MANGANESE IN THE BOTTOM SEDIMENTS OF THE EASTERN PART OF BAY OF BENGAL

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Introduction

TWENTY bottom sediment samples covering different marine facies of the eastern part of Bay of Bengal (Lat. 7° 40′–20° 28′; Long. 92° 20′–97° 59′), which formed part of the collections made during a cruise on "Anton Brunn", a U.S. Oceanographic ship, in 1963 as a part of International Indian Ocean Expedition, were chemically analysed. The sediments were collected by dredge and snapper. As a part of the chemical study of the above sediments, this paper presents the results of the geochemical distribution of manganese in the clay-sized sediments, estimated colorimetrically by the persulphate method of Radar and Grimaldi (1961). The latitudinal zonation of carbonate content in the sediments of the eastern part of Bay of Bengal has already been reported by Durgaprasada Rao and Poornachandra Rao (1969).

Results and Discussion

The individual values of manganese content show large variation from a minimum of 0·015% to a maximum of 0·34% (Table I). However, it is observed, that there is a regional variation in Mn content, a decrease in the concentration of this element towards south. Higher amounts of Mn are found in the terrigenous sediments of the northern part (above the northern extremity of Andaman Islands) when compared to the southern part characterised by high carbonate content (45%). This type of antipathic relationship between carbonate content and manganese has been observed by Wakeel and Riley (1960), and Subba Rao (1964) in marine sediments.

The regional variation in the manganese content might be due to two factors: (1) Control exercised by the continental geological formations and the amount of discharge by the rivers, and (2) the influence exerted by the carbonate content on Mn precipitation in the depositional environment. However, the influence of the second factor does not seem to be important. If it were so, in the southern part, where the sediments contain appreciable carbonate content (45%), the CO_2 from the decomposing organic matter will first attack the carbonate with the formation of bicarbonate which in turn, will tend to raise the pH (Manheim, 1961). As the high pH and the presence of small quantities of solid calcium carbonate form the most favourable environment for the non-reversible precipitation of manganese in the solid phase (Rankama and Sahama, 1950), one would naturally expect higher amounts of manganese. But contrary to this only small amounts of manganese are present in the sediments of the southern part.

TABLE I
Manganese in the bottom sediments of the eastern part of Bay of Bengal

Sample No.	Location	Depth in fathoms	$CaCO_3$ %	Mn %
South of Mergui Archipelago:				
17	7° 40′ N, 97° 08′ E	202	37	0·025
19	8° 29′ N, 97° 59′ E	27	47	0·015
20	9° 13′ N, 97° 51′ E	35	58	0·020
24	10° 36′ N, 96° 39′ E	1360	21	0·160
22 B	10° 40′ N, 97° 10′ E	160	50	0·015
Off Andaman Islands:				
28–I	11° 20′ N, 92° 40′ E	30	37	0·015
28–II	11° 35′ N, 92° 40′ E	25	26	0·016
28	11° 49′ N, 92° 52′ E	49	16	0·020
28 B	12° 01′ N, 92° 55′ E	27	41	0·025
29	12° 23′ N, 93° 20′ E	36	98	0·016
Irrawaddy Delta Shelf:				
36 A	13° 00′ N, 97° 41′ E	37	15	0·340
37	13° 28′ N, 97° 19′ E	39	6	0·050
40	15° 19′ N, 96° 24′ E	10	2	0·095
42	15° 08′ N, 94° 04′ E	16	17	0·040
43	15° 08′ N, 94° 04′ E	30	12	0·055
44	15° 30′ N, 93° 20′ E	31	10	0·065
Off Brahmaputra Delta:				
50 A	19° 27′ N, 92° 32′ E	550	9	0·050
48	19° 41′ N, 93° 08′ E	21	5	0·085
47 B	19° 50′ N, 92° 55′ E	17	2	0·060
47	20° [illegible]8′ N, 92° 20′ E	11	6	0·055

Considering the first factor mentioned above, the Brahmaputra and Irrawaddy river systems draining respectively through reworked sedimentary formations and certain well-marked alluvium-covered areas, separated by belts of hilly country mainly composed of gneisses and basic intrusives (0·25 to 0·09 Mn) with notable manganese content (Chhibber, 1934), join the Bay of Bengal in the north-east. The sedimentary detritus discharged by the above rivers is mostly deposited in the northern part of the area resulting in the increase of Mn content. The southern part is practically devoid of river contribution of sediments from the land area. Thus the high manganese content of the northern part sediments may be ascribed to the significant contribution from the source material through rivers compared to the southern part.

Conclusions

From the above results, it is concluded that the northern part of the area under investigation has different type of sediments from that of the southern part. As far as manganese content in the sediments of the eastern part of Bay of Bengal is concerned, it is inferred, that the source of the sediments and the amount of discharge of rivers played rather important role than the prevailing environmental influence.

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HIGH TEMPERATURE K-FELSPAR IN A BASIC CHARNOCKITE OF KONDAVIDU, GUNTUR DISTRICT, ANDHRA PRADESH

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TWO hundred metres south-east of the village Kondavidu (Lat. N. 16° 15′ 40″; Long. E. 80° 15′ 50″) occurs coarse-grained basic charnockite forming hill-like mass. It shows dominantly granulitic and occasionally subophitic textures. In thin section it is composed of labradorite felspar, hypersthene, augite, K-felspar, quartz and biotite together with accessory apatite, magnetite and pyrite. The labradorite felspar ($An_{55-58\,\%}$) is seen mostly as twinned prisms and laths. The hypersthene occurs as anhedral plates with $2V_\alpha = 56°$ to $57°$, $(\gamma-\alpha) = 0\cdot017$, $\beta = 1\cdot702$ and pleochroic with α = salmon pink, β = pale yellowish-pink, and γ = pale green. Pale green augite having $2V_\gamma = 51°$, $\gamma : [001] = 40°$, $(\gamma-\alpha) = 0\cdot024$ and $\beta = 1\cdot680$ exhibits similar shape and size as that of hypersthene.

Microperthitic K-felspar belonging to the sanidine-anorthoclase group of the High albite series (Deer *et al.*, 1962) occurs as discrete crystals or patches within the labradorite felspar. The K-felspar has $\beta = 1\cdot522$ to $1\cdot523$ and variable optic axial angle ($2V_\alpha$) from 24° to 44° (determined on the universal stage). The optical characters have shown that the K-felspar grains having $2V_\alpha$ ranging from 24° to 34° are more abundant than the grains giving optic axial angles between 34° and 44°. The K-felspar is often found replaced by labradorite, and in such instances it occurs as patches within the latter. It constitutes 4·16% of the mode and it is found difficult to separate from the host rock for further investigation. However, the K-felspar takes the characteristic stain when the thin section of the basic charnockite is treated with sodium cobaltinitrite. The felspars show effects of strain. Anhedral quartz exhibits deformation lamellæ and strain shadows. Strongly pleochroic brick-red biotite is secondary after pyroxenes. Apatite occurs as prisms here and there. Magnetite and pyrite are seen as discrete grains and as granular inclusions in pyroxenes.

The basic charnockite of Kondavidu contains thin and elongated xenoliths of possibly semipelitic composition measuring about $0\cdot3 \times 6$ metres tapering at both ends, and these xenoliths are composed of the mineral assemblage almost similar to the host rock; hence