

GRAIN SIZE AND SORTING AS INDICATORS OF ENERGY OF DEPOSITIONAL ENVIRONMENT OF GHAR FORMATION (LATE LOWER MIOCENE), IRAQ WESTERN DESERT

*Aqeel A . A . Al - Zubaidi , * Sadi K . Jan , ** Jabbar A . H . Al - Amiry

*Iraq Natural History Museum , University of Baghdad

**The State Company of Geological Survey And Mining

ABSTRACT

Ghar formation is subdivided into three lithological types according to the percentage of detrital quartz and calcite (micrite and sparite), through the petrographic study of 13 thin sections collected from a section at Wadi Al - Ratgha (west of Al - Qaim , Iraq Western Desert). The three rock units are : Limy sandstone , limestone and sandy limestone .

Depending on the mean grain size of detrital quartz and degree of sorting and the type of matrix , Ghar Formation can be classified in to three types , i. e. off - shore sediments with low energy environment , near shore sediments with high energy environment and mixed sediments with transitional energy environment . This is due to local transgression and regression of sea level at late lower Miocene during the deposition of Ghar Formation .

INTRODUCTION

Ghar Formation was first described by Owen and Nars (1958) from Well Zubair No. 3 . It consists of sands , gravels , rare sandy limestone , rare clay and anhydrite deposited in the littoral or partly deltaic environment of miocene age (Van Beilen , etal , 1959) , while Buday (1980) believed that its age is late lower Miocene . In the Western Desert , Ghar Formation is represented by quartz sandstone and sands interbedded with sandy limestones (AL - Jumaily , 1974) . This Formation is also studied by AL - Hashimi and Amer (1985) and they concluded that it was deposited in fluvio- marine environment .

The Formation is underlain unconformably by Dammam Formation (Middle Upper Eocene) and overlain by Jeribe or Euphrates Formation (Lower Middle Miocene) (Buday , 1980) .

The purpose of this study is to show that the rock units and the energy of the depositional environment could be reclassified according to grain size , sorting and type of matrix .

GEOLOGICAL SETTING

The Ghar Formation is located on the Stable Shelf at the northern edge of the Arabian Platform . It crops out as longitudinal belt across Wadis Akash , Ratgha and AL-Manee in a nearly E-W direction South West of AL-Qaim (Fig . 1) .

PETROGRAPHY

Thirteen samples from Ghar Formation in Wadi AL -Ratgha has been thin sectioned (Miller , 1988) and studied under polarized microscope (Curry , et al , 1982) . These samples reflect that the detrital fragments composed mainly of quartz , cemented by micrite , microsparite and sparite . Grain size of calcite cement are typified according to Greensmith (1981) . Some beds are composed mainly of micrite with fossils of *Milliolina* , *Gastropoda* and few fragments of shells (plate 1 - 1) * .

The quartz grains of sandstone beds range in size mean from 0.105 mm to 0.169mm (table-1) . Quartz grains are rounded to well rounded and the degree of sorting according to Compton (1962) ranged from poorly sorted to well sorted (Plat 1 - 3) . The high degree of textural and mineralogical maturity of rocks reflects very stable area and reworked through several cycles of sedimentation (Pettjohn 1975) .

According to Fuchtbauer and Muller (1977) , Ghar Formation is classified into three major units i . e limy sandstone , limestone and sandy limestone (Fig . 3) .

ENERGY OF ENVIRONMENT

The subdivision of energy of environment as adapted using Flugel (1982) hypothesis . These are low energy zone characterized by micrite matrix and poorly sorted ; transitional energy contains partly micromatrix and grains , poorly to moderately sorted and high energy zone of high amount of sparite cemented well sorted grains (Fig . 4) . This could be referred to the fluctuation of the sea level i . e transgression and regression which is probably controlled by tectonic activity and / or global sea level changes .

* other bbeds has low mean quartz grains , moderately sorted , cemented by micrite , microsparite or microsparite - sparite (plate 1 - 2) , while the rest of beds shows large mean quartz grains , well - sorted , cemented by sparite (plate 1 - 3) .

CONCLUSIONS

Ghar Formation rocks are represented by limy sandstone, limestone and sandy limestone.

Three types of sediments were recognized i. e. off shore marine sediments, shallow marine near shore sediments and sediments produced by mixing of near shore and offshore sediments.

The energy of environment to Ghar Formation were divided into three zones: low energy environment, high energy environment and transition zone.

Local regression and transgression of sea level might happened at Late Lower Miocene.

Table 1 Grain size (mm) and sorting of detrital quartz grains and the type of matrix.

Sample No.	Grain size (mm)		Sorting	Matrix
	Range	Mean		
13	0.45 - 0.299	0.146	Well	Microsparite
12	0.40 - 0.269	0.139	Moderate	Microsparite Micrite
11	0.43 - 0.256	0.133	Moderate	Sparite Microsparite
10	0.42 - 0.298	0.156	Well	Sparite
9	0.41 - 0.293	0.149	Well	Sparite
8	0.31 - 0.231	0.115	Poor	Micrite Microsparite
7	0.52 - 0.331	0.169	Well	Sparite
6	0.55 - 0.290	0.159	Well	Sparite
5	-	-	Poor	Micrite
4	-	-	Poor	Micrite
3	0.34 - 0.232	0.119	Moderate	Microsparite Micrite
2	0.34 - 0.200	0.105	Poor	=
1	0.33 - 0.227	0.121	Moderate	Sparite Microsparite

Sample No	Plate No.	description	Energy of environment
2,4,5,8	1 - 1	No quartz grains , samples composed mainly of micrite with few fossils (Milliolina , Gastropada and shell fragments).(off shore marine sediments) .	Quite energy , off shore marine environment .
1,3,11,12	1 - 2	Low mean quartz grains , moderately sorted , cemented by micrite , microsparite or microsparite - sparite . (Interaction between shallow marine and off - shore sediments) .	Transition Zone
6,7,9,10,13	1 - 3	Large mean quartz grain size well - sorted , cemented by clean coarse grained calcite (sparite) . (near shore sediments) .	High energy (wave and tide) shallow marine environment

Table - 2 Zone of energy of environments of Ghar Formation .

LITERATRE CITED

- AL - Hashimi , H.A.J. and Amer , R.A. , 1985 , Tertiary Microfacies of Iraq . State Organization for Minerals , Baghdad , 56 p .
- AL - Jumaily , R.M. , 1974 ; Report on the Regional Geological Mapping of the area between Iraqi - Syrian border - T1 oil pumping , SOM Library , Baghdad .
- Buday , T. , 1980 , Regional Geology of Iraq V. 1 Stratigraphy and Palaeogeography . State Organization for Minerals . Baghdad , 445 p .
- Compton , R.R. , 1962 , Manual of Field Geology . Wiley and Sones , London , 378 p .
- Curry , A. , Grayson , R. F and Hosey , G.R. , 1982 Under the Microscope , Blandford press , poole. In : Tucker , M. 1988(ed.) Techniques in Sedimentology , Blackwell Scientific Publication, 394 p .
- Flugel, E. 1982 Microfacies Analysis of Limestone. Springer - verlag , Berlin , 633 p .

Fuchtbauer, H., and Muller, G. 1977 Sediment-petrologie . E.Schweizer-Bartisch Verlags Buchhanlung, 784 p.

Greensmith, J.T. 1981 Petrology of the Sedimentary Rocks. Allen and Unwin, 241p.

Miller, J. 1988 Microscopical Techniques : 1. Slices, slides, stains and peels. In: Tucker, M. 1988(ed.) Techniques in Sedimentology, Blackwell Scientific Publication, 394 p.

Owen , R.M.S. and Nasr , S.N. , 1958 , The Stratigraphy of the Kuwait - Basrah Area , in Weeks , L.G. (ed.) , Habitat of oil , Asymposium , AAPG pub . , pp. 252 - 1278 .

Pettijohn , E.J. , 1975 , Sedimentary Rocks , Harper and Row publisher , 628 p.

Tucker , M. , 1988 , Techniques in Sedimentology , Blackwell Scientific publication , 394 p.

Van Bellen , R.C. , Dunnington , H.V. , Wetzel , R. and Morton , D. , 1959 , Lexique Stratigraphique International Asie , Iraq V. 3. Facc . 10 a , 333 p.

استخدام الحجم الحبيبي و الفرز والأرضية دلائل على طاقة البيئة الترسيبية لتكوين
الغار (مايو سين اسفل متأخر) في الصحراء الغربية العراقية

عقيل عباس أحمد الزبيدي / سعدي خان جان / متحف التاريخ الطبيعي - جامعة

بغداد

جبار عبد حسين العامري / الشركة العامة للمسح الجيولوجي والتعدين

الخلاصة

قسمت صخور تكوين الغار الى ثلاثة انواع اعتماداً على نسبة وجود حبيبات المرور (الكوارتز) الفتاتية والكالسايت الموجود على هيئة مكرايت وسبارايت وذلك من خلال دراسة 13 شريحة رقيقة لنماذج صخرية جمعت من احد المقاطع في وادي الرتكة (غرب القائم - الصحراء الغربية العراقية) وكانت الأنواع الثلاثة هي : صخور رملية حيرية . صخور حيرية وصخور حيرية رملية .

Energy indicators of depositional environment

قسمت رواسب تكوين الغار الى رواسب بحرية بعيدة عن الشاطئ في بيئة ذات طاقة واطنة ورواسب بحرية قريبة من الشاطئ في بيئة ذات طاقة عالية ورواسب خليطه في بيئة انتقالية ذات طاقة متوسطة اعتمادا" على معدل الحجم الحبيبي للمرو الفتاتي ودرجة الفرز ونوع الأرضية. ان هذا التقسيم يعزى الى عمليات تقدم وأنحسار بحري محلي خلال عملية ترسيب تكوين الغار في المايوسين الأسفل المتأخر .

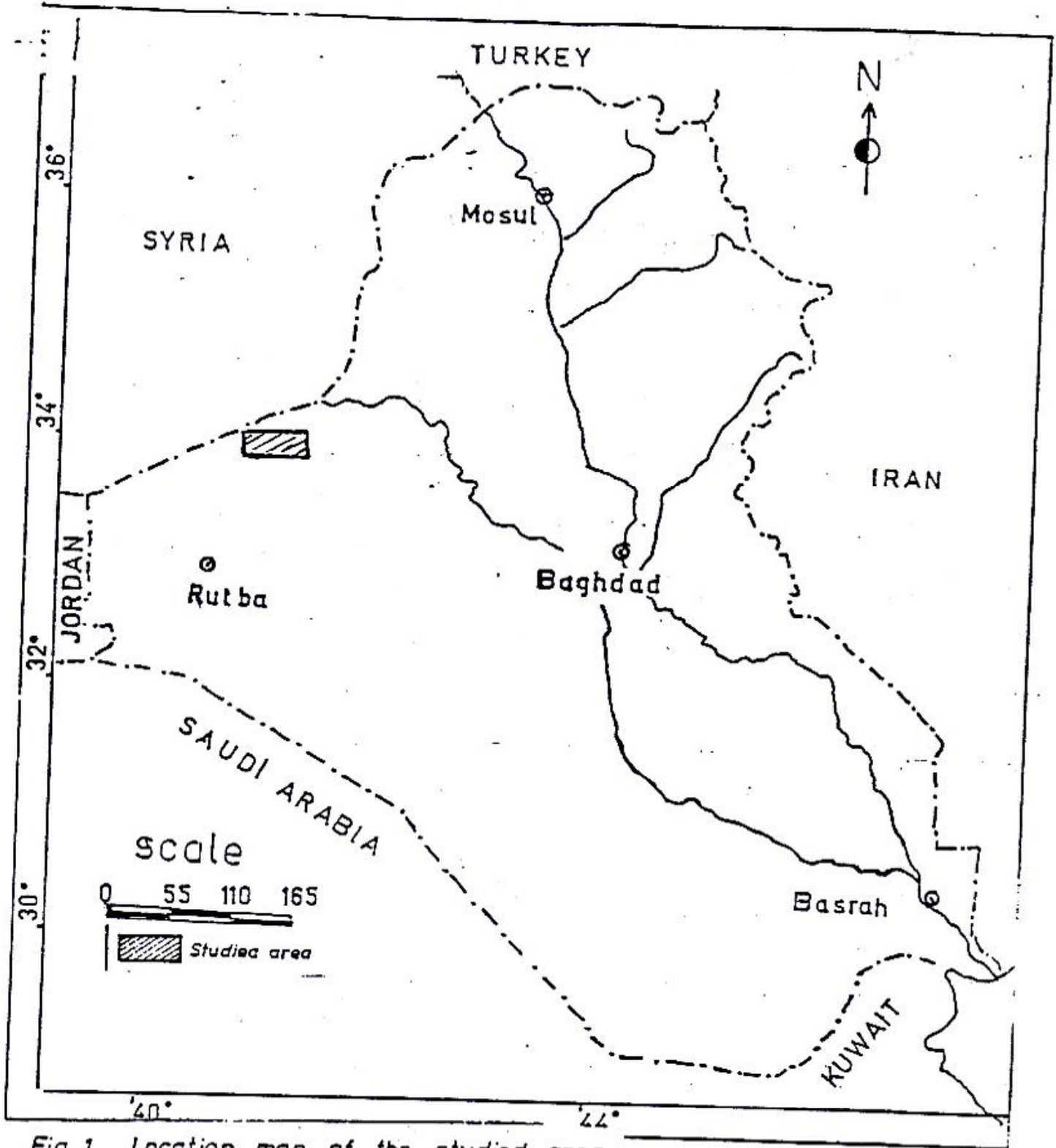


Fig.1 . Location map of the studied area .

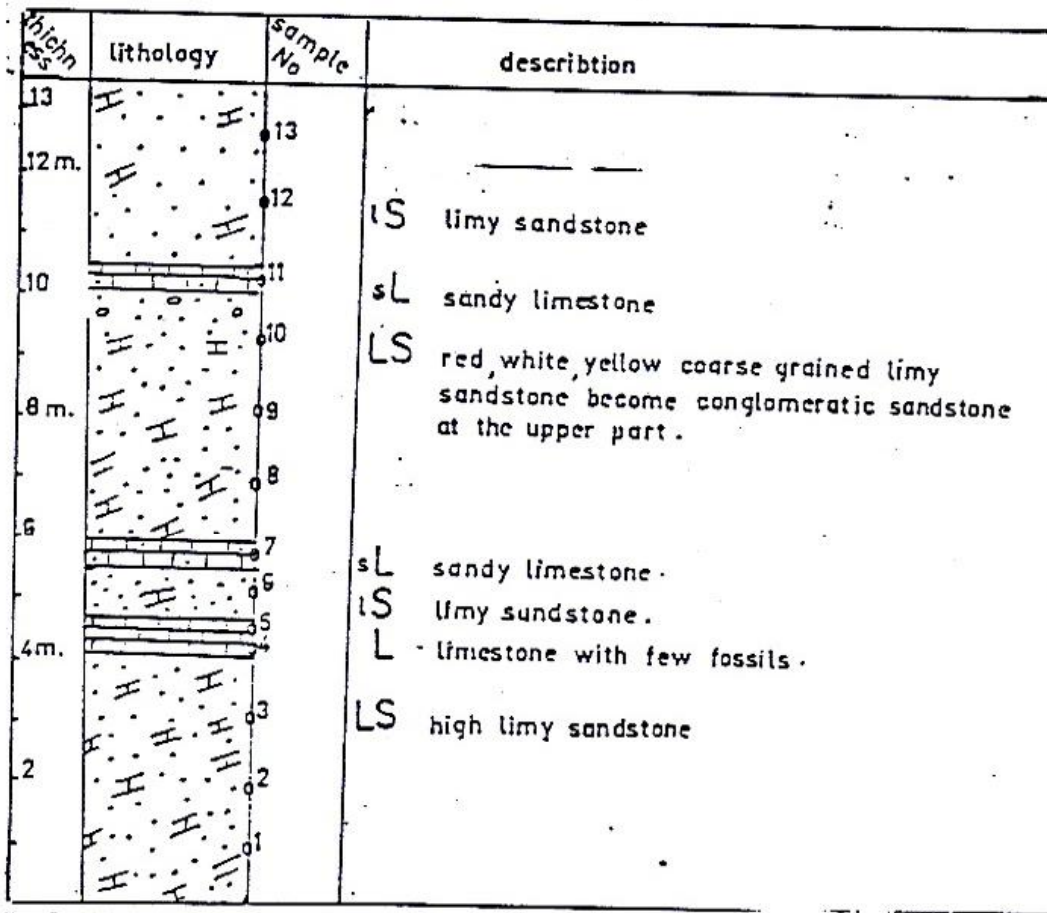
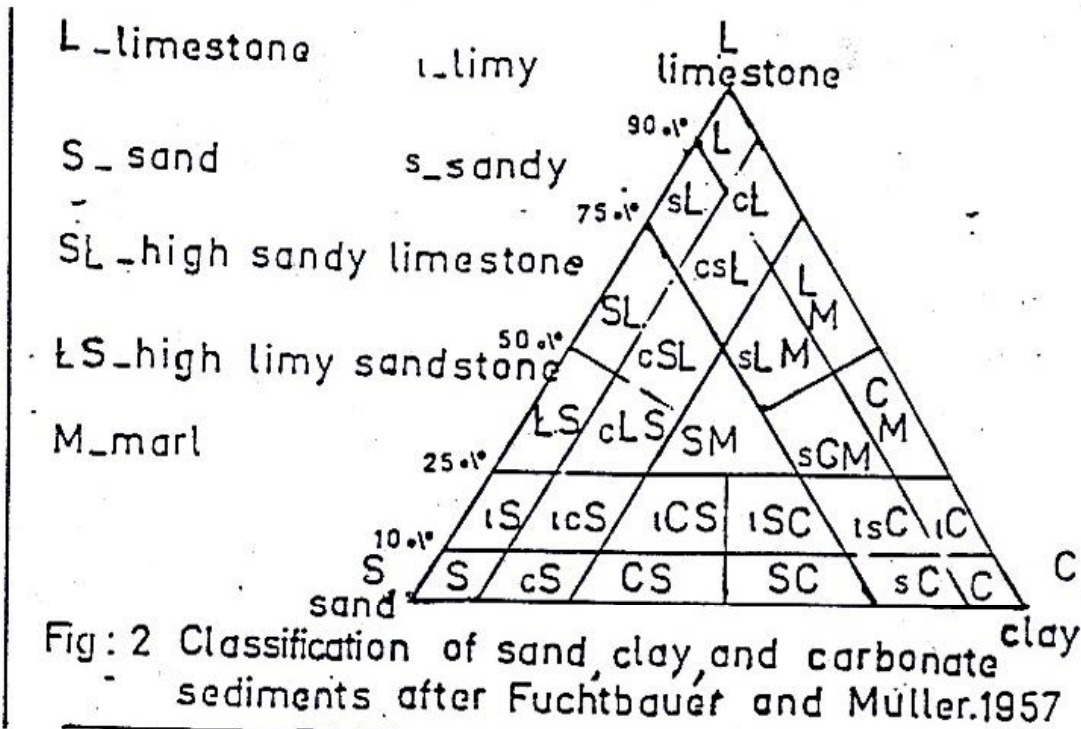
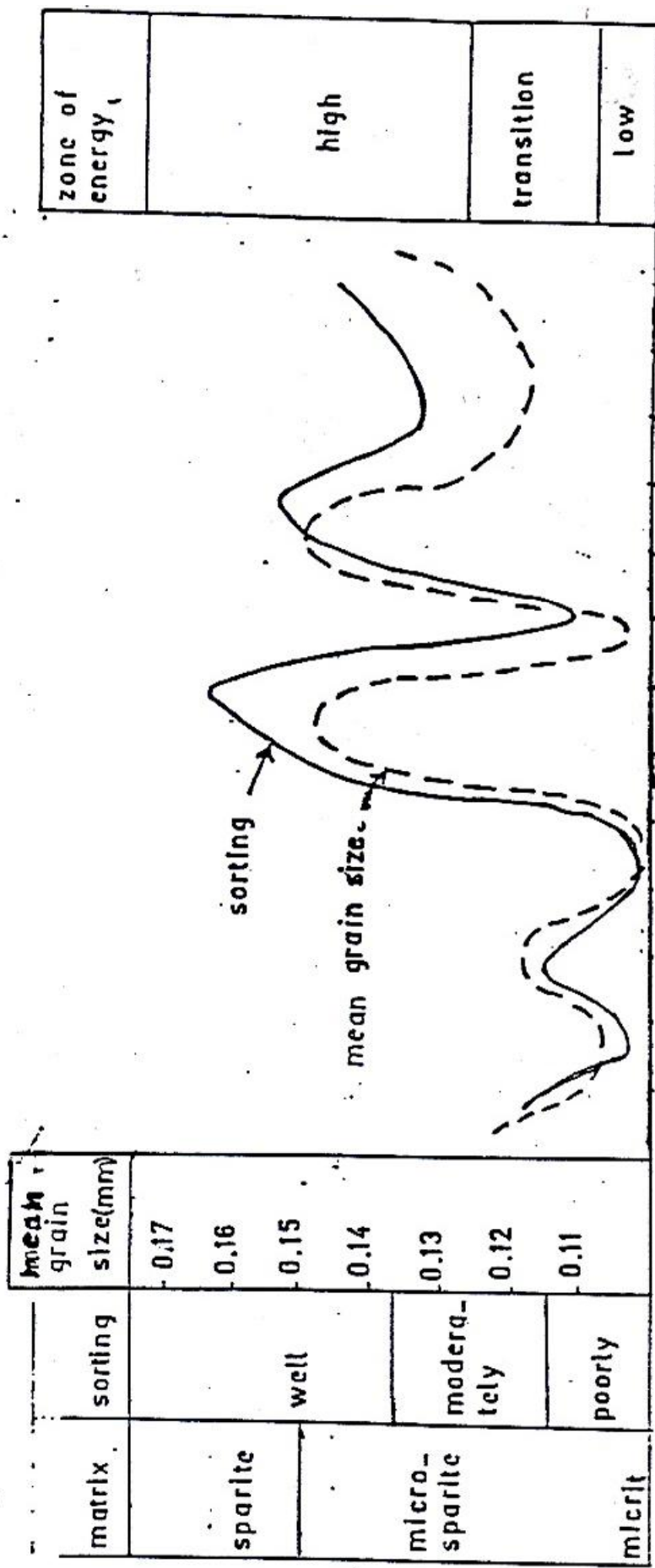


fig.3 Lithologic section of Ghar Formation.

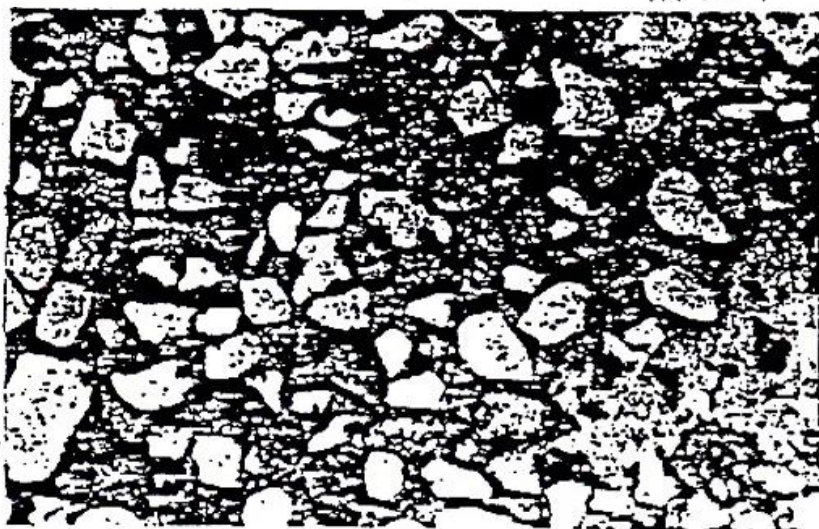


sample No. 1 2 3 4 5 6 7 8 9 10 11 12 13

fig.4 relationship between grain size, sorting, and matrix, and the energy of environment of Ghar Formation



- 1 -
micrite with few fossils and shell fragments



- 2 -
quartz grains cemented by micrite and sparite



- 3 -
quartz grains cemented by sparite