Relationship between clay mineralogy and thermal maturity of Neogene-Quaternary shales in Ras El-Barr well No. 1, off shore Nile Delta, Egypt

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The Nile Delta basin contains a thick section of Neogene-Quaternary strata that have a different values of thermal maturity as determined by vitrinite reflectance. The studied area in the Esatern part of the off shore Nile Delta basin is represented by the Ras El-Barr well No. 1. Clay mineralogy, the half-width of 10 A° illite and chlorite peaks, and the A/H (Area under peak/peak height) are systematically related to thermal maturity. Fig. 1, see GUTHRIE *et al.*, 1986 and HEROUX *et al.*, 1979.

The most important changes in clay minerals with increased depth of burial are: (a) the regular reduction of expandable layers; (b) the gradual increase in the crystallinity of illite and chlorite (decrease of the half width value) with depth. Table 1.

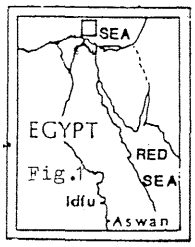

Fig. 1

The results of this study suggest that, in the absence of vitrinite, the values of half width of 10 A° peak and A/H parameters of illite (especially glycolated) may be used quantitatively to estimate the levels of thermal maturity; and consequently as indicators for the differentiation between the above and below oil window zones and to approximate hydrocarbon generation-preservation stages of potential source rocks.

Table 1. Summary of clay mineral data and the mean values of the level of organic metamorphism (LOM) (Hood *et al.*, 1975), the vitrinite reflectance R_o, and T_{max}, the maximun bottom hole temperature of each Formation.

Age	Formation	Label	Depth cm	Nonglycolated A/H I	Nonglycolated Half-width I	Nonglycolated Half-width C	Glycolated A/H I	Glycolated Half-width I	Glycolated Half-width C	Clay minerals Identified	T_{max} °C	R_o	LOM
Pleisto-cene	Mit Ghamr	B_1	599	2.64			0.89			Smectite dominates			
			903	2.17			1.43			"			
			990	1.68			1.45	0.72	0.71	(I),mixed layer clay,(C)	49 -		4.6
Upper Pliocene	El-Wastani	B_2	1060	1.28	1.32	0.40	0.80	0.40	0.48	(I),mixed layer clay,(C)	57	0.21	5.0
			1212	1.05	0.62	0.35	1.06	0.60	0.51	(I),(C),minor mixed layer clay			
Middle & lower Pliocene	Kafr El-Sheikh	B_3	1351	0.91	0.56	0.36	0.88	0.52	0.40	(I),(C),minor mixed layer clay	95.1	0.31	6.7
			1569	0.56	0.42	0.26	0.60	0.43	0.28	" " " "			
			1686	0.75	0.52	0.33	0.84	0.62	0.36	" " " "			
			1854	0.80	0.65	0.26	0.88	0.60	0.28	" " " "			
			1989	0.72	0.47	0.23	0.64	0.42	0.38	" " " "			
			2550	0.57	0.39	0.44	0.55	0.38	0.40	" " " "			
			2670	0.54	0.38	0.28	0.53	0.38	0.26	" " " "			
Lower Pliocene	Abu Madi	B_4	2799	0.49	0.38	0.35	0.46	0.32	0.35	" " " "	102	0.46	7.0
Miocene	Sidi Salem	B_6	2920	0.57	0.36	0.35	0.39	0.28		(I),(C)	140	0.57	9.6
			2998	0.56	0.35	0.37	0.38	0.26		(I),(C)			

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

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The area of study extends from sidi Abd El-Rahma to Mersa Martruh for about 150 Km. It can be divided according 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 succive ridge 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 arised from the mineralogical investigations

1.- The first stage of diagenesis proceeds through the transformation of aragonit 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 aragonit into calcite become more obvious than that into Mg-calcite. Actually these comprises the middle stage of the diagenetic process.

4.- The last stage is accounted for the second ridge, where aragonit 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 aragonit into Mg-calcite decreases landward.

b.- The transformation of aragonit 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 diagenic changes occur in a different from 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 diagenesist the transformation of Aragonit 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 arised from the chemical investigations

1.- The substitution of Ca for Mg is strong in the Gulf of Kanayis where the aragonit 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 aragonit.

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 wich covers with Mg-calcite secreting organisms.

b.-The diagenetic process by which Aragonit 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 aragonit. 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).

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