SHORTER COMMUNICATIONS

A POSSIBLE CARBONATITE OCCURRENCE NEAR HOGENAKAL, TAMIL NADU SOUTH INDIA*

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The carbonate rocks occur near Hogenakal (77°46′35″E : 12°17′15″N) within the the Precambrian complex of charnockitic gneisses, and were mistaken for xenoliths of crystalline limestone by the writer when he first examined them in early 1970. However, due to their association with pyroxenite and syenite, the possibility of their being carbonatites was suspected; and indeed many carbonatite occurrences were first thought to be only xenoliths of limestone (e.g. Magnet Cove, Arkansas and Spitzkop, Transvaal).

In the area under discussion, the investigation of the carbonate rocks was done mainly to determine their economic potential, as apatite minerals have developed in appreciable quantity (5% of the rock). Initially, therefore, not much emphasis was placed on their petrogenesis, and they were considered to be limestones. But, from the subsequent studies (structural, petrographical and geochemical) of the rocks, it is becoming increasingly clear that they are not limestones.

The carbonate rocks, enclosing the xenoliths of pyroxenite and syenite, occur as discontinuous bodies. Basic dykes and sills have also been developed conformably along the contact, and within the possible carbonatite complex. All these facies have developed in a zone of fractures or shears in areas mainly underlain by charnockitic rocks. The geological setting shows that pyroxenites intruded first, followed successively along the same fracture zone, by syenite, carbonate rocks and the basic dykes and sills in the order mentioned. Hence the intrusive nature of the carbonate rock is indicated. All the above rock types have concordant relationship with charnockites, which also have been intruded by conformable bands of pink granite.

The area generally appears to have been disturbed structurally. The general trend of the rocks is NNE with dips of 60°E to vertical. The fracture/shear zone that has possibly aided the intrusion of the ultrabasic-alkali silicate-carbonate rocks has a trend of N15° to 25°E. A similar fault plane (N30° to 45°E) just east of this location is now occupied by the Chinnar and Cauvery rivers. Such a possibility was earlier discussed by Grady (1971), and the writer has been able to confirm it in the field. Most of the basic dykes and sills have intruded along fracture planes.

The pyroxenes and alkali feldspars derived from the xenolithic bodies of pyroxenites and syenites have been mixed with the calcites giving a mesocratic or melanocratic appearance to the carbonate rocks. The abnormal concentration of mafics (Table I) in the carbonate rocks can thus be explained.

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A similar probable carbonatite occurrence has been reported in Central Australia by Crohn, P.W. and Gellately, D.C., 1968 within the parallel and linear bands of a mixed rock consisting of pyroxenite and syenite, all constituting a possible carbonatite complex.

TABLE I

MODAL COMPOSITION (VOL. %) OF THE CARBONATE ROCK

Calcite	38.0
Pyroxenes (diopside and augite)	30.0
Biotite	20.5
Apatite	7.0
Aegerine	3.5
Magnetite	1.0
	100.0

The carbonate rocks are of fine to medium-grained texture and consist mainly of calcite, biotite and pyroxene. Apatite forms the major accessory while magnetite is found as microscopic and magascopic grains. Veins of calcite are also noticed. Thin sections show apatite, biotite and pyroxene in a granular matrix of calcite. The accessory minerals magnetite, alkali-pyriboles, sphene, monazite, olivine etc., which are typical of carbonatites are seen.

The magmatic nature of the magnetite in the carbonate rocks is clearly established from the chemical analysis which reveals the presence of Ti, V and P in relatively high concentrations (Table II).

TABLE II

PARTIAL ANALYSIS OF MAGNETITES FOUND IN THE CARBONATE ROCKS FROM HOGENAKAL (1)

	1	2
Ti	0.42	0.6 to 5.0
V	0.15	0.02 to 0.3
P	0 01	n.d.

1. Magnetite from carbonate rock, Hogenakal, Tamil Nadu, India, analysed in the chemical laboratory, T.M.D.P., Madras.
2. Magnetite from beforsite. Sevathur, Tamil Nadu, India. Borodin and others (1971).

The magmatic nature of the calcites and their contamination with Na are indicated by the formation of rims of aegerine (brown) around biotites surrounded by calcites. Individual grains of aegerine are also found. The magmatic nature of the calcite is indicated also by its rounded and ellipsoidal nature, due to movements.

Analyses of the carbonate rocks also show the presence of TiO_2, P_2O_5 and F and are comparable to those of other carbonatites (Table III).

TABLE III

CHEMICAL ANALYSES OF THE CARBONATE ROCKS FROM HOGENAKAL AND OF CARBONATITES OF FEN AND EAST AFRICA

	1	2	3
TiO_2	0.22 - 0.38	0.12 - 2.51	0.2 - 0.4
MgO	3.84 - 8.23	1.62 - 10.59	0.8 - 18.8
CaO	32.16 - 40.51	23.35 - 50.47	24.1 - 54.5
P_2O_5	3.39 - 4.48	0.95 - 6.92	0.13 - 0.3
F	0.05 - 0.08	0.08 - 0.56	0.02 - 0.3

1. Range of values of four representative chip samples of carbonate rocks collected from trenches, Hogenakal, Tamil Nadu, India. Analysed in the C.T.A.L., Madras.
2. Carbonatite, Fen area of Norway
3. Carbonatite, East Africa

Source: *The Geology of Carbonatite* by Heinrich P 221, Table 8-1

Analyses of samples of the carbonate rocks for Sr and Ba indicate their presence in appreciable amount (Table IV).

TABLE IV

COMPARISON OE Sr-Ba VALUES OF CARBONATE ROCKS OF HOGENAKAL WITH THOSE OF LIMESTONES AND CARBONATITES OF OTHER AREAS IN TAMIL NADU

	1	2	3	4	5
Sr	1.00	0.03	0.01	0.70	0.75
Ba	0.05	0.01	0.003	0.13	0.06

1. Specimen of the carbonate rock collected from trench III, Hogenakal, Tamil Nadu. Analysed in the Geochemical Laboratory, T.M.D.P., Madras.
2. Crystalline limestone, Karur area, Tamil Nadu. (Deans and Powell—1968)
3. Crystalline limestone, Sankaridrug, Tamil Nadu. (Deans and Powell—1968)
4. Sovite
5. Dolomite carbonatite

(Sevathur, Tamil Nadu (Deans and Powell-1968))

The Sr and Ba values of the carbonate rocks more nearly approximate those of the carbonatites than those of crystalline limestones. Mention may be made about the floats of allanite that were found within the carbonate rocks.

The above characteristics suggest that these carbonate rocks are, in fact, carbonatites. Their intrusive nature, their association with pyroxenite and syenite, the

presence of accessory minerals apatite, magnetite, alkali pyroxenes and amphiboles, monazite, olivine (?) etc., the presence of Sr, Ba, Ti and P in high concentrations similar to those in carbonatites, and the presence of Ti, V and P in the accessory-magnetites, all support this conclusion. Further work on this occurrence is in progress.

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A NOTE ON THE OCCURRENCE OF GLACIAL PAVEMENTS ALONG NORTHERN BOUNDARY OF NORTH KARANPURA COALFIELD HAZARIBAGH DISTRICT, BIHAR

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Although glaciation during the Talchir period (Upper Carboniferous) in India is an accepted phenomenon, and Talchir deposits of glacial origin (e.g. boulder bed) have been described from various coalfields (Pascoe, 1959) direct evidences of glacial movement are particularly scanty. The only unequivocal evidence of ice action so far recorded is the presence of glacial striae near Irai on the Pranhita-Godavari valley (Fedden, 1875). The other reported occurrence of glacial scratches from Ajoy river in Raniganj coalfield in the Damodar valley region (Smith, 1963) is generally accepted with reservation.

In the course of recent geological studies in and around North Karanpura coalfield, the westernmost of the Damodar valley group of coalfields, several occurrences