

Mineralogical and Chemical Diagenesis of the coastal sediment in the area from Sidi Abd El-Rahman to Mersa Matruh (Egypt)

Mohamed A. SHATA

National Institute of Oceanography and Fisheries, Kayet Bay, Elanfoshy, Alexandria (Egypt)

The area of study extends from Sidi Abd El-Rahma to Mersa Matruh for about 150 Km. It can be divided according to its morphology into two parts ; namely Gulf of Kanayis and Abu Hashaifa Bay (Fig.1).

Two types of sediments were collected those of bottom samples and the other collected from three successive ridges extending parallel to the North Western coast of Egypt. The aim of study is to follow up the mineralogical and chemical change during the course of the carbonate diagenesis.

A.- Emphasizes arising from the mineralogical investigations

1.- The first stage of diagenesis proceeds through the transformation of aragonite into low Mg-calcite in the Gulf of Kanayis.

2.- In Abu Hashaifa Bay the transformation of Mg-calcite into the more stable of carbonate minerals is not clear.

3.- The samples of the first ridge reveal that the transformation of aragonite into calcite becomes more obvious than that into Mg-calcite. Actually these comprise the middle stage of the diagenetic process.

4.- The last stage is accounted for the second ridge, where aragonite and Mg-calcite are converted into calcite, the transformation of aragonite into Mg-calcite is ceased.

The correlation between the different forms of the carbonate minerals indicates that :

a.- The transformation of aragonite into Mg-calcite decreases landward.

b.- The transformation of aragonite into calcite increases in the same previous direction.

c.- The last stage of diagenesis proceeds particularly in the second ridge.

Comparable study between the present work and that of (LYNN *et al.*, 1979) leads to conclusion that the diagenetic changes occur in a different form rather than that in both of the Mediterranean Coast of Israel (GAVISH & FRIEDMAN, 1969) and in Bermuda Island (RISTVIT, 1971), in which the early loss of Mg-calcite through the course of long term regional diagenesis had been achieved. For the short term local diagenesis the transformation of Aragonite into Mg-calcite is observed in the study area. These diagenetic processes have not signs in the sediments off Alexandria (EL-SAYED, 1974, STOFFER *et al.*, 1980) and the adjacent sediments of Arabs Bay (ANWAR *et al.*, 1981).

B.- Emphasizes arising from the chemical investigations

1.- The substitution of Ca for Mg is strong in the Gulf of Kanayis where the aragonite dominates. In the other studied area the substitution becomes lower. The reason for such chemical behaviour thought to be the increase of the other forms i.e. Mg-calcite and calcite on the expense of aragonite.

2.- Generally Mg-content reflects two important processes.

a.- Mg-calcite secretion from organisms, where there is positive correlation between Mg-content and Mg-calcite i.e. Mg increases in the area which covers with Mg-calcite secreting organisms.

b.- The diagenetic process by which Aragonite transformed into Mg-calcite.

3.- The Sr content of the study area shows that the higher content of Sr are linked with the higher values of the aragonite. It becomes lower under the influence of the transformation of the aragonite into the other forms of the carbonate minerals. Generally Mn increases in the existence of calcite owing to its incorporation in the crystal lattice of the calcite (ICHIKUNI, 1983).

References

- ANWAR (Y.-M.), EL-ASKRY (M.-A.) & NASR (S.-M.), 1981.- Petrography and origin of the oolitic carbonate sediments of Arabs Bay, Western part of the Continental shelf of Egypt. *Neues Jb. Geol. Palaontol. Monatsh.* (Stuttgart), 2, 12 Abb, pp. 65-75
- EL-SAYED (M.-K.), 1974.- Littoral and shallow water deposits of the continental shelf area of Egypt, off Alexandria. *Thesis. Univ. Alexandria*, 150 p.
- GAVISH (E.) & FRIEDMAN (G.-M.), 1969.- Progressive diagenesis in Quaternary to late Tertiary carbonate sediments, Sequence and time scale. *J. Sed. Petrol.*, 39, pp. 980-1006.
- ICHIKUNI (M.), 1983.- Anionic Substitution in Calcium Carbonate ; in *Augustithis*, N. (Ed.) ; The significance of trace elements in solving petrogenetic problems and controversies ; (Athens), pp. 83-94.
- LYNN (M.), WALTER (N.) & HANOR (S.-J.), 1979.- Orthophosphate effect on the relative stability of aragonite and magnesium calcite during early diagenesis. *J. Sed. Petrol.*, 49/3, pp. 937-944.
- RISTVET (B.-L.), 1971.- The progressive history of Bermuda. *Bio. Stud. Res. Publ.*, 9, pp. 118-157.
- STOFFER (P.), SUMMERHAYES (C.-P.) & DOMINIK (J.), 1980.- Recent pelletal carbonate sediments off Alexandria, Egypt. *Marine Geology*, 34.