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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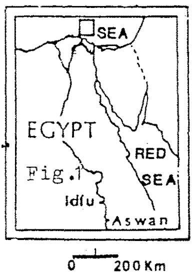
The Nile Delta basin contains a thick section of Neogene-Quaternary strata that have a different values of thermal maturity as determined by vitrinite reflectance. The studied area in the Esatern part of the off shore Nile Delta basin is represented by the Ras El-Barr well No. 1. Clay mineralogy, the 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.



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 maximum 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
Pleistocene	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)			
			1212	1.05	0.62	0.35	1.06	0.60	0.51	(I),(C),minor mixed layer clay	57	0.21	5.0
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			
			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	0.29	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	" " " "	95.1	0.31	6.7
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)			
			2998	0.56	0.35	0.37	0.38	0.26		(I),(C)	140	0.57	9.6

References

GUTHRIE (J.), HOUSEKNECHT (D.) & JOHNS (W.), 1986.- Relationships among vitrinite reflectance, illite crystallinity and organic geochem. In Carb. strata, Quachita mountains, Oklahoma and Arkansas. *AAPG Bull.* v. 70, pp. 26-33

HEROUX (Y.), CHAGNON (A.) & BERTRAND (R.), 1979.- Compilation and correlation of major thermal maturation indicators. *AAPG Bull.* v. 63, pp. 2128-2144.