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STRUCTURAL CONTROL OF MAGNESITE MINERALISATION AT ATTAPADI, PALGHAT DISTRICT, KERALA

Magnesite veins occur in the northeastern part of a NE–SW trending hillock at Kalkandi village (11° 9′ 5″ : 76° 41′ 20″) on the south bank of Bhavani river. Mineralisation is confined to an area of about 1·5 sq km in a peridotite lens, composed mostly of olivine and subordinate clinopyroxene, enclosed in amphibolite and hornblende gneiss. The highly weathered lenticular peridotite, exposed over a strike length of 500 m, follows the NE–SW trend of the country rocks (hornblende gneiss with patches of hornblende-actinolite schist, quartz-biotite schist and amphibolite). The magnesite occurrence is located on the ENE–WSW trending Attapadi shear zone[1,2].

A penetrative axial surface foliation has developed in all the rocks except peridotite. Steep to vertical foliation has a general NE–SW trend. All the rocks, especially the peridotite, are fractured.

Pitting and drilling have shown mineralisation to extend to a maximum depth of 35 m (B. J. Anthraper, pers. comm.). It is not known whether the peridotite body itself extends beyond this depth. Magnesite veins with thickness varying from less than a cm to 20 cm criss-cross the host rock (Fig. 1), where veins intersect an increase in thickness is noticed. Veins extending more than a metre along the strike are found to be more than a cm thick while those extending less than a metre are less than a cm in thickness. Accordingly the former group is termed major veins and the latter—minor veins. Poles of both major and minor magnesite veins when plotted on a lower hemisphere stereographic projection form a number of concentrations giving the impression of poor preferred orientation (Fig. 2). But when the strike of major and minor veins are plotted separately a different picture emerges (Fig. 3 *a*, *b*). It can be seen that the major veins show strong preferred orientation with the great majority of them concentrated between NW–SE and N–S, the mean strike being N30W–S30E. A subordinate concentration along N30E–S30W is also significant. The strike of the minor veins, on the other hand, is more dispersed, most of them trending between NW–SE and NE–SW. However, two mean trends—N45W–S45E and N20E–S20W are discernible. Of these, the former coincides with the dominant trend of the major veins.

Fig. 1. Magnesite veins in peridotite.

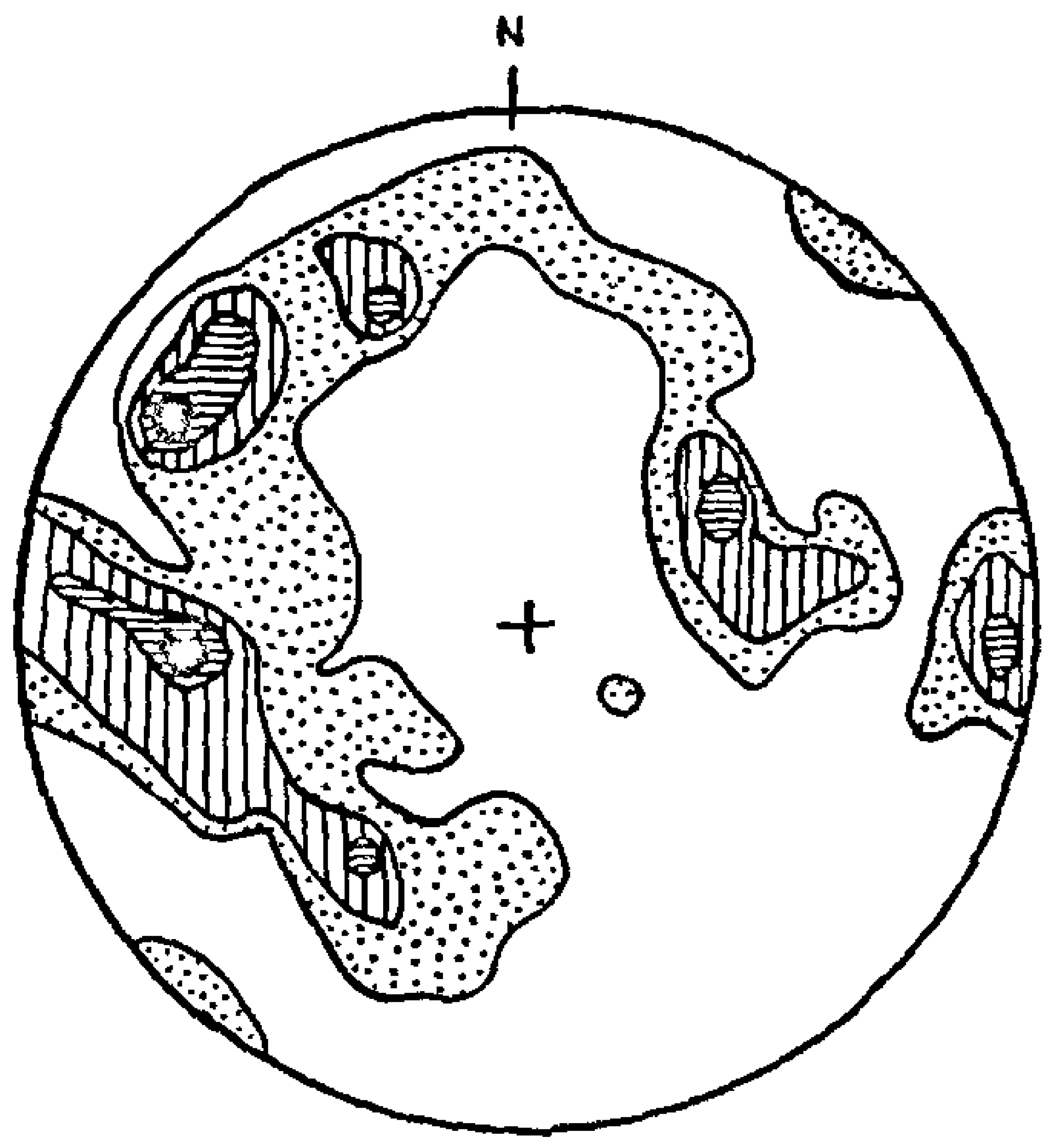

Fig 2

Fig. 2. Lower hemisphere stereographic projection of poles of 145 magnesite veins. Contours—8-6-4-2%.

The veins must have developed along available openings in the host rock at the time of mineralisation. Since the most important openings available in the rocks apart from foliation which has failed to develop in the host rock are joints, possible relation between the trend of joints and veins has to be examined. The strike of joints over an area of

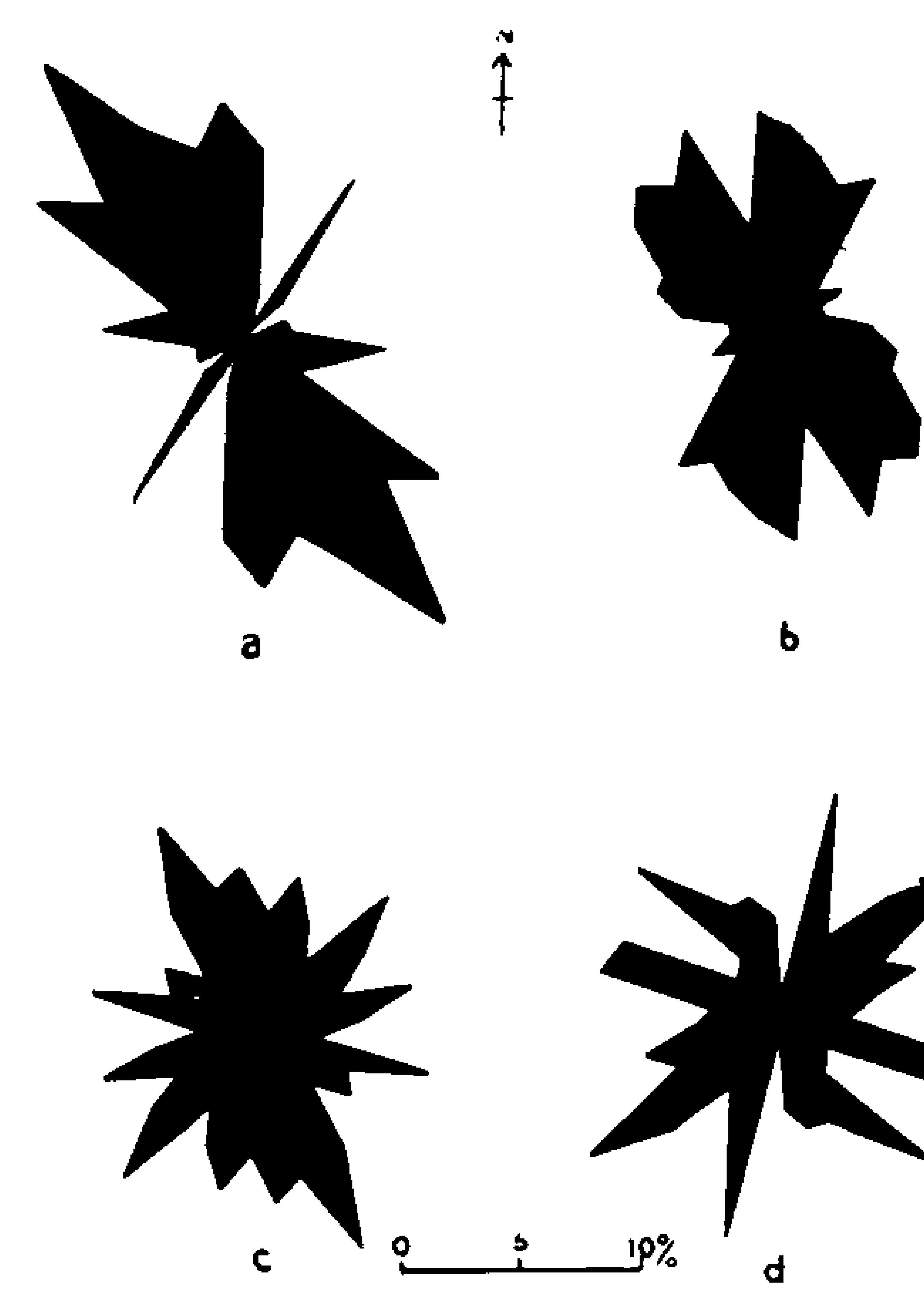

Fig 3

FIG. 3. (*a*) Strike of 48 major magnesite veins. (*b*) Strike of 97 minor magnesite veins. (*c*) Strike of 253 joints. (*d*) Strike of 135 joints in peridotite.

150 sq km is shown in Fig. 3 *c*. Three major trends, *viz.*, WNW-ESE, NNW-SSE and NE-SW with corresponding mean trends of N75W-S75E, N25W-S25E and N55E-S55W are observed. Maximum number of joints trend NNW-SSE. The corresponding mean trend of N25W-S25E coincides with the mean strike of major veins. These fractures, developed after the amphibolite facies metamorphism, belong to one of the two regional fracture systems that control the drainage in the area[1]. One of the two mean trends, observed in the minor veins, *viz.*, N45W-S45E, also approximates this direction.

The strike of joints in peridotite host rock is shown in Fig. 3 *d*. Four major trends with the corresponding mean strike directions along N70W-S70E, N45W-S45E, N15E-S15W and N55E-S55W are evident. Except the N15W-S15E direction, the rest are comparable with the observed regional pattern. But as far as mineralisation is concerned the N15W-S15E direction, though significant only in peridotite, assumes importance because one of the two major trends observed in the case of minor veins nearly coincides with it. Since the fracture pattern observed in peridotite is in general comparable with the regional joint pattern, joints in the host rock and the country rocks have a common origin.

From the above it is seen that there is close affinity between magnesite veins and fractures in the rocks. Mineralising solutions have particularly preferred the NW-SE trending regional fractures as most of the major and a large number of minor veins follow this trend. Further, in the case of minor veins the NNW-SSE trending fractures, prominent mainly in the host rock, have also acted as favourable sites for mineralisation. Structural control exercised by NW-SE and NNE-SSW trending fractures in localising magnesite mineralisation has important bearing on future prospecting for magnesite in the Attapadi area.

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DEPENDENCE OF LINEAR THERMAL EXPANSION COEFFICIENT ON THE RATIO OF GROUNDMASS TO PHENOCRYSTS OF METAVOLCANICS OF INDUS SUTURE ZONE, KASHMIR HIMALAYA

LINEAR thermal expansion coefficient (α) characterizes the capacity of rocks to expand, and determines the change in dimensions when heated. This is of considerable geological significance in determining the joint and fracture pattern in igneous rock masses. The present note gives the preliminary results on thermal expansion of metavolcanics from the Indus suture zone, Kashmir Himalaya and in particular on the dependency of (α) on the groundmass to phenocryst ratio (G/P).

(α) upto 800° C is measured using the dilatometer technique (Ramana[1], Reddy, Rao and Ramana[2]), with a heating rate of $\leq$ 2° C/min. If the length of the sample at a temperature T° C is given by (L_t), and if its length at ambient conditions is (L_a), then (α) is evaluated from the relation, $L_t = L_a (1 + \alpha T)$. The results of (α) are obtained in 1 cm. cores (L_a = 2 to 3 cm), in the temperature range 40° C–600° C only, since the apparent linear thermal expansion coefficient of rocks is affected beyond the fracture initiation temperature (T_g), as reported by Ramana and Sarma[3].