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CARBONATITE BODY NEAR KAMBAMMETTU, TAMIL NADU

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Abstract

A small body of probable carbonatite of magnetite sovite variety occurs in the foothills east of Kambammettu, in Tamil Nadu. The rock is characterized by the presence of calcite in the main, with magnetite (lumps), apatite, barite, phlogopite, monazite and bastnaesite in subordinate quantity. Trace element study has revealed significant presence of P, Ba, Sr and some rare earth elements like Ce, La and Dy. The rock appears to have been emplaced along a NNE-SSW lineament.

Introduction

The purpose of this note is to record the occurrence of a small body of carbonate rock having carbonatitic affinities, on the foothills, east of Kambammettu near the Kerala-Tamil Nadu border. The occurrence is located at the break in slope between the Kambammettu hills in Kerala and the Kambam plains in Tamil Nadu (9°44′40″ : 77°14′35″) (see location map). It lies close to the road from Kambam to Kambammettu where the hill section begins. The carbonate rock seems to have been emplaced along a NNE-SSW lineament coinciding with the scarp of the hill range within the migmatitic and charnockitic terrain.

Petrography

Megascopically the rock is a coarse-grained inequigranular crystalline carbonate. Calcite, magnetite and mica are identifiable in hand specimen. Magnetite is seen disseminated throughout the rock as tiny crystals. Large lumps of magnetite measuring 15 to 20 cm in length form a conspicuous feature. It possesses feeble characteristics of a lodestone.

Apart from the essential mineral calcite and the easily identifiable magnetite, the rock has apatite, phlogopite in accessory quantities with occasional monazite, A few grains of barite were identified after heavy mineral separation. Bastnaesite, a carbonate of rare earth elements also has been identified.

Apatite is common among the accessories and medium to coarse ovoids are often seen veined by calcite. Monazite occurs as medium to coarse grained grains and is characterized by weak pleochroism in brownish yellow shades. Monazite shows parting parallel to 001, has deep birefringence and low extinction angle ($Z \wedge c \sim 5°$). Its 2 V_r was determined as 10°-15°. Monazite is replaced and veined by calcite. Calcite rings are seen around ovoids of monazite. Concentric rims of calcite in monazite also are seen along perlitic cracks developed during cooling.

The small grains of magnetite occur as embayed anhedral crystals in intimate association with monazite and also show veining by calcite. Phlogopite occurs as thin flakes and is commonly replaced by calcite along cleavage planes. It shows normal absorption in the pleochroic scheme from colourless or pale yellow to brownish yellow.

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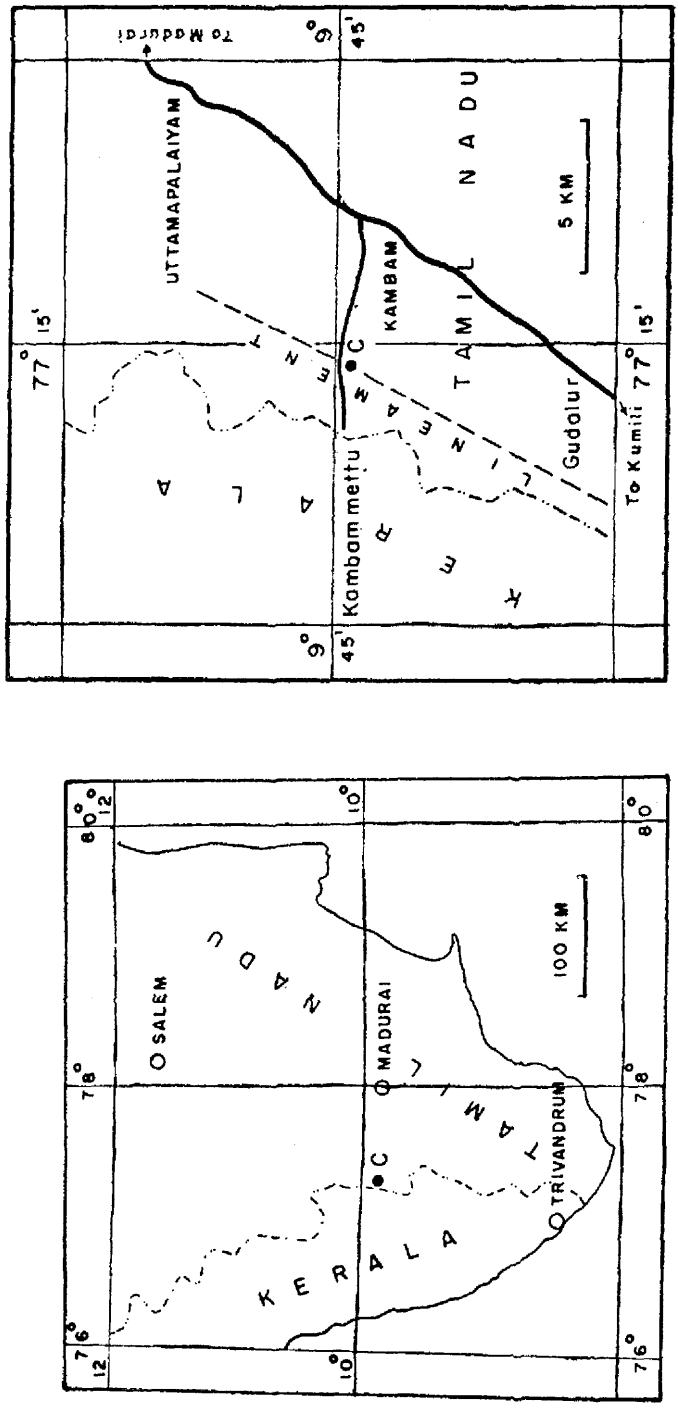

Figure 1. Location map of carbonatite occurrence (C) near Kambammettu

Trace elements

One grab sample of the rock was subjected to qualitative spectrographic analysis for elements characteristic of carbonatites in the Spectrograph Laboratory of Atomic Minerals Division, Bangalore. The result, as tabulated below (Table I) indicates that the sample has affinities for carbonatite.

TABLE I.

Concentration			
More than 1.0%	Between 1.0 and 0.1%	Less than 0.1%	Below detection limit
—	P	Ba, Sr, Ce, La Ti, Zr.	Nb, Ta, Th

Another grab sample was analysed by the spectrographic method in the GSI laboratories at Hyderabad and the incidence of REE and Y in the sample is compared with those of some known carbonatites of Tanganyika (Table II).

TABLE II.

(values in ppm)

	Present area (GSI)	Panda Hill Mbeya (Wedepohl 1969)	Sangu Complex (Wedepohl 1969)
Y	15	94.5	38
La	100	181	76
Ce	100	272	391
Gd	10	34	16.7
Dy	15	Nil	Nil
Ho	2	5.1	2.05
Er	8	14.5	4.5

Other elements determined by GSI are given below (values in ppm).

Ba : >1000, Sr : >1000, Ti : 50, Zr : <50

Nb : <30, Sn : <10, Ge : <5, Cr : <5

Gb : 3

Discussion

Trace and RE elements present in the rock are in agreement with the mineral assemblage described above. 0.1 to 1.0% P is an index of the occurrence of apatite and monazite. The relatively higher abundance of Sr and Ba suggests presence of

magmatic or carbonatitic calcite in which these elements get enriched. This forms an empirical parameter for differentiating carbonates of magmatic origin from those that have passed through the sedimentary cycle (Heinrich, 1966). A major part of the Ba, however, is due to barite. Ce and La which are in the range of 100 ppm, as also other rare elements such as Dy (15 ppm), Er (8 ppm), Gd (10 ppm), Y (15 ppm) etc.. are due to monazite and bastnaesite present in the rock.

An important NNE-SSW lineament marks the break in slope between the Western Ghats and the Kambam plains. Occurrence of the carbonate rock along this lineament adds support to the inference that it is a carbonatite body. Presence of minute disseminations and large lumps of magnetite possessing feeble natural magnetism and the occurrence of barite, phlogopite, monazite and bastnaesite lend further support to the carbonatitic nature of the rock.

Analysis of the magnetite (lump) has revealed that it has 78.13% Fe_2O_3 and 16.67% FeO as against the ideal composition of 69% Fe_2O_3 and 31% FeO for magnetite. The difference is probably due to partial alteration of magnetite to martite under deuteric stage of carbonatite.

The predominance of magnetite and the presence of apatite in relatively high concentration among the accessories and the comparatively low incidence of rare earth elements, qualify the rock to be classified as 'magnetite-apatite' variety of carbonatite (Pecora, 1956). As the rock is rich in calcite and magnetite, it can be described as a 'magnetite sovite'.

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