Anorthosite body in the Nellore Mica-Pegmatite Belt of Eastern India

D. N. KANUNGO AND T. R. K. CHETTY

Abstract

Anorthosites from Nellore mica belt include pure anorthosites, gabbroic anorthosites and anorthositic gabbros. The anorthosite intrusives are deformed and metamorphosed along with the host rocks. The structural setting of the host rocks and similar association of anorthosites in other parts of Eastern Ghats, suggest that these rocks belonged to the Eastern Ghat Orogeny. On the basis of the field set-up and the chemical analyses, the anorthosites of Nellore mica belt show similarity to the anorthosites of Adirondack.

Introduction

Several occurrences of anorthosites have been described from different parts of India, particularly from the Eastern Ghats. The occurrence of such rocks from Nellore mica belt in Eastern India is being reported for the first time.

Geological setting

The anorthosite occurs as an elongated boby, trending roughly east-west, extending over a kilometre in length and about half a kilometre in width, at the junction of Kandleru river and Pagaderu Kalva (Long: 79°42′ and lat. 14°20′ of toposheet 57 N/11) (Fig. 1). The rocks include pure anorthosites, gabbroic anorthosites and

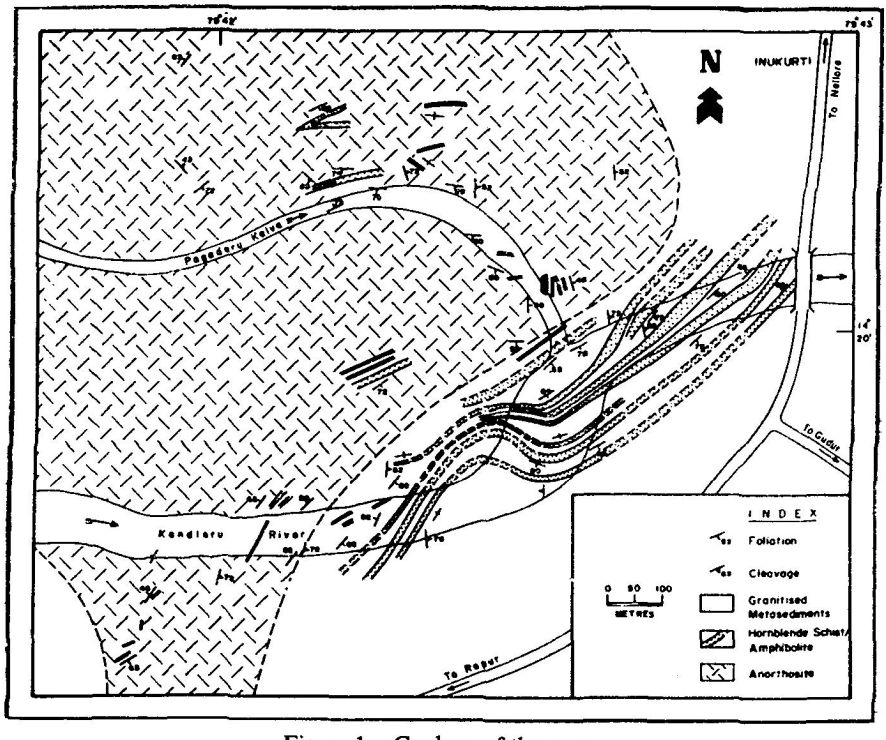

Figure 1. Geology of the area.

anorthositic gabbros. They are found surrounded by amphibolites, quartzites and granites.

The rocks are well foliated at their contacts with the country rocks and such foliation becomes crude or absent away from the contact. The foliation of the anorthosite in general is conformable with the foliation of the host rocks. The rocks seem to be sheared and the foliation is drag-folded at places. Hornblendes and sometimes garnets form the mafic bands. At places garnets are aligned parallel to the foliation which has also been folded.

Some caught up patches of country rocks like amphibolites and quartzite bands have been observed. Tongues and apophyses of anorthosites can be seen intruding these caught-up patches. The foliation of the country rocks is abruptly cut by the intrusion of the anorthositic rocks at a few places showing clearly its intrusive nature.

At a few places fracture-cleavages are well developed showing a trend similar to that in the country rocks. The fracture cleavages in the drag folds are arranged in a fan-shape at a few localities where the felsic bands are folded. Structural observations suggest that these rocks must have been deformed to a large extent along with the country rocks.

Petrography

The colour of the rocks when fresh varies from pale grey to chalky white, while the more weathered varieties are dirty grey in colour. The rocks are mostly medium grained although coarse grained patches are seen at a few places.

Hornblende and garnet form the major accessories while epidote, zoisite, scapolite, sphene, muscovite, apatite, biotite, quartz and opaques are seen in small quantities (Table I). The rocks show hypidiomorphic texture (Fig. 2).

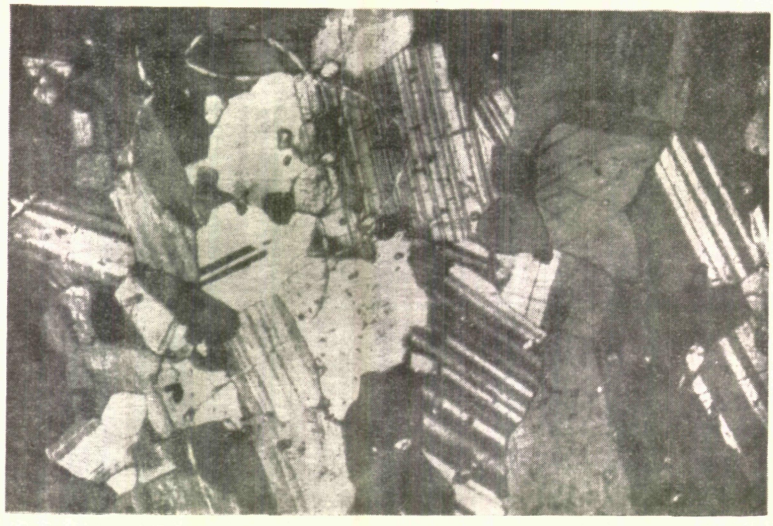

Figure 2. Photomicrograph of anorthosite showing the texture.

Plagioclases (An 50-60%) show distinct twinning and zoning in many of the grains. Combined albite-carlsbad twinning is very common. Some phenocrysts show marginal granulation giving rise to smaller grains. Both fine and widely spaced lamellae, and bending of lamellae are frequently observed. The plagioclase feldspars

show development of several secondary minerals such as epidote, zoisite, scapolite, muscovite, and sphene.

Anhedral hornblende crystals with two distinct cleavages, usually occur at the triple junctions of plagioclase grains. They are pleochroic in shades of bluish green to brownish green and have an extinction angle $Z \wedge c$ 15°-20°. Biotite has rarely developed from hornblende. The presence of plagioclase inclusions in garnet, its association with hornblende, and the released quartz granules in and around garnet suggest that the garnet has formed by the reaction of plagioclase feldspar and hornblende.

Chemical analyses of two samples of anorthosite are given in Table II.

TABLE I. (Modal analyses)

	N46	N75	N66	N74
Plagioclase	92.4	86.8	85.6	73.5
Hornblende	5.6	6.8	3.4	14.5
Garnet	—	—	—	4.8
Epidote	—	2.4	2.2	3.9
Apatite	0.3	2.8	1.5	—
Opaques	0.3	0.3	0.9	—
Quartz	0.5	0.3	0.5	1.3
Others	0.9	0.6	5.9	2.0

TABLE II. (Chemical analyses)

	N46	N93
SiO_2	52.80	53.83
TiO_2	0.72	0.40
Al_2O_3	22.28	21.49
Fe_2O_3	1.91	0.77
FeO	3.16	2.70
MnO	Trace	Trace
MgO	1.31	1.23
CaO	11.51	11.95
Na_2O	6.62	6.00
K_2O	0.15	0.70
P_2O_5	0.07	0.05
	100.53	99.12

Discussion

Development of foliation on the margins of the body, tongues and apophyses into the country rocks, and inclusions of patches of host rocks, clearly indicate that the anorthosites are intrusive in origin. The presence of secondary minerals, micro-

inclusions, bent lamellae and marginal granulation of plagioclase phenocrysts suggest that these rocks have also been metamorphosed and hence the term 'meta-anorthosites' may be more appropriate.

The relatively low anorthite content of plagioclase (labradorite), high TiO_2, low CaO and Al_2O_3 (Table II) and the absence of chromite bearing minerals rule out the possible correlation of these rocks with Group III anorthosites of Windley (1970). On the contrary, these rocks are similar to those of Adirondack massif anorthosites of North America (Buddington, 1961). This view is further supported by the absence of layered nature and cumulate textures.

The occurrences of anorthosites all along the Eastern India including the present find suggest that all these rocks might have been formed during a particular phase of tectonism. According to Sarkar (1968) a prominent metamorphic and/or granitic activity affected the Eastern Ghat belt at 1600 m.y. which is in conformity with the apparent ages of anorthosites, taken from all over the world, which range from 1100 to 1700 m.y., with a cluster around 1300 to 1400 m.y. (Herz, 1969). From the structural setting of the host rocks and the similar association of anorthosites in other parts of Eastern Ghats, it is probable that all these rocks belonged to the Eastern Ghat orogeny.

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Address of the authors

D. N. KANUNGO and T. R. K. CHETTY, National Geophysical Research Institute, Hyderabad-7.