FRACTURE AND VEIN PATTERN AT MARUTHA GOLD PROSPECT, KERALA STATE

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ABSTRACT

At Marutha, gold occurs in association with pyrite and chalcopyrite along the contacts of quartz veins with amphibolite and hornblende gneiss. Analysis of the spatial orientation of quartz veins and fractures in rocks shows that auriferous quartz-veins have preferred the NE-SW trending and moderately dipping fractures.

INTRODUCTION

OCCURRENCE of gold in Nilambur valley, Kerala State is well known[1–3]. Recently the Kerala Mineral Exploration and Development Project (KMEDP), through exploratory drilling, demarcated an area of nearly 1 km^2, around Marutha (figure 1) for gold associated with quartz veins. Studies were carried out in an area of about 100 km^2, northeast of Nilambur, in and around the gold prospect, to investigate the structural aspects of gold mineralization.

GEOLOGICAL SETTING

Rocks of the area are poorly exposed due to thick soil cover, vegetation and lateritization. The rock types traced are hornblende gneiss, amphibolite, magnetite quartzite, charnockite and talc-tremolite schist in the decreasing order of abundance (figure 1). Occasionally the hornblende gneiss is banded showing alternating layers of mafic and felsic minerals. The band width varies from a few mm to more than 5 cm. Amphibolite is massive and free from megascopic foliation. At places enclaves of amphibolite are observed in hornblende gneiss. Transition from hornblende gneiss to amphibolite is gradual. A penetrative foliation, well-developed in hornblende gneiss and talc-tremolite schist, is the dominant planar fabric. Banding in the gneiss, when present, and layering in the magnetite quartzite are parallel to foliation. The general trend of foliation is NE-SW. The nature and orientation of minor folds in hornblende gneiss and magnetite quartzite indicate superposed folding. Two groups of minor folds have been identified. The earlier folds (F_1), developed on foliation, plunge moderately to NE or SW and are asymmetrical to symmetrical with interlimb angle of 30°–90°. The later one (F_2) are more open (interlimb angle $> 120°$) and plunge moderately to NW or SE.

VEINS AND FRACTURES

Both hornblende gneiss and amphibolite are traversed by quartz veins. Quartz veins have a general NE-SW trend, being parallel to the regional strike of the country rocks. The veins (strike extension from 1 m to 5 m) vary in width from 1 cm to 2 m. Some of the veins, independent of width and strike extension, pinch out (figure 2).

Gold occurs in association with pyrite and chalcopyrite along the contacts of quartz veins with the country rocks. In cores gold specks can be megascopically observed. Since mineralization is mostly along the contacts of quartz veins with the country rocks, the attitude of veins was investigated. The strike of exposed veins from different parts of the area shows a strong preferred orientation with most veins striking NE-SW (figure 3a), the mean trend being N50E-S50W. Three minor concentrations with mean trend N65W-S65E, N5W-S5E and N15E-S15W are also noticed. Poles to the veins show strong preferred orientation with a compact maximum plunging 40/N315 (figure 3b). Thus most veins dip moderately towards SE. A few veins dipping in the opposite direction are also present. Elongation of the major concentration can be attributed to later F_2 folding since the veins are affected by NW-SE trending broad open F_2 folds.

The veins are observed in both amphibolite, free from foliation, as well as in foliated hornblende gneiss. Foliation planes do not control vein localization as the veins cut across foliation. The relation between fractures in the rocks and veins was also examined. Fractures are more in amphibolite compared to hornblende gneiss. The fracture trends form five concentrations, the mean trends being N55E-S55W, N25E-S25W, N5W-S5E, N35W-S35E and N65W-S65E (figure 3c). Of these, the fractures trending N35W-S35E and N25E-S25W are present both in the veins and the country rocks and hence

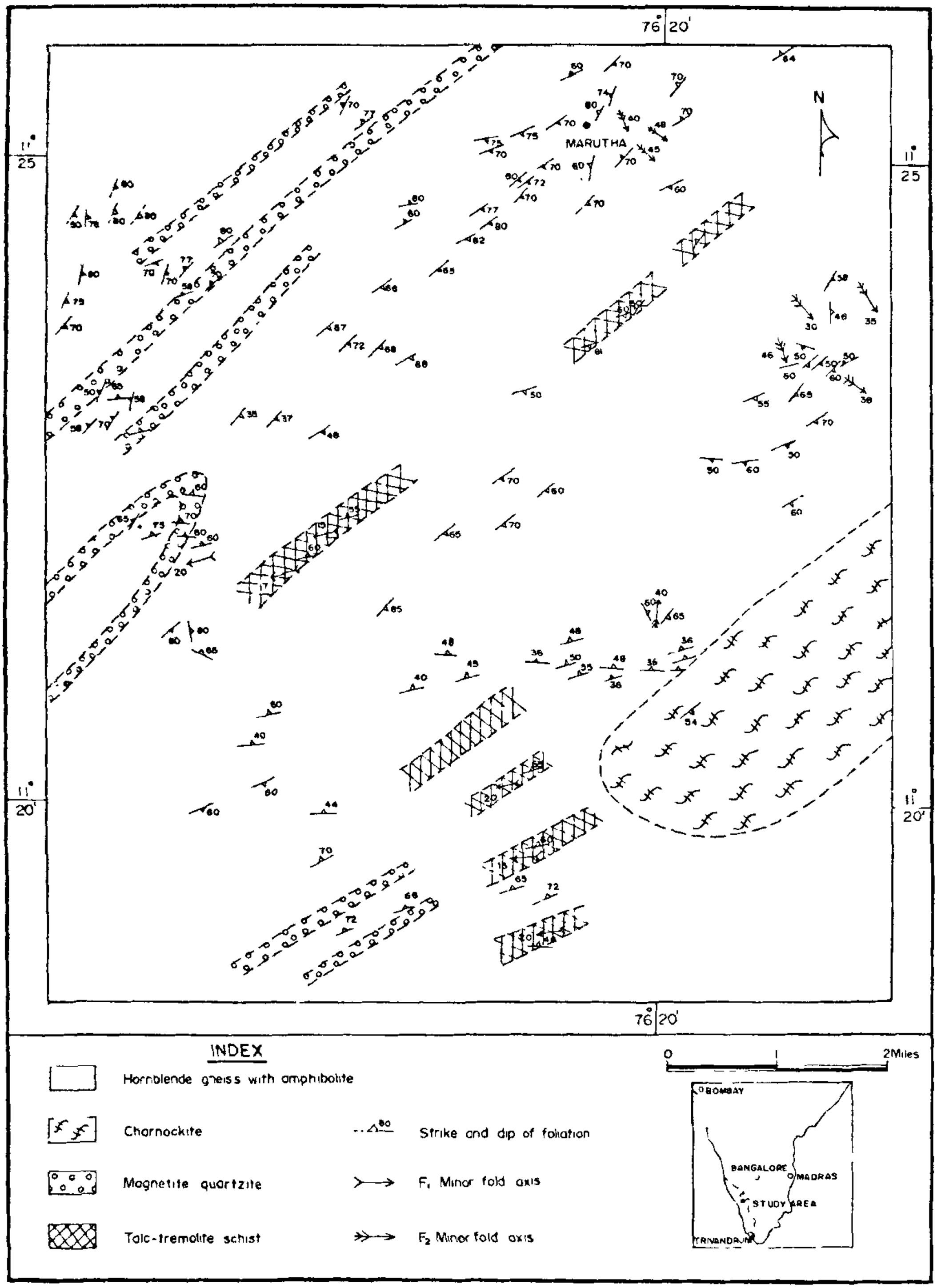

Figure 1. Geological map.

Figure 2. Quartz veins in amphibolite. Note the pinching of veins.

are later than the veins. The mean trend of the majority of veins agrees with the mean N55E-S55W trend of fractures. Though there are a few veins along the other mean trends of fractures (figure 3a), almost all of them are outside the prospect and seem to be devoid of gold. Since the majority of veins trend parallel to NE-SW fractures, a diagram of poles to these fractures from the whole area was prepared (figure 3d). The concentrations in the pole diagram of veins correspond to the moderately plunging submaxima of figure 3d.

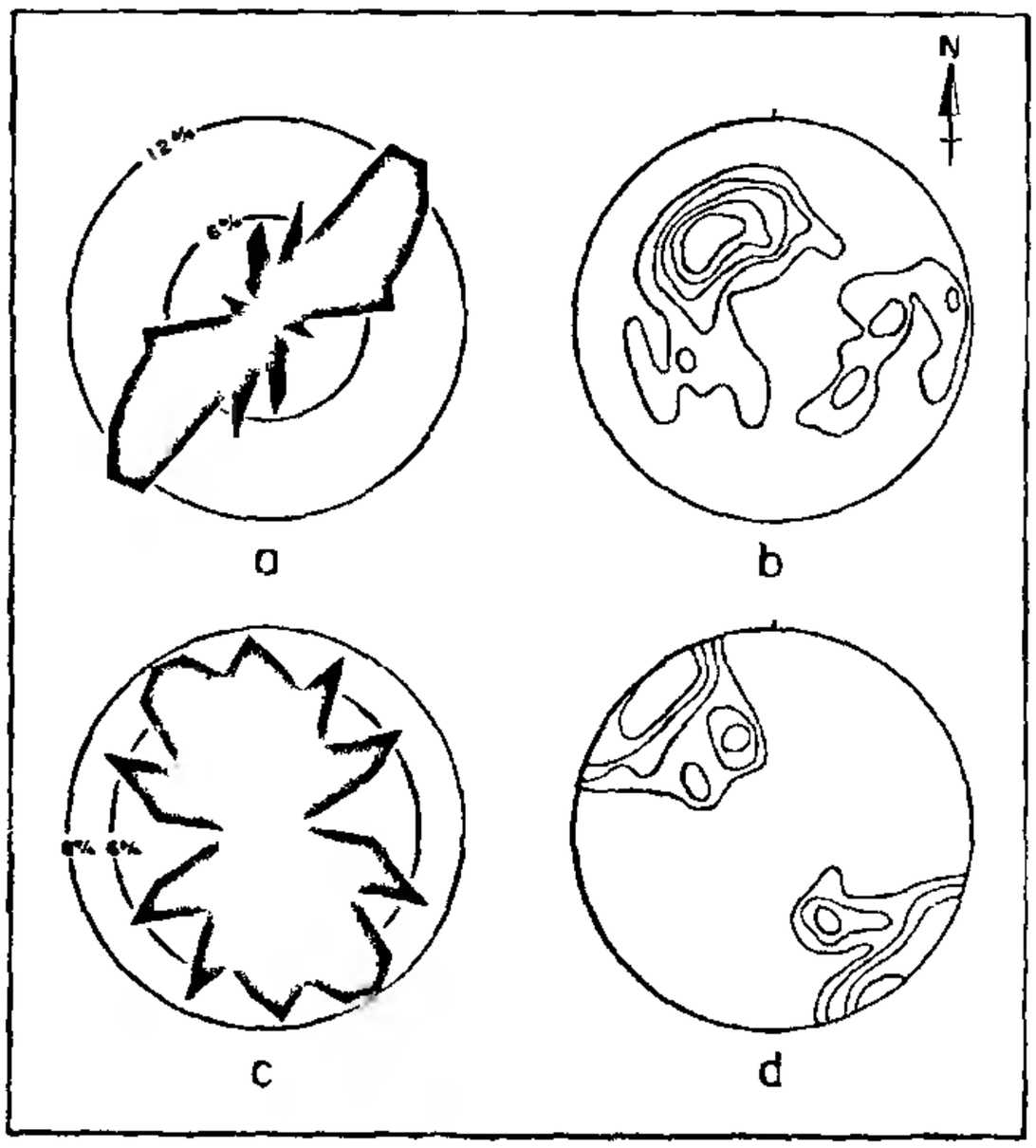

Figure 3a–d. a. Strike of 240 quartz veins; **b.** Equal area projection of poles to 240 quartz veins. Contours at 10–7–5–2–1%; **c.** Strike of 425 fractures, and **d.** Equal area projection of poles to 114 fractures trending NE-SW. Contours at 9–7–5–3–1%.

CONCLUSIONS

Gold mineralization along the contacts of quartz veins with amphibolite and hornblende gneiss indicate lithological control. Analysis of spatial disposition of quartz veins and fractures reveals close relation between fractures and quartz veins. Gold-bearing veins are affected by F_2 folding, while being free from the effects of F_1 folding. Therefore gold mineralization must have taken place before F_2 folding. Auriferous quartz veins have preferred the NE-SW strending, moderately dipping fractures.

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ANNOUNCEMENTS

INTERNATIONAL CONFERENCE ON SINTERING OF MULTIPHASE METAL AND CERAMIC SYSTEMS

The above conference will be held at New Delhi from 31 January to 3 February, 1989. The conference will cover the following topics: 1. Sintering fundamentals: Solid and liquid phase sintering, 2. Phase equilibria and sintering, 3. Synthesis of multiphase powder systems, 4. Sintering and multiphase microstructure evolution, 5. Strengthening of sintered multiphase systems, 6. Pressure sintering, 7. Novel consolidation methods, 8. Experimental techniques in multiphase sintering research, 9. Testing and evaluation, 10. Multiphase sintered metal/ceramic systems, 11. Case studies in product development, and 12. New horizons.

The programme will consist of invited as well as contributed papers. The contributed papers shall be in the form of oral or poster presentation. One page of typed abstract is required so as to reach latest by 30 September 1988.

For details please contact: Prof. G. S. Upadhyaya, Convener, ICSMC 89, Department of Metallurgical Engineering, Indian Institute of Technology, Kanpur 208 016.

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The national essay competition on "importance of ozone layer on health" will be organised under the auspices of the National Congress of SIRMCE to be held at Ahmedabad during October 29–31, 1988. The best writer will be awarded Rs.500/– and a certificate of merit. Three copies of essay along with full address may be sent to the following address before 30 August 1988: Parag Jhala Endowment Scheme of SIRMCE, India, B–02 Sidhachakra Apartment, Ahmedabad 380 006.