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PETROGRAPHY AND GOCHEMISTRY OF SOME MIDDLE EOCENE LIMESTONES (MOKATTAM FORMATION) AT THE AREA EAST OF BENI SUEF, NILE VALLEY, EGYPT.

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ABSTRACT

The Microfacies associations of Mokattam Formation at Gebel El-Alalma and Gebel Homret Shaiboun located in the area lying east of Beni Suef can be classified as Globigerina biomicrite, foraminiferal biomicrite, foraminiferal dolomitic biomicrite and bivalve pelmicrosparite. Alteration of calcite to microsparite is met with in both localities whereas dolomite crystals are developed only in Gebel Homret Shaiboun section. These facies indicate that the environment prevailing during the deposition of this formation was marine. The limestones of Gebel El-Alalma were deposited in deep marine environment while the section of Gebel Homret Shaiboun was most probably deposited in comparatively shallower water conditions (near shoreline) as evidenced by the relatively higher amounts of iron oxide, sodium and soluble chlorides as well as sulphates in some beds. Precipitation of halite and gypsum and the deficiency of clastic provision from land suggest that arid climate was prevailing during the deposition of these beds.

INTRODUCTION

The exposed Eocene rocks at the east of the Nile Valley were the subject of several geological studies. Published investigations concerning the lithostratigraphy and biostratigraphy of Eocene strata along the Nile Valley are numerous as e.g. Ansary and Ismail (1956), Said (1962), Bishay (1966), Boukhary (1970), Zaghloul (1974), Hassan *et. al.*, (1978), etc. On the other hand, petrographical studies were carried out by several authors as e.g. Faris and Soliman (1952), Ghorab and Ismail (1957), Hassan (1966), Akaad and Naggar (1967), Khadr (1972), Hanna (1977), El-Gindi (1978), Abd El-Wahab (1979), Soliman and Korany (1980), etc. The previous geochemical studies include the work of Kabesh and Hamada (1954), El-Hinnawi and Loukina (1972), Kamel *et. al.*, (1982), Abd El-Maguid (1984), etc.

The main objective of this work is to carry out detailed petrographical and geochmical studies on some Eocene rocks collected from two stratigraphical sections located at Gebel El-Alalma and Gebel Homret Shaiboun in the area lying to the east of Beni Suef (Fig. 1). The exposed Eocene rocks in the area of study (Hassan *et. al.*, 1978) fall into three stratigraphic units namely Mokattam Formation, the Qurn Formation and Wadi Hof Formation. These units belong to Middle and Upper Eocene. The studied rocks are related primarily to Mokattam Formation of Middle Eocene age.

For the purpose of the present investigation, two sections are described, measured and sampled. A total of 17 samples were collected from the indurated rocks. The petrographic characteristics and the microfacies associations are identified by microscopic examination of thin sections. The mineral contents are quantitatively determined by X-ray diffractometry. The gochemical study includes complete chemical analysis of bulk rock samples using complexometric, gravimetric, colorimetric, flame photometric and atomic absorption spectrophotometric techniques. The following constituents have been determined: Sio_2, A.I.R. (acid insoluble residue), $Al_2 O_3$, $Fe_2 O_3$, MgO, MnO, $Na_2 O$, $P_2 O_5$, $H_2 O^-$, L.O.I. (Loss on ignition), SO_3^{--}, Cl^-, and Sr. The precision and the accuracy of the obained data are found satisfactory and therefore applicable in the present geochemical investigation.

The results of these interrelated studies are used to interpret the environmental conditions prevailed during the deposition of the rocks under consideration.

PETROGRAPHY

The lithologic succession of Mokattam Formation at Gebel El-Alalma section (about 13.5 m thick) and at Gebet Homret Shaiboun section (about 37.5 m thick) are presented in Figs. (2) and (3) respectively. The section of Gebel El-Alalma includes 5 beds which are composed mainly of yellowish white chalky limestones. At Gebel Homret Shaiboun, the section is composed of yellowish to brownish white hard limestone with ocasional clay, gypsum and sand intercalations.

(A) Microfacies Associations

The classification of Folk (1959) for carbonate rocks is followed in the present study. The limestones of Mokattam Formation in the investigated localities can be classified as Globigerina biomicrite, Bivalve Pel-microsparite, Foraminiferal biomicrite and foraminiferal dolomitic biomicrite facies.

1 - Globigerina Biomicrite Facies :

The microfacies was recorded in all samples examined representing beds No. 1, 2, 4 and 5 in Gebel El-Alama. In thin section, the rock consists mainly of very fine calcite ooze enclosing very small shells of *Globigerina, Nodosaria* and well preserved fragmented shells. Some opaque and ferruginous materials are distributed haphazardly in the matrix. The shells are crystallized to sparry calcite in few parts and also some of the groundmass is crystallized to sparite showing a mosaic texture (Fig. 4 and 5).

2 - Bivalve Pel-microsparite facies :

This microfacies was recorded in bed No. 2 in the lowest part of Gebel Homret Shiboun. The rock consists mostly of microcrystalline calcite matrix with occasional rounded pellets of carbonate matenial (Fig. 6). These rounded pellets are found as dust. Bivalves ar the only fragmented shells observed and crystallized partially to sparry calcite. The microcrystalline calcite matrix shows aggrading recrystallization to sparry calcite in few parts characterized by well defined mosaic texture (Fig. 7). The rock contains finely disseminated clayey materials and few spots of iron oxides.

3 - Foraminiferal Biomicrite Facies :

This microfacies was detected in beds No. 4, 8, 10 and 11 at Gebel Homret Shaiboun succession. The rock consists mainly of shells of foraminiferal species such as *Globigerina, Textularia, Operculina, Rotalia, Miliolides* and *Orbitolites* embedded in yellow microcrystalline calcite matrix (Fig 8). Aggrading recrystallization to sparry calcite is observed in some shell walls. The allochems are non-oriented. Minor amounts of subangular to subrounded ill sorted quartz grains are scattered (Fig. 9).

4 - Formainiferal Dolomitic Biomicrite Facies :

This microfacies is detected in bed No. 6 in the section of Gebel Homret Shaiboun. This rock is composed mainly of fine microcrystalline calcite associated with dolomite rhombs. The dolomite rhombs are zoned with cloudy centres and clear rims and occasionally locked some quartz grains. The microfauna are rare and represented by *Globigerina* and *Bolivina* species.

(B) Mineralogical investigation using X - ray Data

The variations in the non-clay minerals in the collected samples from Mokattam Formation at Gebel El-Alalma and Gebel Homret Shaiboun sections and clay minerals in the latter section are discussed here using the results of X -ray analysis. The vertical distribution of the detected minerals is presented on Figs. (10) and (11).

From the obtained data, it is evident that Mokattam Formation at Gebel El-Alalma and Gebel Homret Shaiboun is characterized by the presence of calcite as a major constituent. The vertical distribution of calcite indicates that mineral in the section of Gebel El-Alalma increases gradually from the lowest part, with the exception of bed No. 4 which shows a decrease in its content.

-- On the other hand, the vertical distribution of minerals in the analyzed rock samples from Gebel Homret Shaiboun reveals that the amount of calcite is very low in the lowest part of the section represented by bed No. 1 then its values show a remarkable fluctuation in the other successive beds. The notable decrease in calcite content in bed No. 6 is due to the presence of appreciable amounts of dolomite content which replaced calcite partially. This reflects that dolomitization affected calcite in nearly the middle part of the section. The section of Homret Shaiboun is characterized also by the presence of quartz, halite and gypsum as minor consi tuents in the different beds, though bed No. 3 contains a consderable amount of halite.

The data obtained from the examination of sample No. 1 from Geb Homret Shaiboun section indicates that the clay minerals present are mainly kaolinite with subordinate illite. This sample was selected because of its high amount of Al_2O_3.

GEOCHEMISTRY

The results of chemical analysis of Mokattam Formation at Gebel El-Alalma and Gebel Homret Shaiboun are shown in Tables 1 and 2. The minimum, maximum and average values of the obtained chemical data are given in Table 3. The distribution of the major components is presented as histograms on Fig. 12.

The geochemical characteristics of Mokattam Formation at Gebel El-Alalma and Gebel Homret Shaiboun can be summarized in the following : -

CaO and L.O.I. are remarkably high in the samples of Gebel El-Alalma and Gebel Homret Shaiboun which indicates that calcite constitutes the main bulk of both sections. However, the section of Gebel Homret Shaiboun shows a relatively lower amounts of CaO and L.O.I. The high abundance of MgO in some samples of the latter section reflects that dlomite is more pronounced in this section.

Te detrital materials are abundant in some beds of Gebel Homret Shaiboun as evidenced by the relatively higher content of SiO_2, A.I.R., Fe_2O_3, Al_2O_3 and K_2O.

The triangular diagram illustrating the correlation of the rock samples on the basis of $CaCO_3$, $MgCO_3$ and A.I.R. (Fig. 13) indicates that all samples of Gebel El-Alalma section and most samples of Gebel Homret Shaiboun section are localized towards the $CaCO_3$ end whereas few samples from the latter section are scattered between $CaCO_3$ end and A.I.R. end. This reflects that the rocks of Mokattam Formation vary between pure limestone and impure limestone rich in terrigneous material.

On the other hand, the ternary plot of SiO_2, (CaO + MgO) and Al_2O_3 of Gebel Homret Shaiboun samples (Fig. 14) indicates that most of the rock samples are related to the category of limestone and dolostone where diagenetic modifications are possible and only one sample is related to sandy shale category.

Also, calcium forms a moderate negative correlation with the acid insoluble residue (Fig. 15) in Gebel El-Alalma (r=0.45) and strong negative correlation in Gebel Homret Shaiboun samples which indicates that most calcium is present in the carbonate phasa as evidenced from its intimate relationship with L.O.I.

The scatter diagram between the total iron expressed as Fe_2O_3 and acid insoluble residue in Mokattam Formation (Fg. 16) shows a strong positive correlation in samples of Gebel El-Alalma (r = + 0.79) and Gebel Homret Shaiboun (r = + 0.70) which indicates that most iron is intimately attributed to the acid insoluble residue.

The concentrations of sulphates and soluble chlorides are considerably higher in the section of Gebel Homret Shaiboun. The sulphates are most probably occurring in gypsum because CaO content n some samples is relatively higher than the corresponding loss on ignition and thus the excess CaO is present as sulphates. As a genral rule, the soluble chlorides are concordant with the amounts of sodium which points out to the presence of halite.

The high concentrations of manganese and phosphorous in Gebel Homret Shaiboun relative to those in Gebel El-Alalma may be an indication to its adsorption on clay minerals (Turekian and Wedepohl, 1961; Bencini and Turi, 1974).

The strentium abundance ranges from 922 ppm to 1016 ppm in Gebel El-Alalma section with an average of 962 ppm whereas its content in Gebel Homret Shaiboun varies between 275 ppm and 1125 ppm with an average of 727 ppm.

Tt is noted that the anomalously high or low contents of Sr are mainly confined to Gebel Homret Shaiboun section. The average values of both sections are comparable with the average of carbonate rocks as reported by Turekian and Wedepohl (1961) being 610 ppm. The relationship between Sr and Ca. (Fig. 17) shows a strong positive correlation in Gebel El-Alalma samples (r = 0.67) and in Gebel Homret Shaiboun samples (r = 0.79).

DISCUSSION OF RESULTS

The main characteristic features of Mokattam Formation limestones as well as syntheses of environmental conditions that originally prevailed during their deposition will be discussed in the following :

1 - Biomicritl limestone varieties constitute the main bulk of Mokattam Formation. Only Globigerina biomicrite is reported in Gebel El-Alalma section, while in Gebel Homret Shaiboun, the limestone varieties include form inferal biomicrite, Bivalve pel-microsparite and Foraminiferal dolomitic biomicrite. These microfacies associations provide a strong evidence that during the Middle Eocene, the facies of Mokattam Formation at the studied area were deposited under open marine conditions and the section of Gebel El-Alalma of this formation was most probably deposited in relatively deeper conditions suitable for the planktonic species such as Globigerina.

2 - Terrigenous matter as represented by quartz and clay are only present in small amounts in the section of Gebel Homret Shaiboun. This relects deficiency in the clastic provision from land to the environment of deposition which may be attributed to the scarcity of inflowing streams to the environment.

Clay minerals as identified by X - ray examination inclde kaolinite and illite. Kaolinite develops through continental chemical weathering of silicates mainly feldspars. Kaolinite can be transformed to illite by the action of salt water (Kulbicki and Millot, 1963). Also, illite can be formed by combination of excess silica and alumina in marine depositional basins. Keller (1970) regarded that both potassium and hydrogen are needed for the formation of illite. Illite is detected in sample No. 1 at Gebel Homret Shaiboun section where its potassium content reaches 0.77%.

3 - The carhonate rocks were subjected to certain diagenetic alterations such as :-

(a) Recrystallization. It is noted in both sections of Gebel El-Alalma and Gebel Homret Shaiboun. Recrystallization process is belonging to the S - phase in which grain growth of an original cryptocrystalline to microcrystaline caleite altered into microsparite. It is mainly of the aggrading recrystallization type of Folk (1959).

(b) Dolomitization. It is detected only in the section of Gebel Homret Shaiboun. Dolomite cyrstals which are commonly zoned were developed early diagenetically, related to interstitial solutions and process of remobilization of magnesia incorporated in the sediments (Soliman and Korany, 1980). According to Folk and Land (1975), the salinity as well as Mg / Ca ration may control dolomitization.

4 - The environmental significance of the obtained geochemical data cab be elucidated in the following aspects :-

(a) The presence of calcite as the most predominating mineral in most beds of Mokattam Formation points out to an alkaline medium of the environment of deposition (pH more than 7.8).

(b) The shallower marine environment (near shoreline) at Gebel Homret Shaiboun section is evidenced by the relatively higher iron oxide in most beds. The evaporation effect due to the prevailing arid climate during the deposition of these beds as well as the semirestricted marine environment are evidenced by the contents of sods, soluble chlorides, lime and sulphates which are precipitated as halite and gypsum.

(c) Although the iron oxide content is high reachng up to 8.22% Fe_2O_3, manganese content is low in the section of Gebel Homret Shaiboun. Carvagal and Landergren (1969) pointed out that variotions in the depositional environment such as redox potential, pH and the amount of detritus are the principal factors affecting the concentration of manganese in marine sediments. Regarding the small ionic potential of manganese, it is highly leached even in very weakly acidic medium (Goldschmidt, 1954). Because of its high pH (more than 9.0), the different valences of manganese cause its transformation from one form to another and its migration with marine water far from iron. This is again a reflection for the shallow marine environment of deposition.

CONCLUSIONS

The lemestones of mokattam Formationat Gebel El-Alalma and Gebel Homret Shaiboun are distinguished by the abundance of Globigerina biomicrite, foraminiferal biomicrite, foraminiferal dolomitic biomicrite and bivalve pelmicrosparite facies whic are depesited under deep marine to comparatively shallow marine environment of deposition. They are mostly formed of cale te with some dolomite, halite, gypsum quartz and clay as revealed by X - ray analysis. From the geochemical point of view, this formation is characterized by high abundance of CaO and loss on ignition and low abundance of A.I.R., SiO_2, $Al_2 O_3$, MgO, MnO and K_2O indicating impoverishments of clastic provision.

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Table 1 : Results of chemical Analyses of the major and trace constituents of Mokattam Formation at Gebel El - Alama .

Sample No.	SiO_2 %	Al_2O_3 %	F_2O_3 %	CaO %	MgO %	Mn_2O %	Ma_2O %	K_2O %	P_2O_5 %	H_2O^- %	L.O.I %	SO_3 %	Cl^- %	OCl^- %	A.I.R. %	$MgCO_3$ %	$CaCO_3$ %	$CaSO_4$ %	NaCl %	Ca/Mg ratio	Sr^{++} ppm
1	–	tr	0.145	52.20	2.04	tr	0.59	tr	0.011	0.65	42.75	0.32	0.76	0.17	1.97	4.3	93.0	0.54	1.25	30.4	936
2	–	tr	9.131	53.63	0.51	tr	tr	tr	0.0.17	1.98	42.97	0.13	tr	tr	0.10	1.1	95.7	0.47	tr	122.8	992
3	–	tr	0.247	53.34	0.51	0.005	0.59	tr	0.012	0.27	42.33	0.10	0.76	0.17	2.50	1.1	95.5	tr	1.25	122.2	1016
4	–	tr	0.117	53.63	0.51	tr	0.59	tr	0.014	0.55	42.97	0.30	0.67	0.15	1.05	1.1	95.6	0.51	1.11	122.8	943
5	–	tr	0.233	53.29	0.51	0.005	0.95	tr	0.015	0.26	42.67	0.30	1.08	0.25	2.27	1.1	95.0	0.50	1.78	120.6	922

(-) : Not Determined (tr) : Trace (N.D.) : Not Detected (L.O.I.) : Loss on Ignition (A.J.R.) : Acid Insoluble Residue

Table 2 : Results of chemical Analyses of the major and trace constituents of Mokattam Formation at Gebel Homret Shaiboun

Sample No.	Sio_2 %	Al_2O_3 %	F_2O_3 %	CaO %	MgO %	Mn_2O %	Ma_2O %	K_2O %	P_2O_5 %	H_2O' %	L.O.I %	SO_3 %	Cl' %	OCl' %	A.I.R. %	$MgCO_3$ %	$CaCO_3$ %	$CaSO_4$ %	NaCl %	Ca/Mg ratio	Sr^{++} ppm
1	29.92	9.50	8.42	8.58	9.51	tr	8.91	0.77	0.040	3.06	15.06	8.36	10.21	2.35	33.33	1.1	4.8	14.2	16.8	19.7	275
2	--	tr	0.58	45.76	0.55	0.011	2.23	tr	0.059	1.03	38.83	0.39	2.55	0.59	9.54	1.2	81.0	2.7	4.2	84.0	766
3	12.70	0.64	5.62	36.47	0.51	0.020	7.02	0.28	0.240	1.03	26.21	4.04	8.01	1.85	13.55	1.1	59.8	6.9	13.2	21.8	825
4a	11.80	3.06	3.41	42.19	2.30	0.055	0.31	0.70	0.380	0.78	34.97	0.25	0.14	0.03	17.50	4.8	74.8	0.4	0.2	37.2	828
4b	-	tr	0.44	47.91	1.53	0.005	tr	tr	0.013	0.97	40.96	3.85	tr	tr	5.09	3.2	80.5	6.5	tr	46.4	896
5	2.40	0.64	1.59	50.05	1.28	tr	0.16	0.21	0.020	1.41	38.64	4.44	tr	tr	2.40	2.7	83.6	7.6	tr	7.9	1125
6	--	tr	0.74	37.10	5.62	0.003	1.08	tr	0.016	0.44	39.62	0.36	1.24	0.29	14.59	11.8	65.6	0.6	2.0	31.5	732
7	5.06	2.39	4.21	47.15	1.78	0.049	2.36	0.56	0.111	0.75	29.62	5.13	2.70	0.62	5.82	3.8	77.5	8.7	4.5	14.9	849
8	12.14	1.53	2.00	41.47	3.32	0.138	0.47	0.28	0.062	tr	48.80	0.70	0.31	0.07	12.31	7.0	72.9	1.2	0.5	113.7	650
9	--	tr	0.26	49.34	0.51	0.003	0.74	tr	0.016	0.01	39.26	2.29	0.85	0.20	7.50	1.1	69.1	3.8	1.4	40.5	742
10	6.38	0.89	2.41	43.15	1.27	0.049	4.12	0.43	0.151	tr	37.16	0.92	4.70	1.08	6.49	2.7	65.7	1.6	7.8	20.7	532
11	5.04	1.15	3.41	48.20	2.76	0.002	0.36	0.28	0.171	0.20	39.52	0.58	0.14	0.03	6.19	5.8	85.1	1.0	0.2	33.9	858

(-) : Not Determined (tr) : Trace (N.D.) : Not Detected (L.O.I.) : Loss on Ignition (A.I.R.) : Acid Insoluble Residue

Table 3: Average, Minimum and Maximum contents of the major and trace constituents in the studied rocks of Mokattam Formation

Constituents	Gebel El-Alalma N = 5	Gebel Homret Shaiboun N = 12
SiO_2%	-- / --	10.68 / 2.40 - 29.92
Al_2O_3%	tr / tr	2.48 / 0.64 - 9.50
Fe_2O_3%	0.175 / 0.117 - 0.47	2.76 / 0.26 - 8.42
CaO%	53.22 / 52.20 - 53.65	41.45 / 8.58 - 50.05
MgO%	0.82 / 0.51 - 2.04	1.83 / 0.51 - 5.62
MnO%	0.005 / tr - 0.005	0.034 / 0.002 - 0.138
Na_2O%	0.68 / 0.59 - 0.95	2.52 / 0.16 - 8.91
K_2O%	tr / tr	0.44 / 0.21 - 0.77
P_2O_5%	0.014 / 0.011 - 0.017	0.11 / 0.01 - 3.06
H_2O^- %	0.74 / 0.26 - 1.98	0.97 / 0.01 - 3.06
L.O.I. %	42.74 / 42.33 - 42.97	34.89 / 15.06 - 40.96
SO_3^{--}%	0.23 / 0.10 - 0.32	2.61 / 0.52 - 8.36
Cl^-%	0.28 / 0.67 - 1.08	3.09 / 0.14 - 10.21
A.I.R. %	1.58 / 0.10 - 2.50	11.19 / 1.40 - 33.33
Sr^{++}ppm	912 / 882 - 1016	757 / 275 - 1125

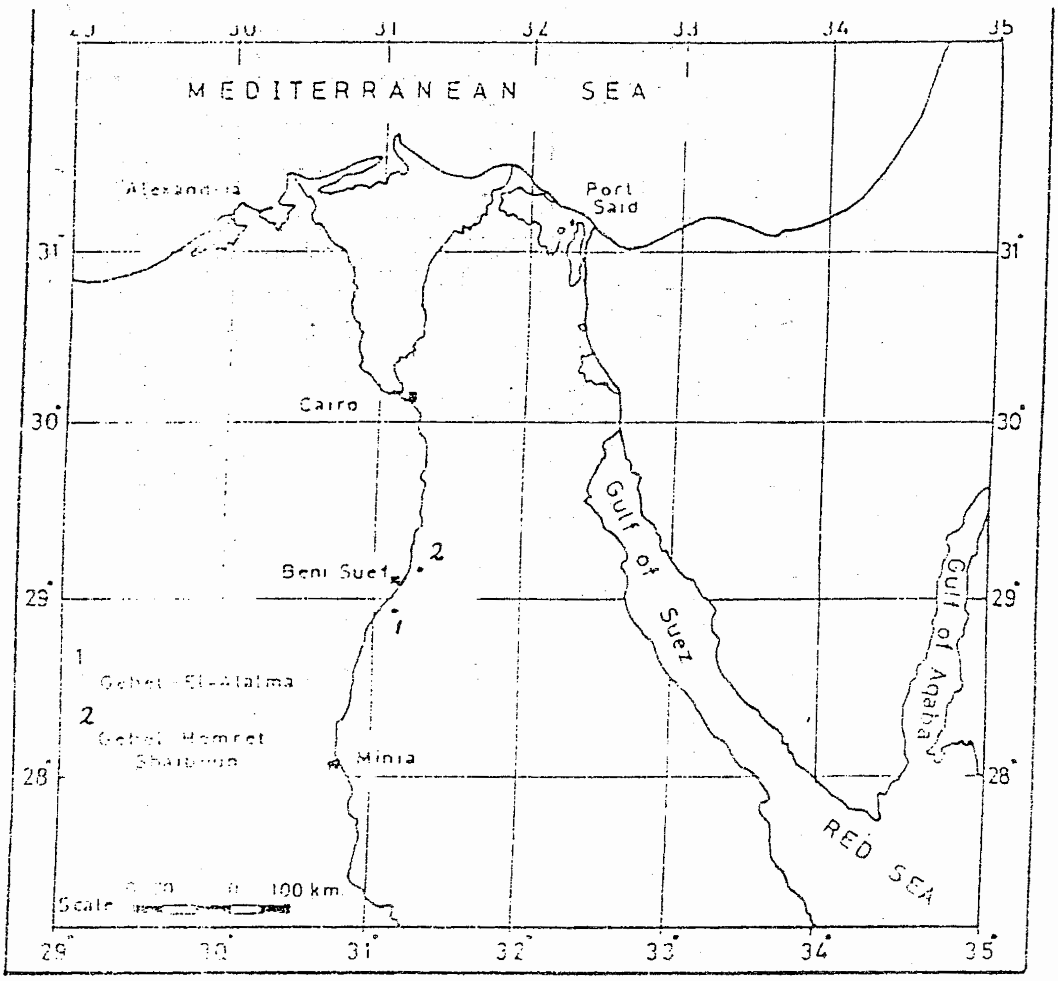


Fig. (1) : Location Map of the study area.

Stage	Age	Fm	bed No	Thickness in (m)	Sample No.	Log.	Lithological Description
MIDDLE EOCENE	LUTETIAN	MOKATTAM FORMATION	5	2	5		Limestone, yellowish white Chalky, hard containing microfossils of Globigerina.
			4	4	4		Limestone "Globigerina biomicrite", yellowish white chalky hard containing microfossils of Globigerina.
			3	3	3		Limestone, yellowish white hard and compact fine grained with rare fossils.
			2	2	2		Limestone, "Globigerina biomicrite" White chalky containing microfossils of Globigerina.
			1	2.5	1		Limestone, yellowish white packed containing Globigerina.

Fig. (2) : Measured surface columnar section of Mokattam Formation at Gebel El Alalma..

Limestone

0 1 2 3 4 m
Scale

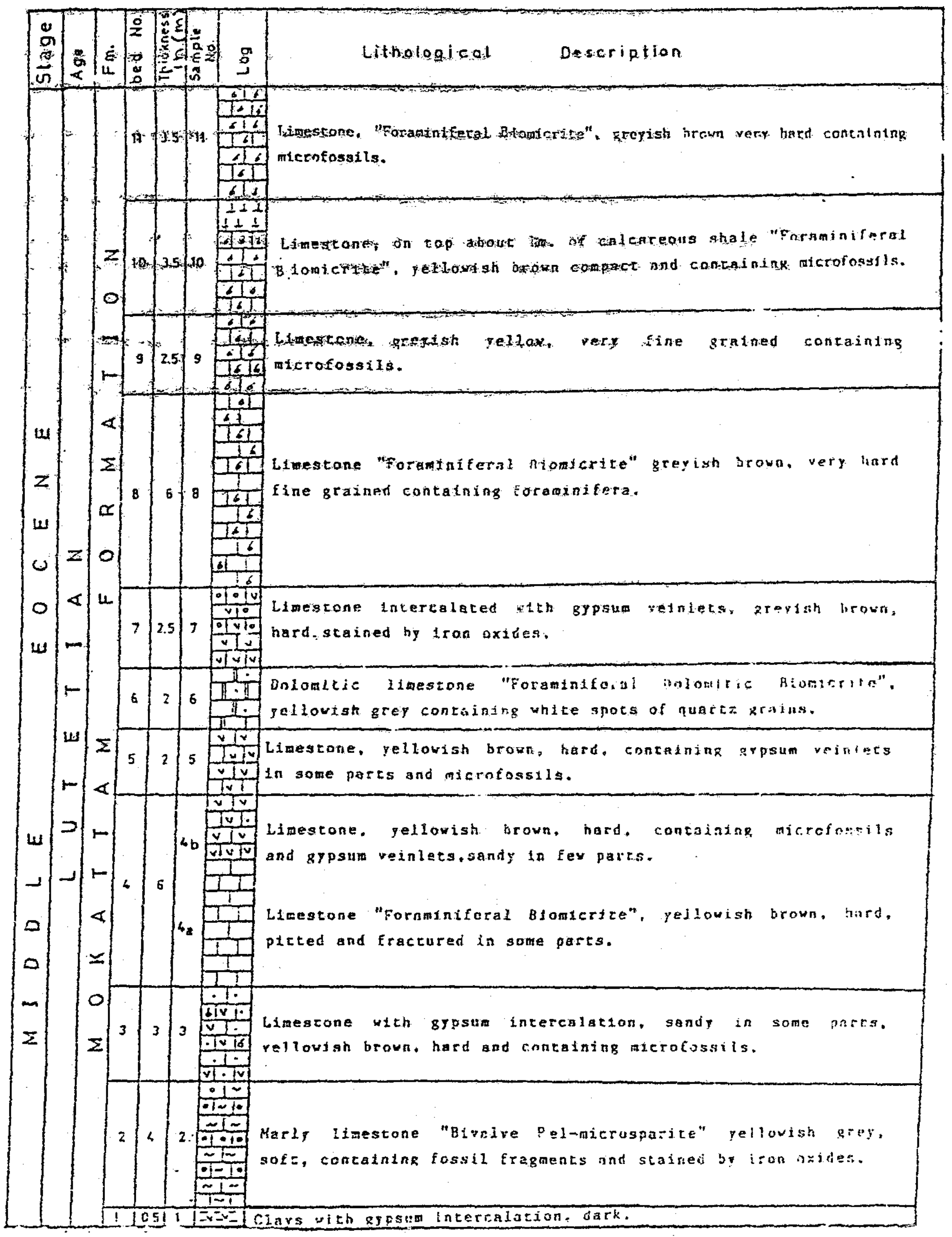
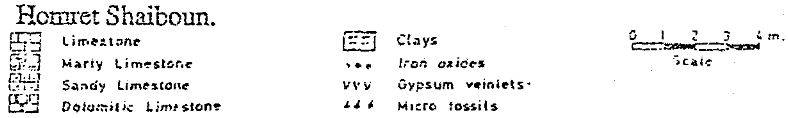


Fig. (3) : Measured surface columnar section of Mokattam Formation at Gebel Homret Shaiboun.



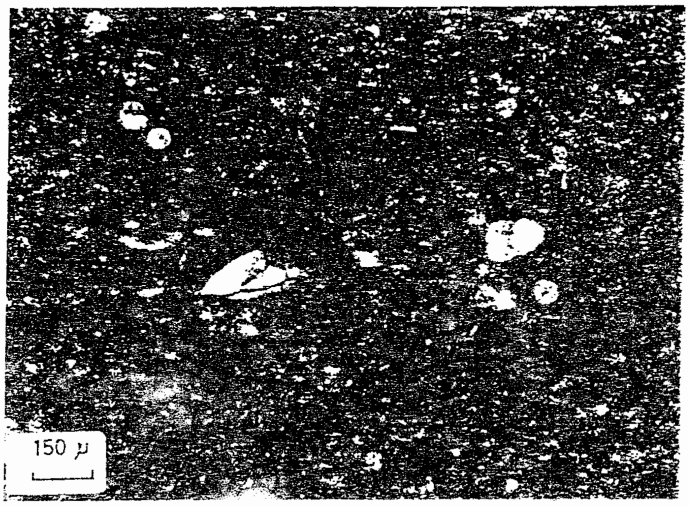


Fig. (4) : Photomicrograph of Globigerina Biomicrite showing Globigerina species embedded in micritic groundmass ":Sample No. 2 Gebel El-Alalma, Mokattam Formation".

P.L.

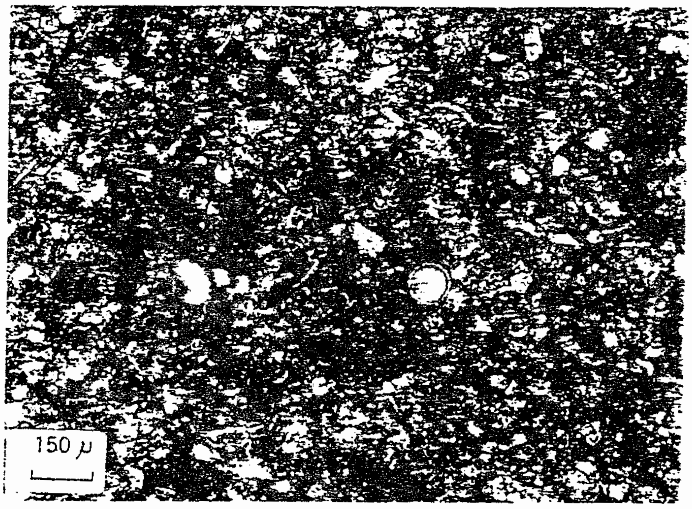


Fig. (5) : Photomicrograph of Globgerina Biomicrite showing recrystallization to sparrymicrite, sample No. 4 "Gebel El Alalma, Mokattam Formation.

P.L.

Fig. (6) : Photomicrograph of Bivalve Pel-microsparite showing well defined mosaic texture associated with pellets of carbonate. Sample No. 2, Gebel Homret Shaiboun "Mokattam Formation".

P.L.

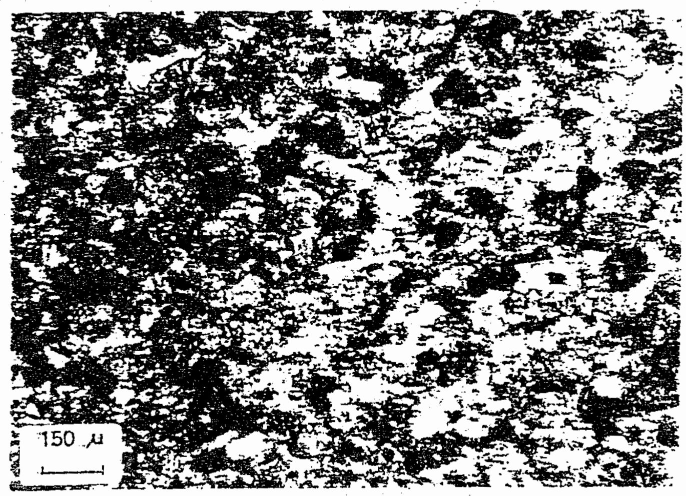


Fig. (7) : Photomicrograph of Bivalve Pel-microsparite showing rounded pellets of carbonate, Sample No. 2, Gebel Homret Shaiboun "Mokattam Formation".

P.L.

Fig. (8) : Photomicrograph of Foraminiferal Biomicrite showing small varieties of foraminiferal species embedded in micritic groundmass. Sample No. 4a, Gebel Homret Shaiboun "Mokattam Formation."

P.L.

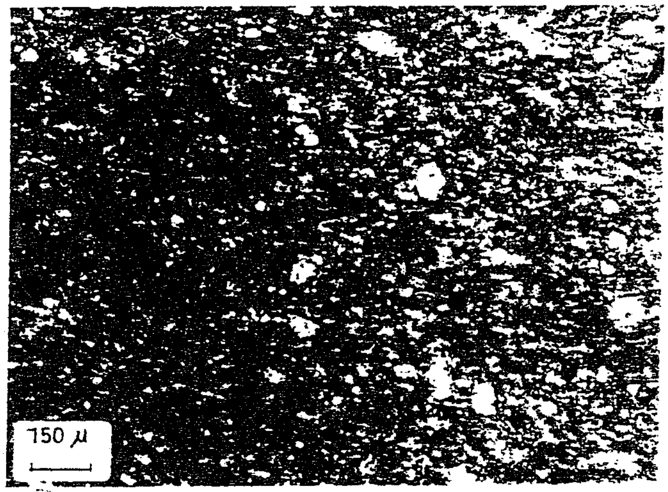


Fig. (9) : Photomicrograph of Foraminiferal Biomicrie showing foraminiferal associated species with subangular quartz-grains embedded in micritic groundmass. Sample No. 10, Gebel Homret Shaiboun "Mokattam Formation".

P.L.

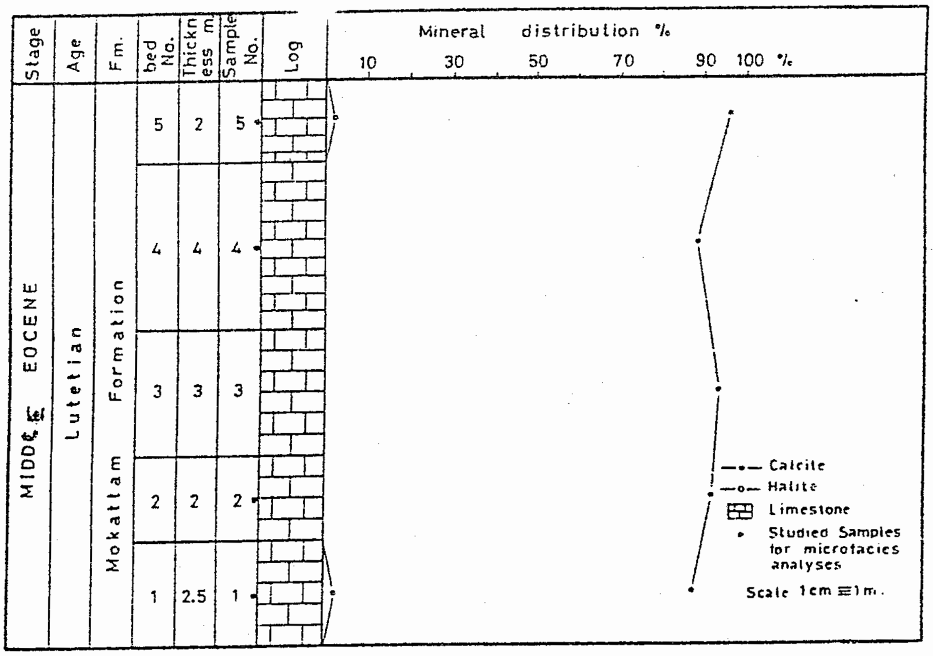


Fig. (10) : Vertical distribution of Calcite and Halite in the rock samples of Mokattam Formation at Gebel El-Alalma.

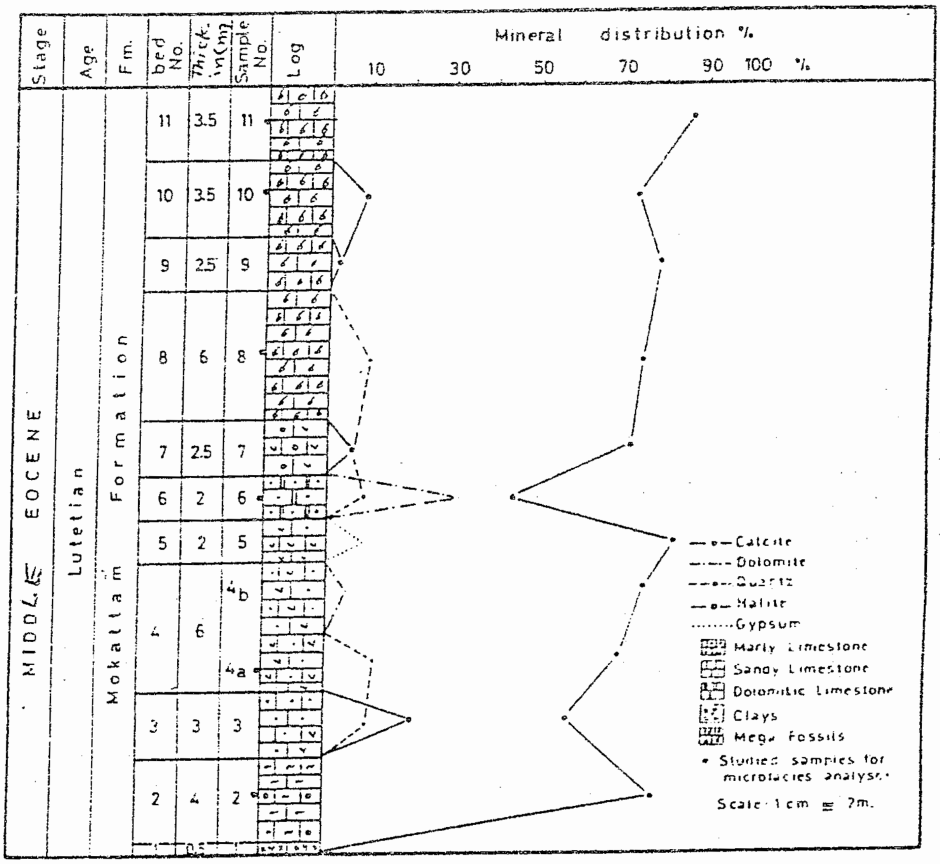
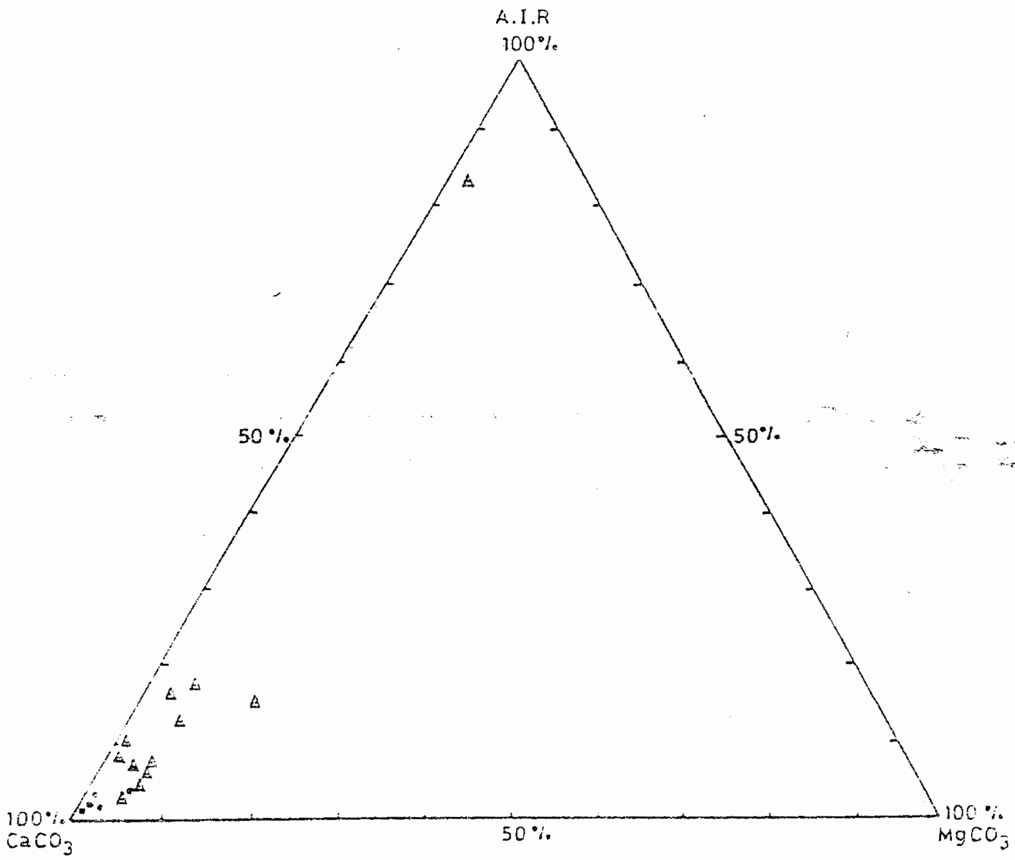


Fig. (11) : Vertical distribution of Calcite, Dolomite, Dolomite, Quartz, Halite and Gypsum in the rock samples of Mokattam Formation at Gebel Homret Shaiboun.



Fg. (12) : Triangular diagram illustrating the correlation of rock samples on the basis of $CaCO_3$, $MgCO_3$ and A.I.R. in the rock samples of Mokattam Formation.

◆ Gebel El-Alalma

Δ Gebel Homret Shaiboun

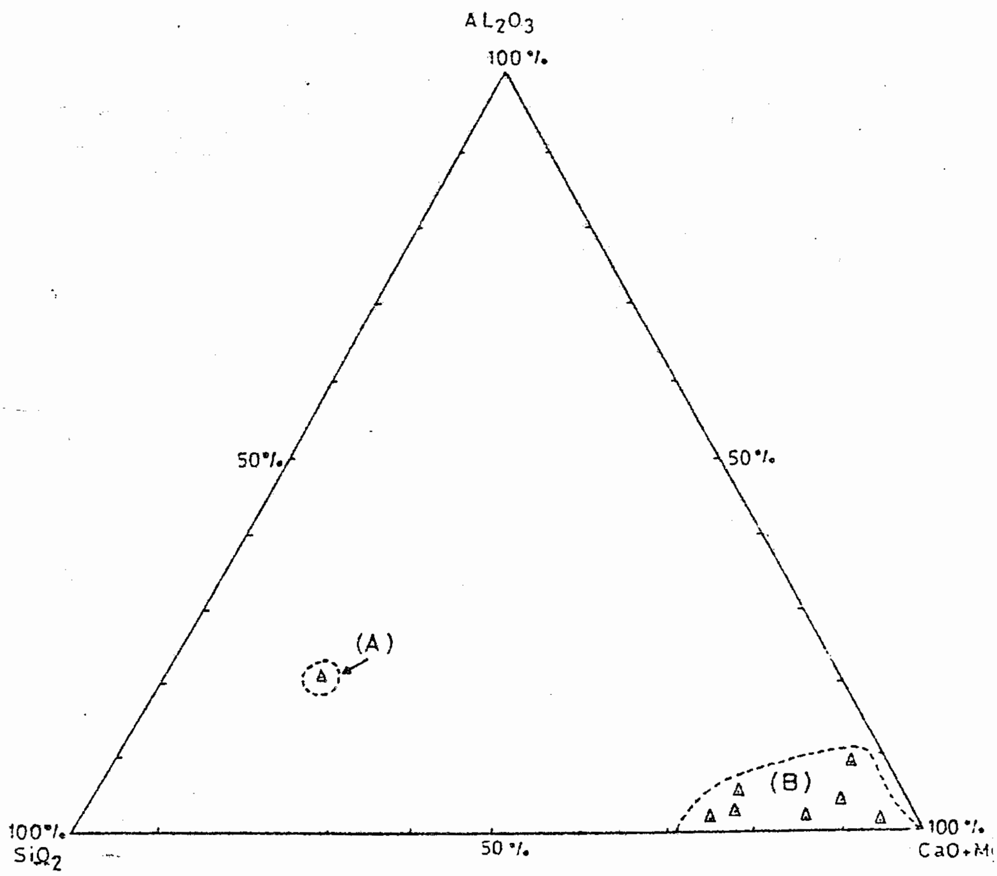
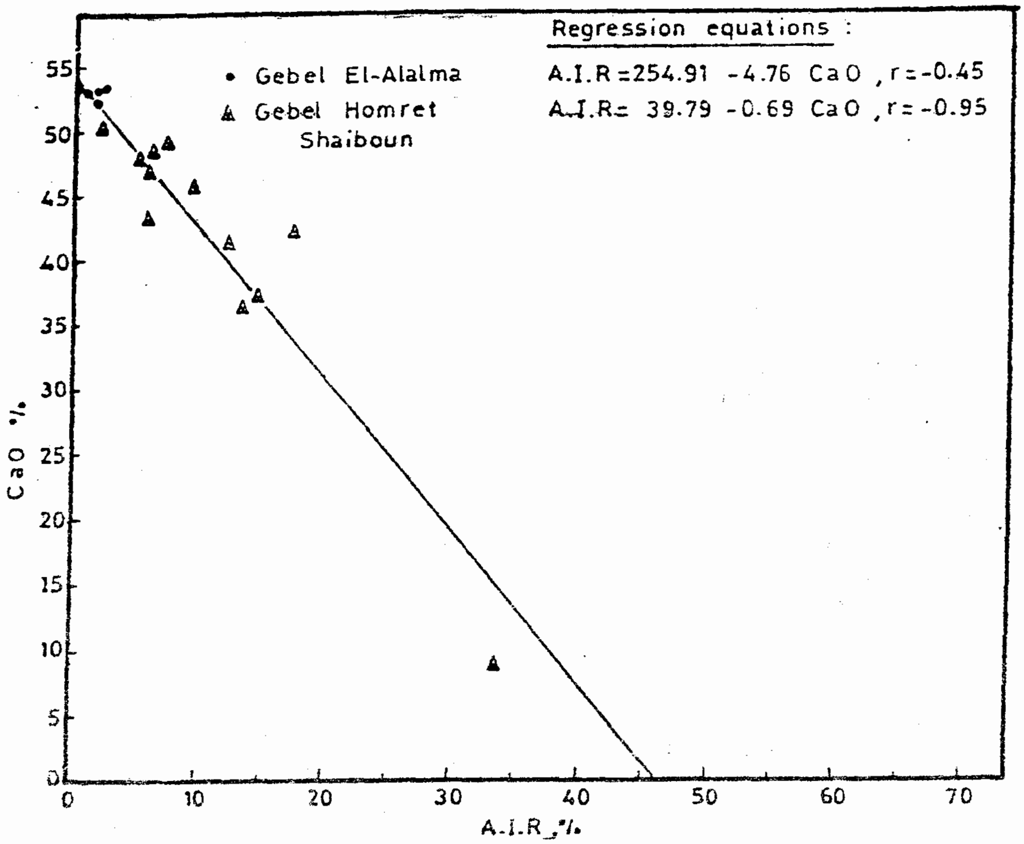


Fig. (13) : Ternary diagram of SiO_2, Al_2O_3 and (CaO + MgO) in the rock ksamples of Mokattam Formation at Gebel Homret Shaiboun.



Fg. (14) : The relationship between Acid Insoluble residue (A.I.R) and CaO contents in the rock samples of Mokattam Formation.

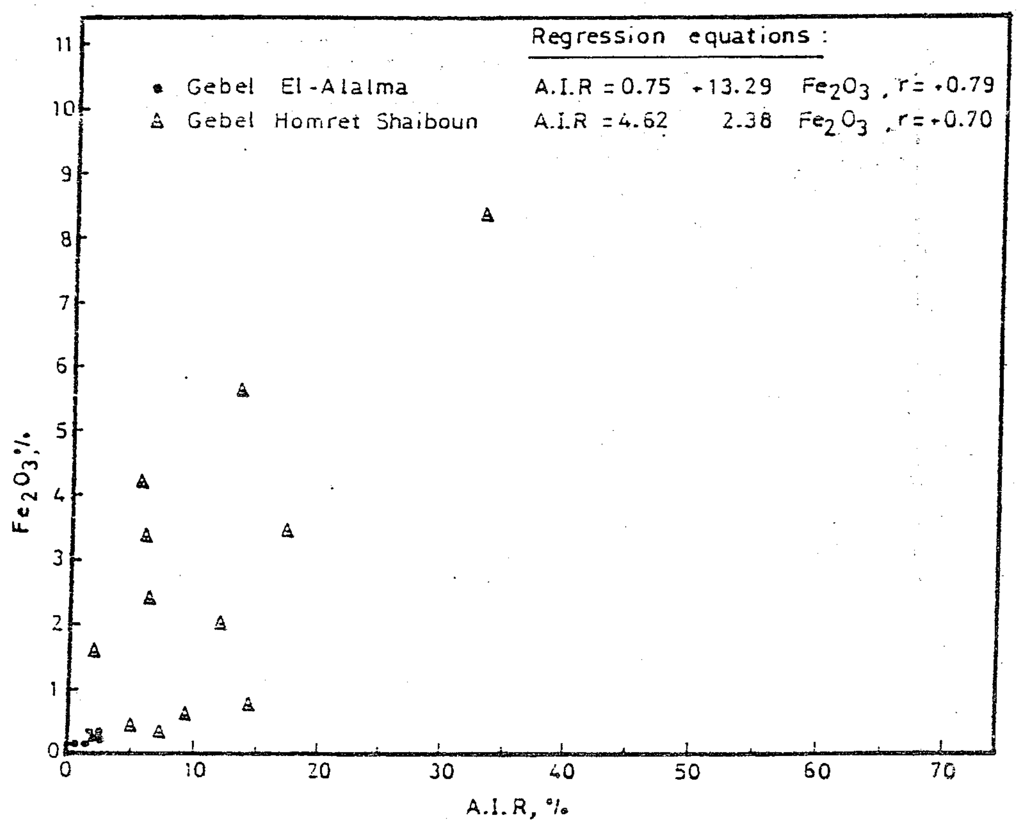


Fig. (15) :. The relationship between total iron (expressed as Fe_2O_3) and acid insoluble residue contents (A.I.R) in the rock ksamples of Mokattam Formation.

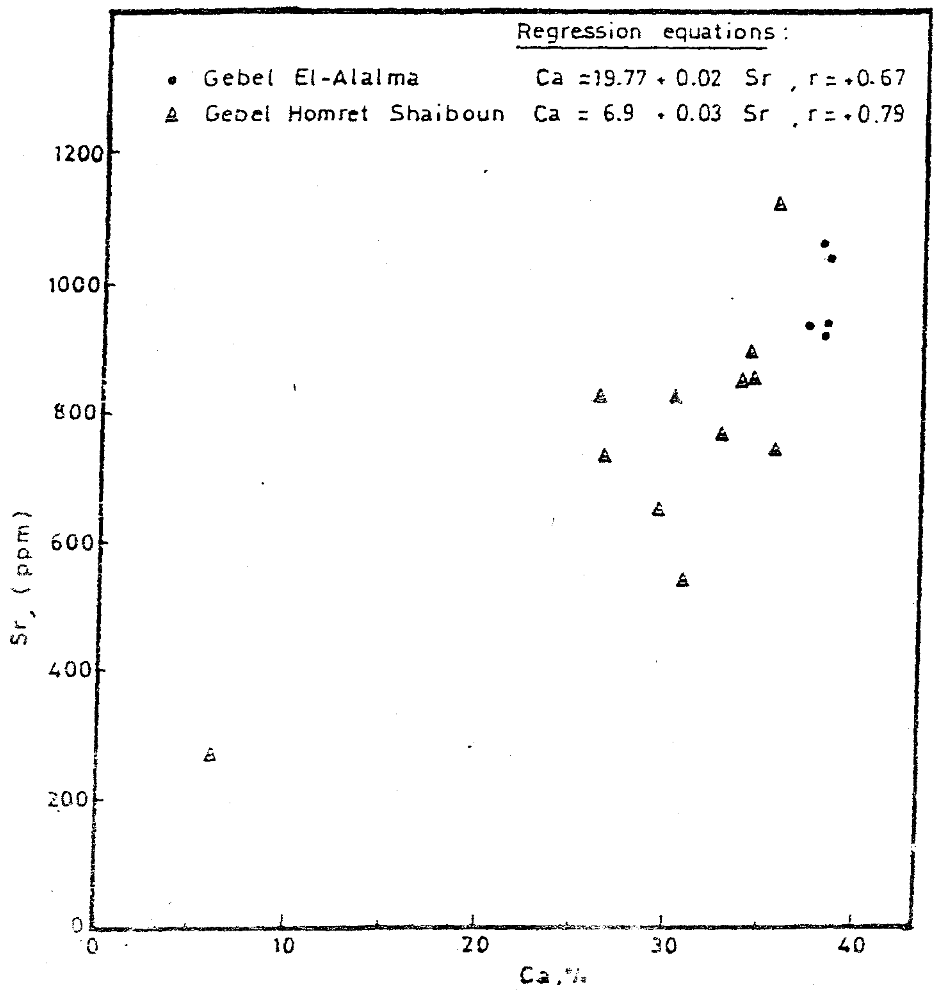


Fig. (16) : The relationship between strontium content and calcium content in the rock samples of Mokattam Formation.

بتروجرافية وجيوكيميائية بعض صخور الحجر الجيري الثابتة للأيوسين الأوسط
(تكوين المقطم) في المنطقة الواقعة شرق بني سويف - وادي النيل - مصر

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يختص هذا البحث بدراسة بيتروجرافية وجيوكيميائية علي بعض صخور الأيوسين الأوسط الموجودة في العلالمة جبل حمرة شيبون في المنطقة الواقعة شرق بني سويف.

وأهم السحنات الدقيقة التي أمكن التعرف عليها هي جلوبيجيرنيا بيوميكريت، بأيفلف بلميكروسباريت، البيوميكريت الحفري والبيوميكريت الدولوميتي. وقد لوحظ أن هذة الصخور قد تعرضت إلي عملياتإعادة التبللور والدلمتة. وتدل نتائج التحليل بالأشعة السينية علي أن تكوين المقطم في منطقة البحث يتكون اساسا من معدن الكالسيت بجانب القليل من الكوارتزوا لهاليت والجبس والدلوميت وفي عينات قاعدة جبل حمرة شيبون يوجد قليل من المعادن الطينية مثل الكاولين . ومن ناحية الدراسات الجيوكيميائية نجد أن عينات منطقة جبل العلالمة يتميز بأن نسبة أكسيد الكالسيوم والفاقد بالحريق تشكل أعلي النسب . بينما معظم عينات جبل حمزة شيبون فيوجد بها أكيسيد السيليكون واكسيد الألومنيوم وأكسيد البوتاسيوم بجانب اكسيد الكالسيوم والفاقد بالحريق . كما يوجد بالقطاع الأخير بعض الطبقات التي تحتوي علي نسب عالية من أكسيد الحديد والصوديوم والكلوريدات الذائبة والكبريتات.

من هذة الدراسة أمكن استنتاج أن هذة الصخور قد ترسبت في بيئة بحرية عميقة، وأن وفرة المواد الكلاستيكية في قطاع حمرة شيبون فيعزي إلي وجود بعض الروافد إلي بيئة الترسيب. ويدل انتشار الكالسيت في هذة الصخور علي وسط قاعدي لبيئة الترسيب. وأن وجود الحديد بنسبة عالية علاوة علي بعض المتبخرات مثل الجبس وكلوريد الصوديوم في قطاع حمرة شيبون برهان علي ضحالة البيئة البحرية نسبيا في هذا القطاع.