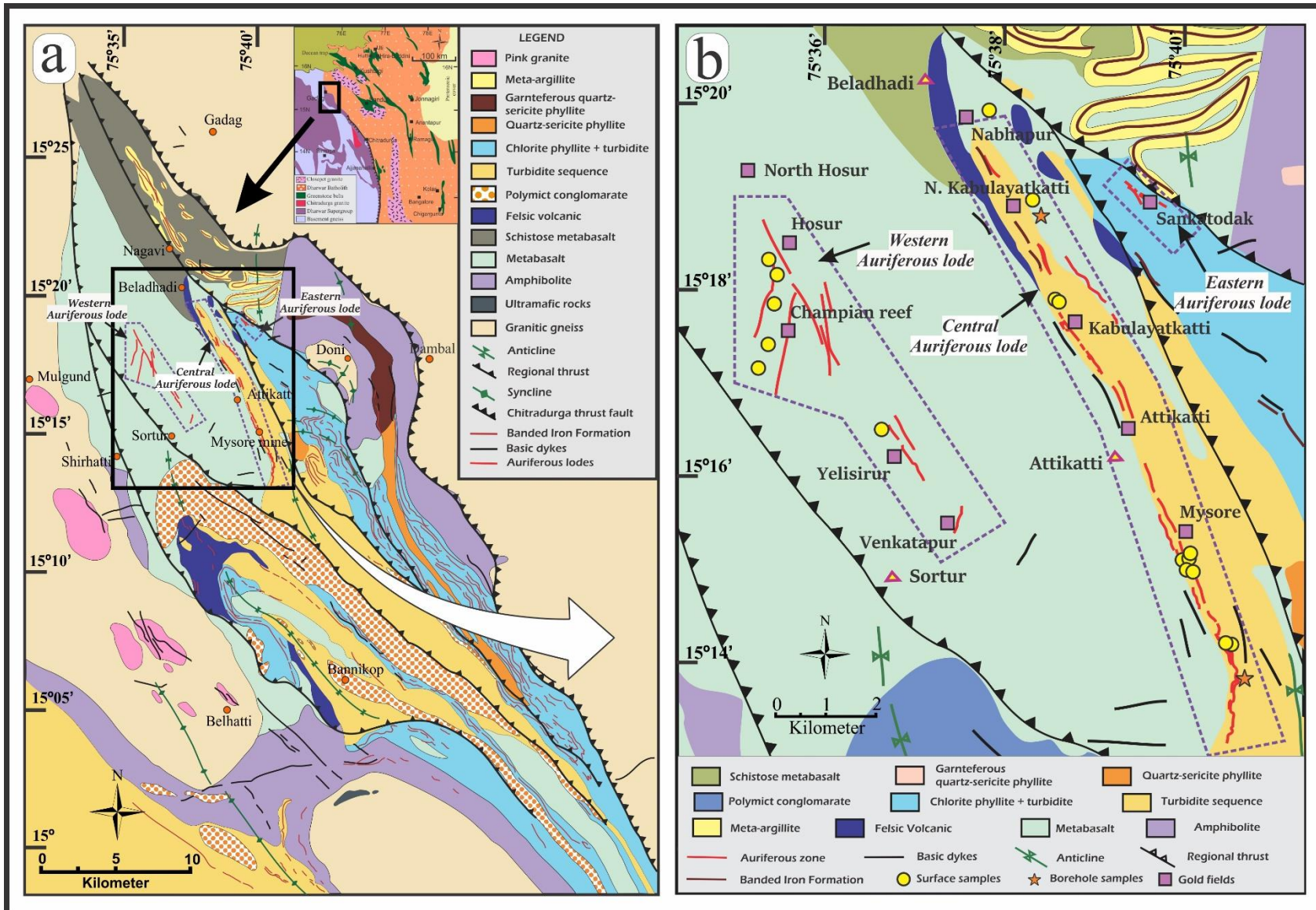
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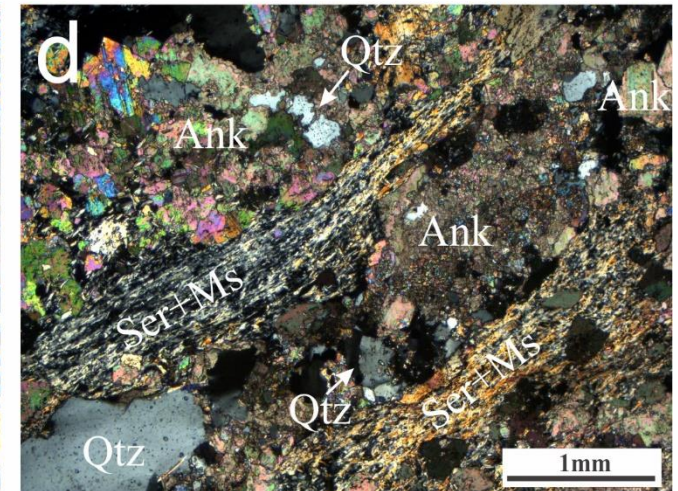
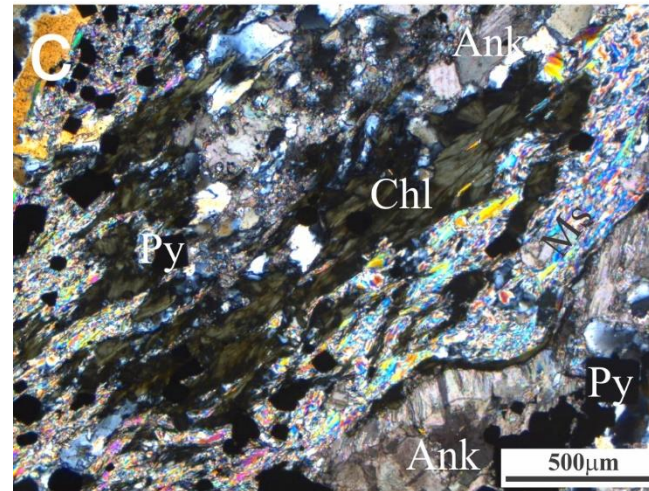
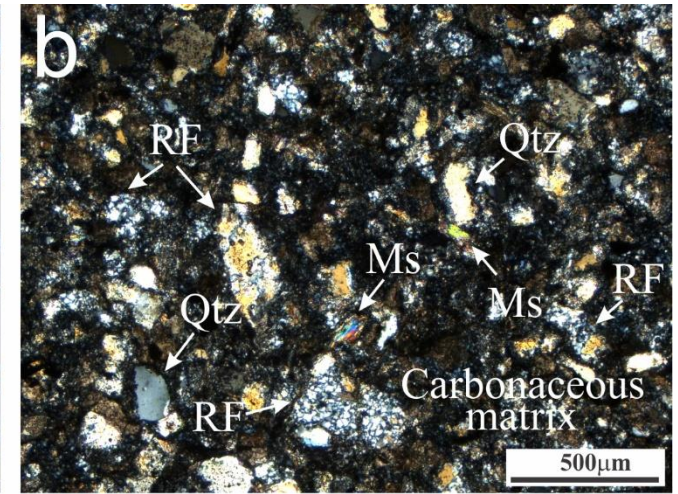
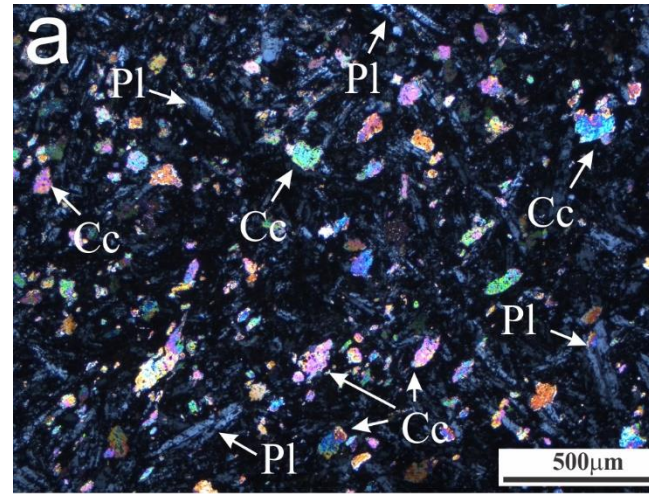
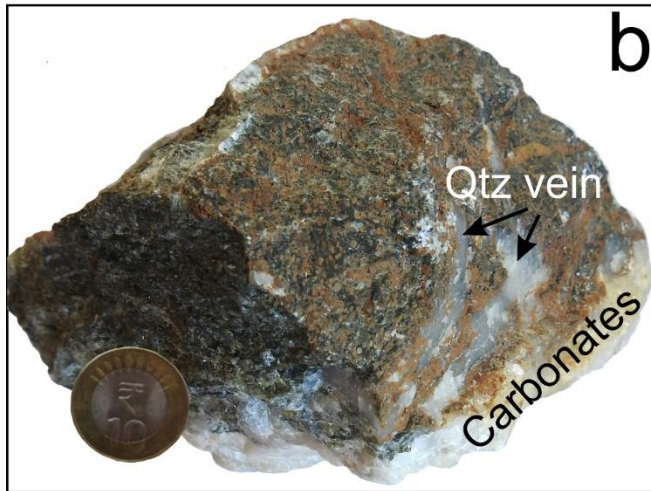
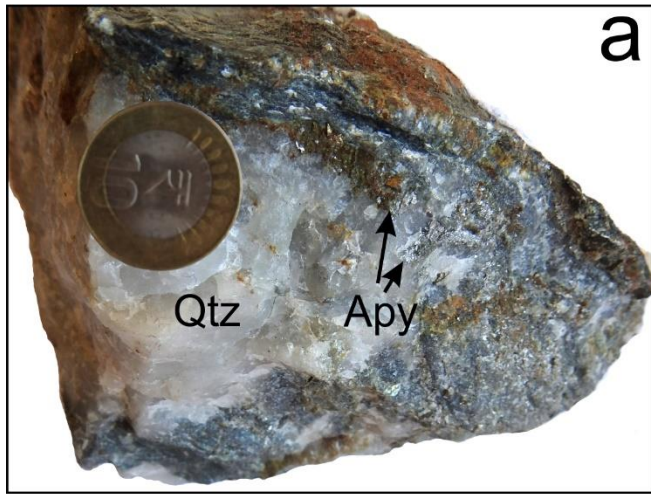
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Study area

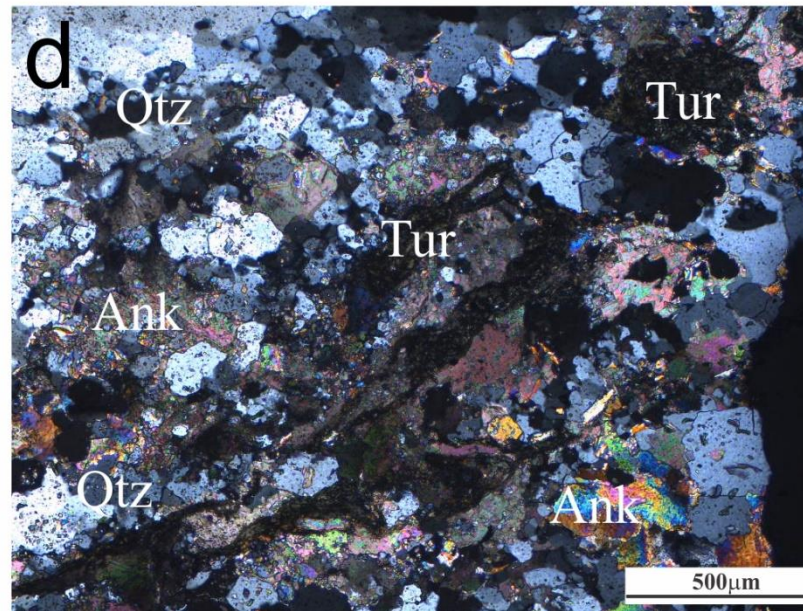
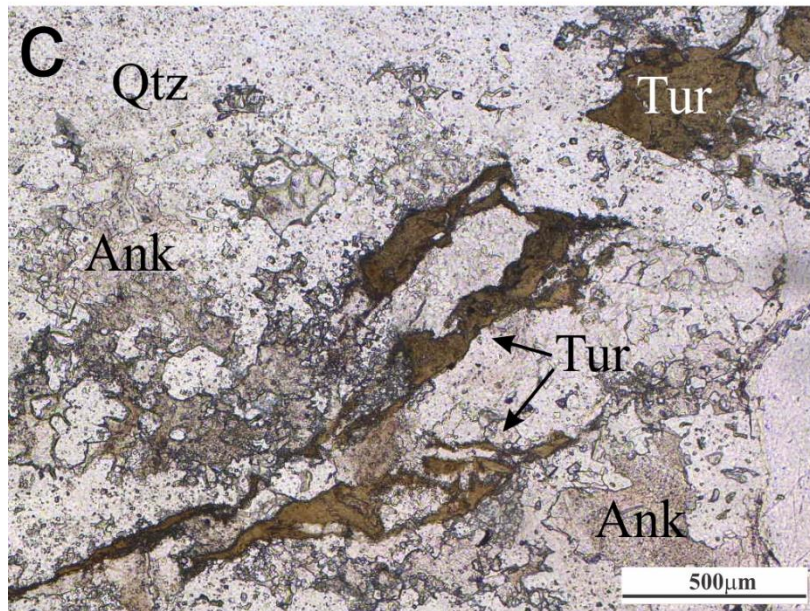
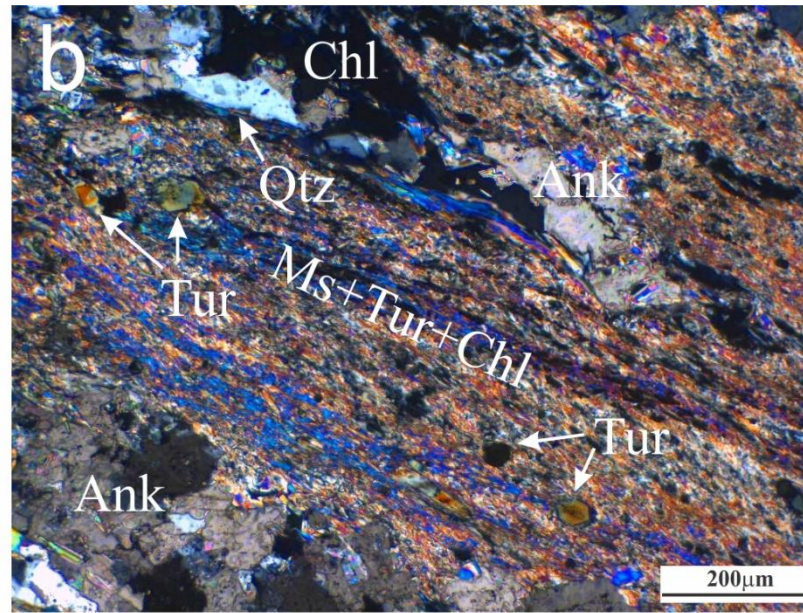
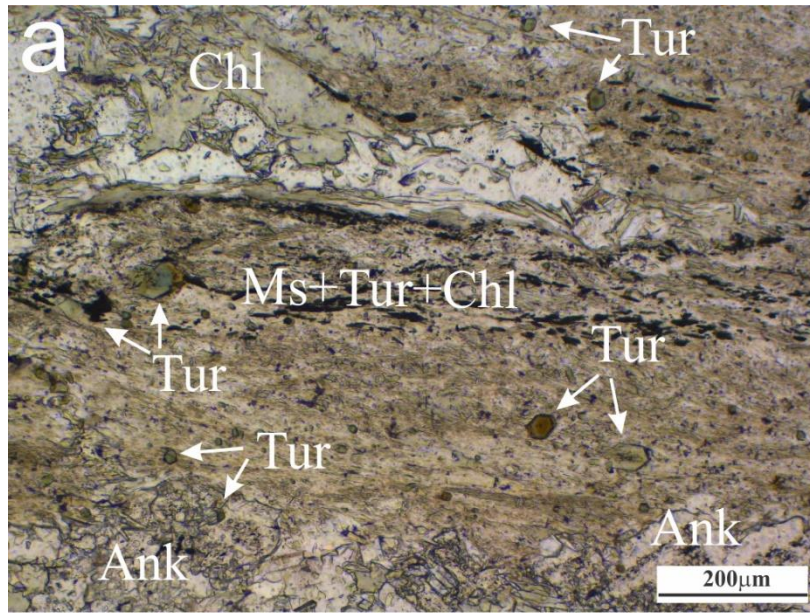


(a) Geological map of the Gadag greenstone belt shows lithological variations and disposition of different auriferous lodes parallel to the regional thrust. Insert represent the location of Gadag greenstone belt along with major gold hosting greenstone belts in the Dharwar Craton, India; (b) Enlarge view of 'a' shows distribution of the three different auriferous lodes (western, central and eastern) hosted by distinct lithology.

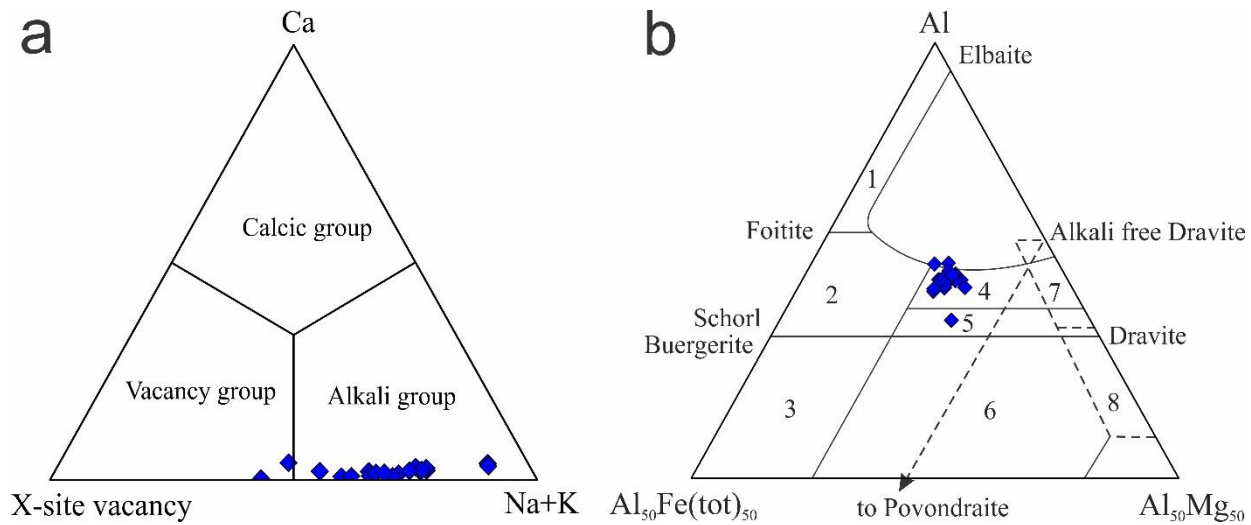


Photographs of quartz carbonate veins containing profuse sulfides in the mineralized zones of Gadag gold field.

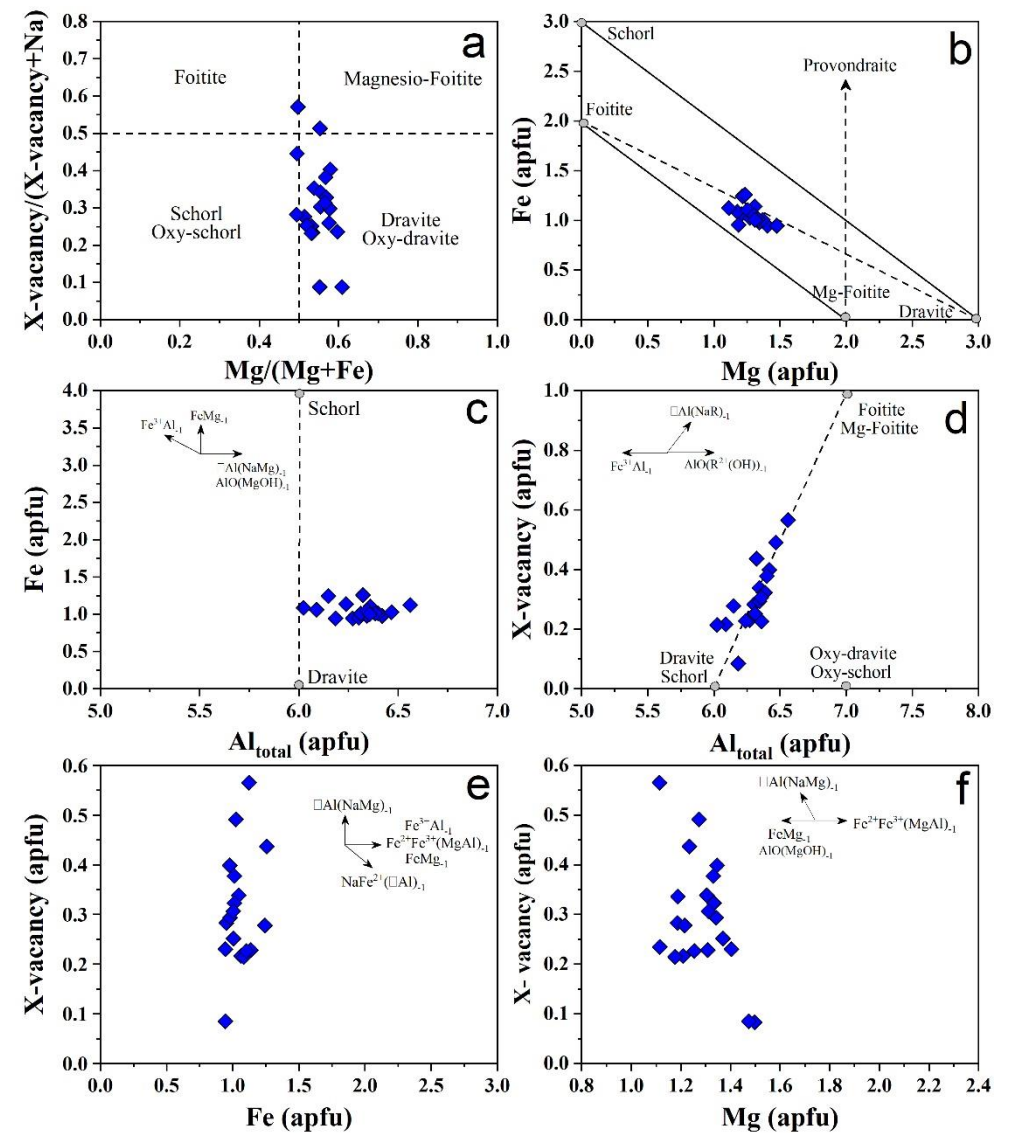
Photomicrographs of unaltered (a, b) and altered mineral assemblages from the western and eastern auriferous lodes (c, d).



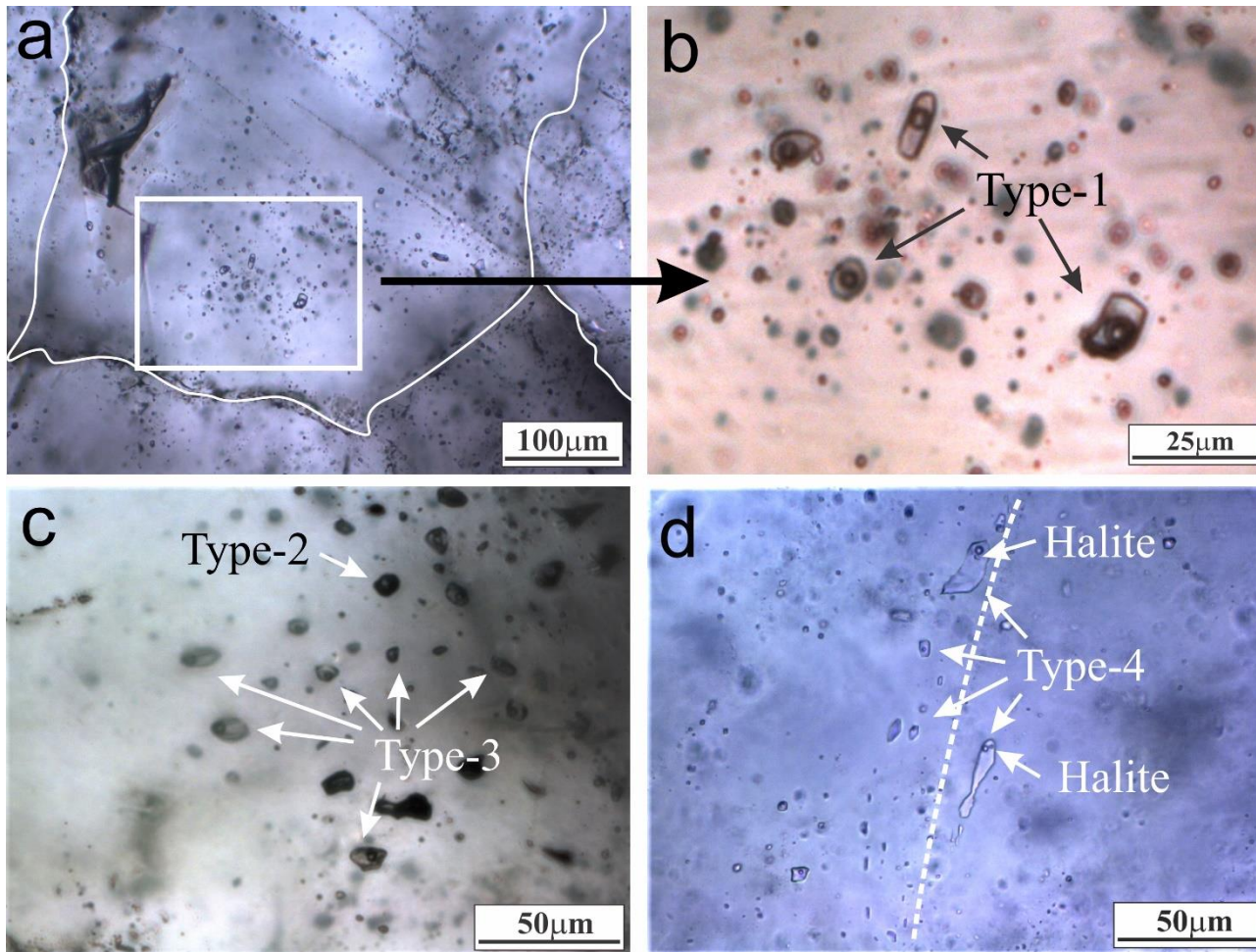
Transmitted light photomicrographs showing the occurrences and textural association of the tourmaline in Gadag Gold Field. (a, b) Euhedral, isolated tourmaline grains (Tur-1) resemble the foliations. (c, d) occurrences of anhedrad, bizarre shaped tourmalines (Type-2) along with quartz and carbonates in the mineralized zone.



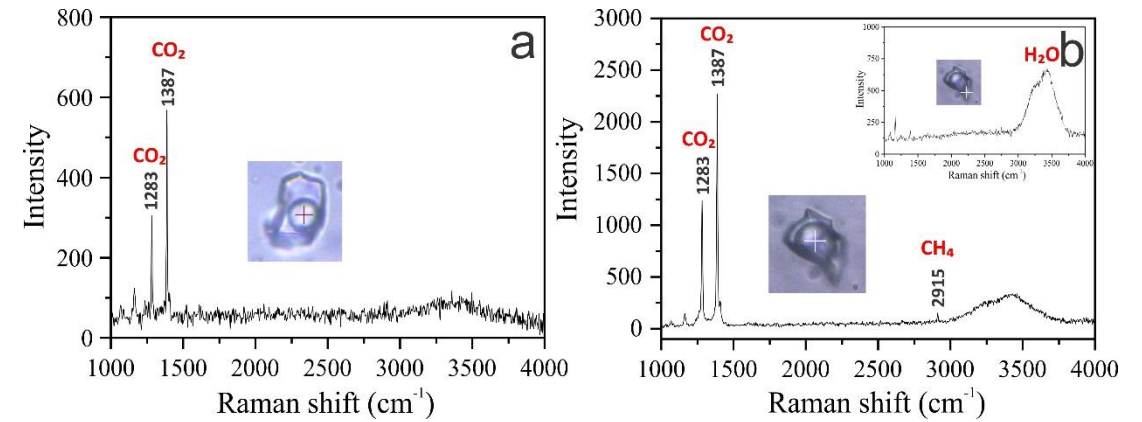
The major oxide compositional plots of tourmaline from the Gadag gold field. (a) Ca-X-site vacancy-Na+K plot (after Hawthorne and Henry, 1999) and (b) Al-Fe-Mg plot (Henry and Guidotti, 1985). Fields in 'b' are: (1) Li-rich granitoids and associated pegmatites and aplites; (2) Li-poor granitoids and associated pegmatites and aplites; (3) Fe^{3+} -rich quartz-tourmaline rocks and hydrothermally altered granites; (4) Metapelites and metapsammities coexisting with an Al-saturating phase; (5) Metapelites and metapsammities not coexisting with an Al-saturating phase; (6) Fe^{3+} -rich quartz-tourmaline rocks, calc-silicate rocks, and metapelites; (7) Low-Ca metaultramafics and Cr, V-rich metasediments; and (8) metacarbonates and metapyroxenites.



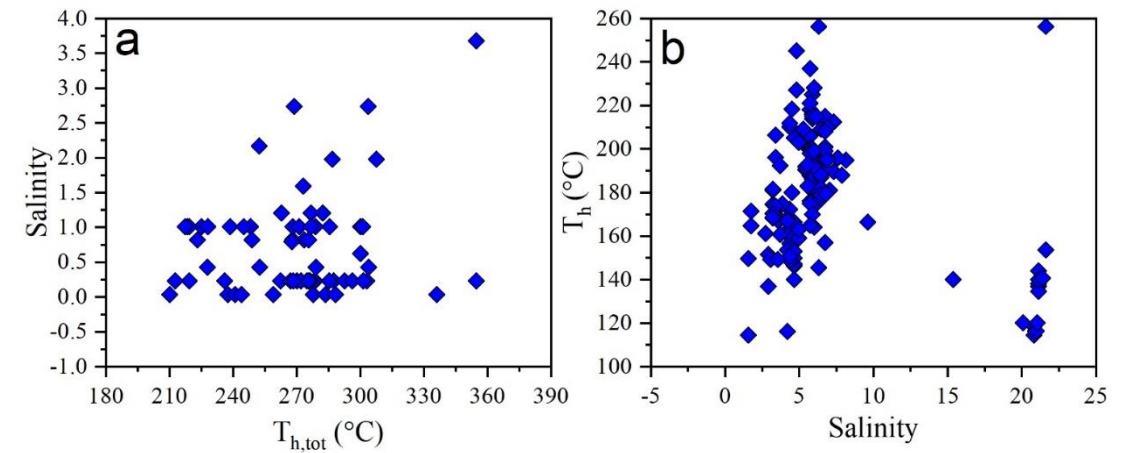
Classification diagram of tourmaline after Henry and Guidotti, 1985 (a) and correlations between different elements are shown in bivariate plots (b-f) from Gadag gold field.



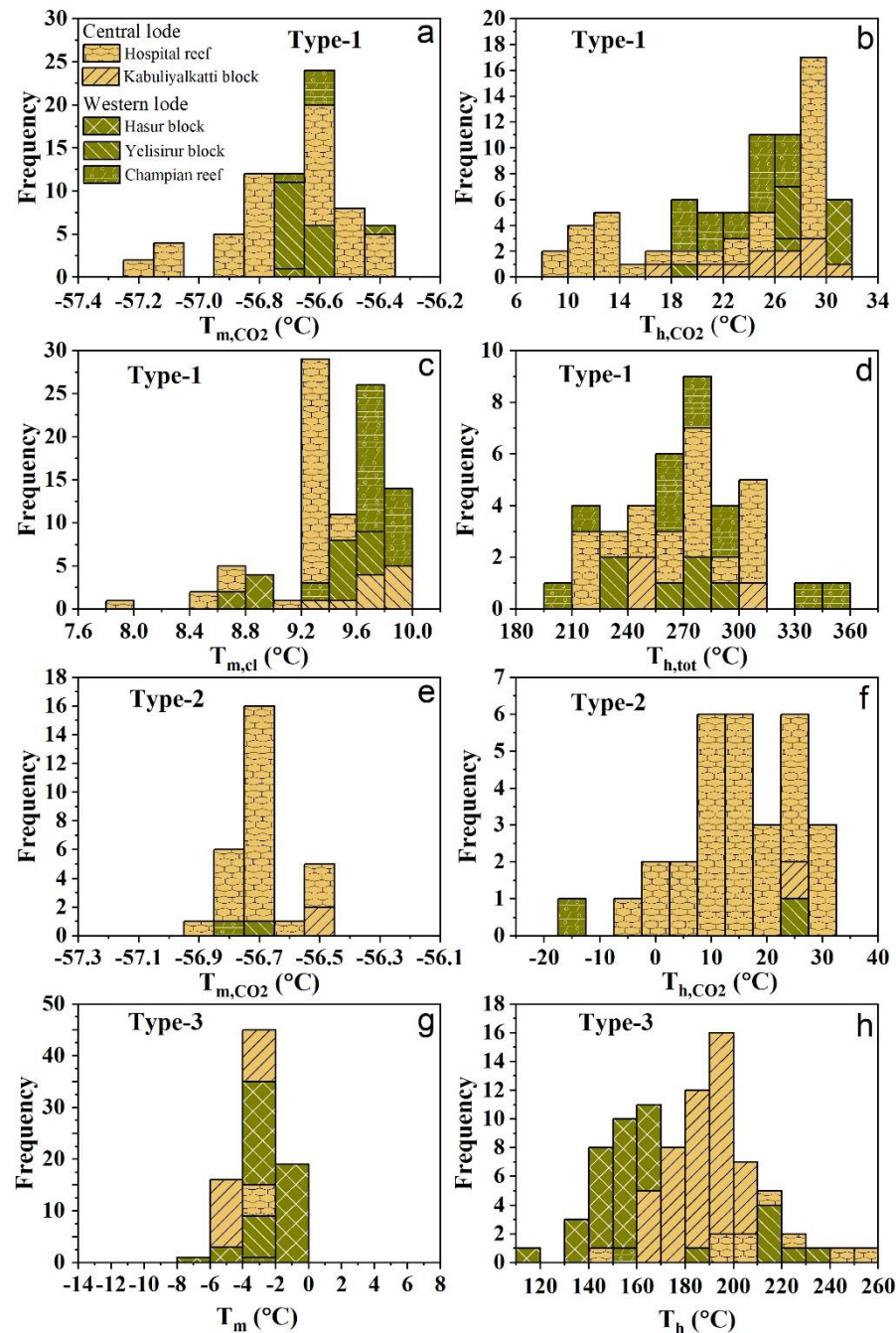
Photomicrographs showing the disposition and occurrences of different types of fluid inclusions. Note that the presence of three different phases of type-1 inclusions during microthermometric experiment at ~15°C



Raman spectra of type-1 inclusion from the western auriferous lode (a) and central auriferous lode (b) at Gadag.



Plots of (a) $T_{h,tot}$ vs. salinity for type-1 inclusions and (b) salinity vs. T_h temperature of type-3 inclusions.



Histogram plots of fluid inclusion microthermometric data. Temperatures of CO₂ ice melting (a), CO₂ homogenization (b), clathrate melting (c) and total homogenization (d) of type-1 inclusions; Ice melting (e) and homogenization temperature (f) of type-2 inclusions; Temperatures of last ice melting (d) and liquid vapor homogenization (e) of type-3 inclusions form distinct auriferous lodes at Gadag.

Summary and conclusions

- Gadag, a part of western Dharwar Craton, India has three different auriferous systems with distinct lithological assemblages.
- Tourmalines from alteration zones are texturally different but compositionally similar.
- They are dravite in nature with high Al_{tot} (6.02 to 6.56 apfu), low Na (0.42 to 0.88 apfu) and medium X-vacancies (0.08 to 0.57 apfu).
- The low Na and predominance of Fe^{2+} in the tourmaline structure indicates low saline, reduced ore fluid of metamorphic origin.
- Fluid inclusion from the auriferous lodes at Gadag reveal low to medium saline (0.04 to 9.59 NaCl equiv.) $H_2O-NaCl-CO_2 \pm CH_4$ ore forming fluid.
- Thus, Fluid inclusion results are consistent with the tourmaline composition and strongly supports the metamorphic origin of ore fluids that responsible for gold mineralization at Gadag.

THANK YOU