

Under the microscope, the rock is seen to be made up of ground mass (82.96%), plagioclase (9.27%) and pyroxene (7.77%). Plagioclase (An. 60-65%) occurs as tiny, twinned laths. The microlites show somewhat crude but distinct preferred orientation, as the longer axes of the microlites show more or less the same trend. Augite ( $ZAC = 40-44^\circ$ ,  $2V_x = 40-46^\circ$ ,  $N_z - N_x = 0.022-0.024$ ), and pigeonite occurs as individual grains and in glomeroporphyritic clusters. Elongation parallel to C-axis is common but all variations are encountered from slender prisms to stout crystals.

Both plagioclase and pigeonite show interpenetration twinning. In both cases, each arm of the interpenetration twin is again a twinned grain. Of the pigeonite cross (Fig. 1) one arm is 0.45 mm. in length and 0.15 mm. in breadth, while the other arm is also of the same length and 0.125 mm. in breadth. It has the following optical characters:

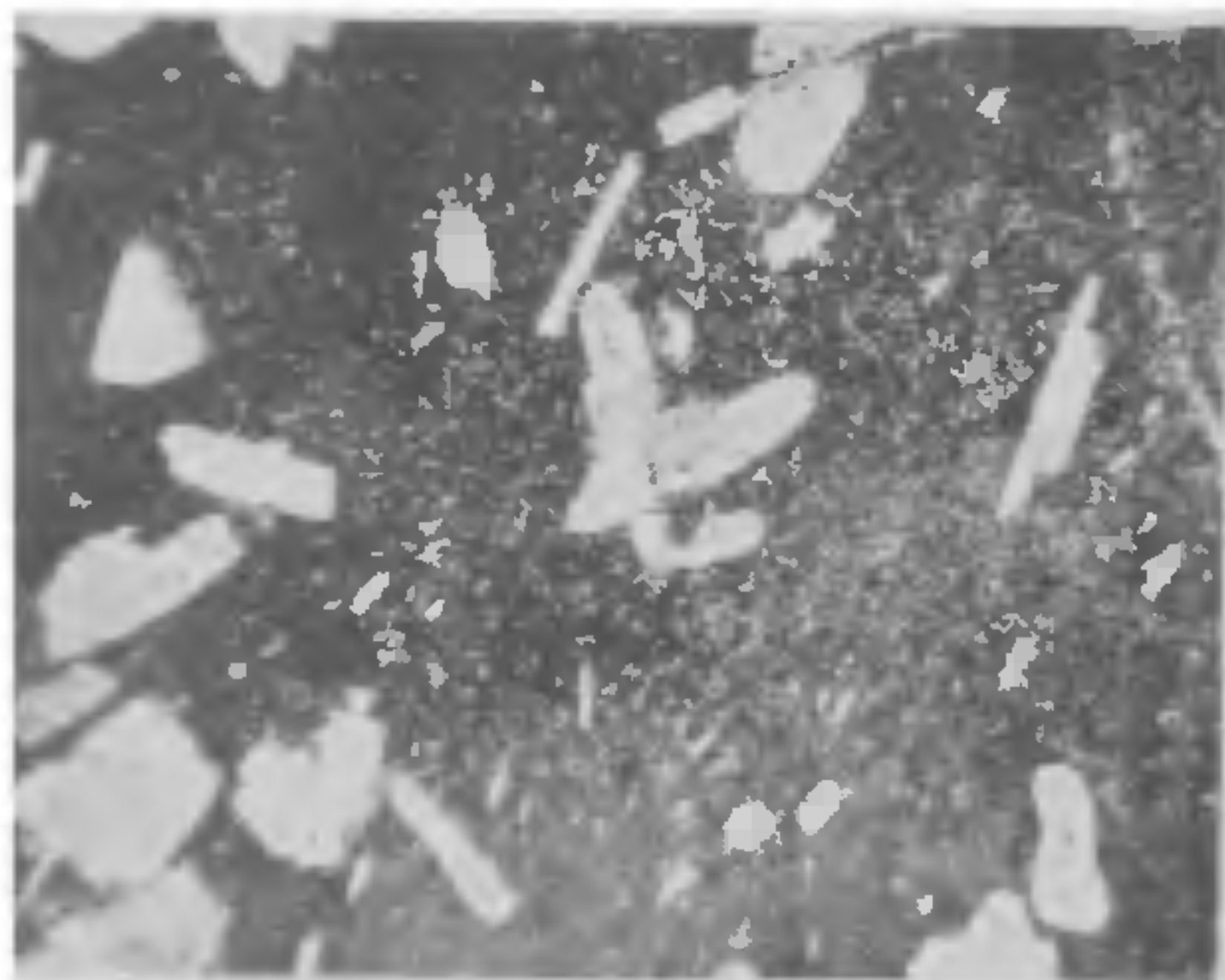


FIG. 1

Colourless, non-pleochroic, positive elongation,  $XZ_1$  010,  $ZAC = 32^\circ$ ,  $N_z - N_x = 0.025$ . The optic axial angle is very low, as indicated by the slight breaking up of the uniaxial cross.

The two individual twins, forming the cross, are contact twins with [100] as twin plane and the angle between the two twin planes is  $80^\circ$ . The interpenetration twin has [101] as twin plane. The interpenetration twin of plagioclase has, as its arms, two simple twins of which one is twinned after albite law, while the other is twinned after carlsbad law.

Gorai (1951) divides plagioclase twins into four types and interpenetration twins are grouped under type 4; these include twins according to the laws that are restricted to, or characteristic of the volcanic as well as plutonic rocks. In the dyke, under study, pigeonite, which is a product of rapid crystallisation and

which is restricted to lavas and other relatively quickly chilled rocks, occurs as interpenetration twins. Hence interpenetration twin of plagioclase, which is associated with twinned and untwinned pigeonite, appears to be restricted to, and characteristic of volcanic rather than plutonic rocks. It may be concluded that the chilled nature, basaltic texture, presence of pigeonite and the occurrence of the interpenetration twinning in both plagioclase and pigeonite suggest that the dyke, under study, has developed under conditions similar to those attained in the volcanic mode of origin.

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Tirupati, October 27, 1967.

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#### TITANIA CONTENT OF SOME ULTRAMAFIC ROCKS OF SOUTH INDIA AND ITS SIGNIFICANCE

THE titanium content of a primary mafic rock appears to be a good measure of its "primitiveness" or the degree of differentiation, as could be seen from Table I. This concept is consistent with the observation that  $Ti^{4+}$  is enriched in the crust relative to the earth to the extent of 2-10% (Taylor<sup>1</sup>).

The titania contents of a suite of 13 ultramafic rocks drawn from the poly-metamorphic Eastern Ghats belt of Southern India have been determined with a "Lumetron" photoelectric colorimeter by the peroxide method of Riley.<sup>2</sup> The titanium content is estimated on the basis of the colour transmission through the yellow compound formed with hydrogen peroxide, at the wavelength of  $415 m\mu$ . The interference of iron is suppressed by employing phosphoric acid. The results are given in Table II.

Judged by the criterion cited in Table I, some of the samples (A18, A23, A27, A29, A32) may conceivably be approximations of the upper mantle in composition. Work is under way to estimate ratios like  $Fe_2O_3/FeO$ ,  $Sr^{87}/Sr^{86}$ ,  $Pb^{208}/Pb^{204}$ , etc., in these rocks to make the result a little more definitive.

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TABLE I

S. No.	Material	Geological significance	TiO <sub>2</sub> %	Reference
1	Type I Carbonaceous Chondrites (Orgueil)	Probable composition of premordial dust cloud from which the earth was formed by accretion	0.07	Wiik <sup>2</sup>
2	Basaltic achondrites	.. Probable composition of the upper mantle	0.48	Urey and Craig <sup>3</sup>
3	"Pyrolite" (Comp. : Olivine 80%; Orthopyroxene 19.3%; Chromespinel 0.70%)	Presumed composition of the upper mantle	0.71	Ringwood <sup>4</sup>
4	Oceanic tholeiite	.. Less differentiated derivative from the upper mantle	1.51	Engel <i>et al.</i> <sup>5</sup>
5	Alkali basalt	.. More differentiated derivative from the upper mantle	2.91	Engel <i>et al.</i> <sup>5</sup>

TABLE II

S. No.	Specimen No.	Description	Location	TiO <sub>2</sub> %
1	A 3/65	"Basic" charnockite (Hypersthene-Gabro)	Kondapalle, Kistna Dt. (A.P.) (16° 35' 30" N; 80° 31' 20" E.)	1.07
2	A 7/65	Amphibolite	do.	0.25
3	A17/65	do.	Sittampundi, Salem Dt. (Madras) (11° 15' 0" N; 77° 54' 0" E.)	0.15
4	A18/65	Hornblende Eclogite	do.	0.37
5	A19/65	Pyroxenite	do.	0.20
6	A21/65	Amphibolite	do.	0.15
7	A22/65	do.	do.	0.25
8	A23/65	Garnet pyroxene-Hornblende-gneiss	do.	0.88
9	A25/65	Pyroxenite	do.	0.20
10	A27/65	Eclogite	do.	0.50
11	A29/65	Garnetiferous Amphibolite	do.	0.42
12	A32/65	Eclogite	Pavitram, Salem Dt. (Madras) (11° 6' 0" N; 78° 16' 20" E)	0.32
13	A34/65	Dunite	do.	0.15

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### AN ACCOUNT OF A RICH FLUORITE DEPOSIT AT HINGORIA, BROACH DT., GUJARAT STATE

THE fluorite deposit at Amba Dongar related to carbonatite evoked great interest in the search for minerals of economic importance. The deposit of fluorite now discovered at Hingoria has a similar geological setting. Fluorite of acid grade occurs as a thick vein in the conical hill and is associated with the Carbonatite (?) rock that has domed up the basalts.

Fluorite occurs in a hillock which lies between Lat. 21° 44'-21° 45' and Long. 73° 15'-73° 16'. The hillock appears like a mole rising to a height of 436 feet above mean sea-level and about 200 feet above the surrounding plain country. It is located half-a-mile west-northwest of the village Hingoria, which is located along the Rajpardi-Netrang bus route (about 3 miles from Rajpardi).

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