



# Classification and description of Dolomitization textures in Lower-Middle Miocene Cycle at Kirkuk Wells. (Jambur-26 and Humren-41)

Salam O. Ibraheem

University of Anbar – College of Science

## ARTICLE INFO

Received: 19 / 5 /2022  
Accepted: 28 / 5 /2022  
Available online: 19/7/2022  
DOI: 10.37652/juaps.2014.122630

### Keywords:

Classification ,  
description ,  
Dolomitization textures ,  
Lower-Middle Miocene Cycle ,  
Kirkuk Wells.  
(Jambur-26 and Humren-41).

## ABSTRACT

The understanding of diagenetic processes and their products has height economic importance because diagenetic criteria a count for many of ptrophysical properties of carbonate rocks and use in industry.To be complete study of dolomitization textures that have been importance which lies within wells Jambur-26 and Humren-41 in addition there are difficulty to limited environments and formed of mechanical dolomitization where there are many mechanic define one process dolomitization. In this study there are five types of dolomitization textures is recognized dependent Randazze and Zakkhos classification which are included micro textured sutured, Suture mosaic texture, Sieve-mosaic fabric and micro texture sieve fabric, Floating- Rhomb Fabric and Contact-Rhomb Fabric.

## Introduction :

Diagenetic processes were defined as all physical, chemical and biological processes that collectively result in transformation of sediment in to sedimentary rocks (Rhymond 1995).The boundaries of the diagenetic processes occur at relatively low temperatures typically below about (250°C)and at depths of up to about(5000m)in addition pressures(Bogge,2010).The pore-fluid composition Salinity of pore water and burial depth that important factor in diagenesis processes.

Three stages of diagenesis processes are divided from(Choquette and Pray 1970), that include: Eodoiagenesis refers to the earliest stage of diagenesis, which takes place at very shallow depth(a few meters to tens of meters) largely condition of the depositional

environment. Mesodiagenesis is diagenesis that take place during deeper burial under conditions of increasing temperature and pressure and changed pore-water composition. Telodiagenesis refers to later stage diagenesis that a accompanies or follows uplift of previously buried sediments into the regime meteoric water.

In this research there are Several diagenetic processes affected the formations of Lower- Middle Miocene cycle, they operate through four main

Diagenetic environment that include marine phreatic, mixing, meteoric phreatic and deep burial. These processes include micrization, neomorphisem ,dissolution, cementation compaction dolomitization and dedolomitization.

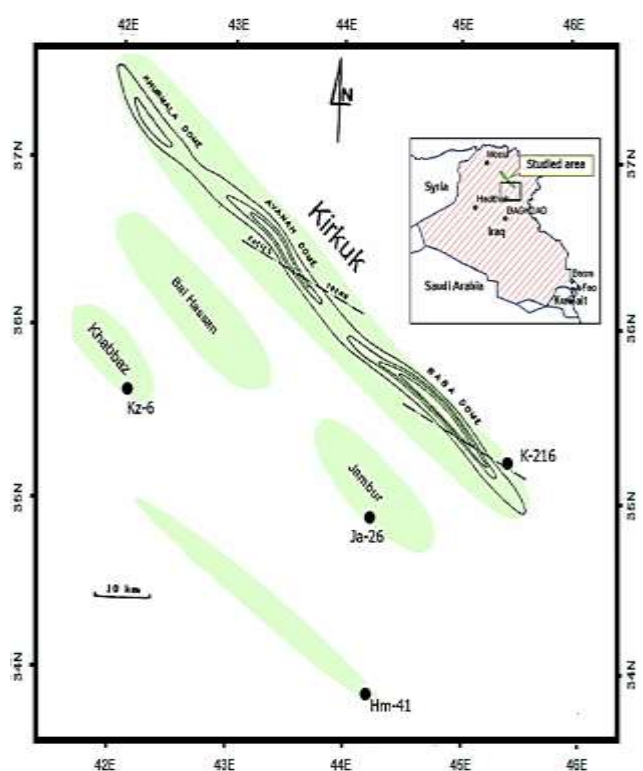
We shall be to concentrate on the types of textures dolomitization dependent Randazzo and Zakhos (1984).(Fig.5a & 5b)

\* Corresponding author at: University of Anbar – College of Science

E-mail address:

**Tectonic setting :**

The study area include Jambur and Hemrine fields which lie between lat.34°-36°and long.43-45 Fig.(1),, that it lie within the unstable shelf within the Hemrin- Makhul subzone which lies within the foothill zone at north to northeaster part of the Tigris zone which lies within the Mesopotamian zone (Buday and Jassim 1987 ) Fig.(2).



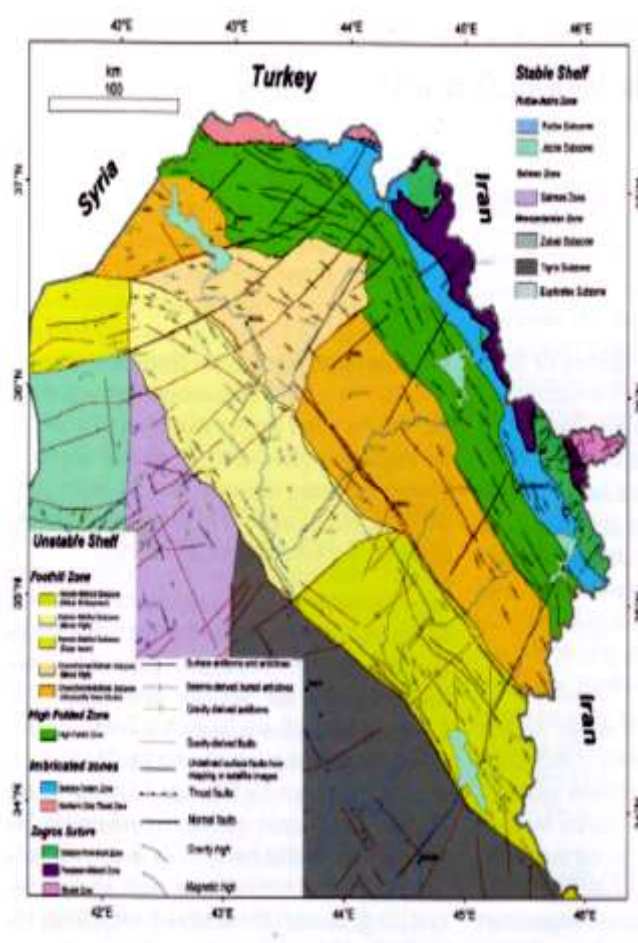
**Fig.(1) Location map of the study area,(After Dunnington 1958, MajidandVeizer, 1986)**

**Fig(2 ) Tectonic map of northern Iraq (Jassim and Goff, 2006).**

### **Lithology – Lithofacies of study area:**

The Lower-Middle Miocene in Hr-41Fig(3) and Ja-26Fig.(4) consist of Serikagni, Euphrates, Dhiban, Jeribe and Fatha formations. Serikagni Formation refers deep marine which consists of planktonic carbonates which include fine grained globigerina limestone slightly dolomitized and recrystallized in places and with variable porosity. Euphrates Formation deposited mainly in shallow open marine

and restricted marine environments and it consists of crystalline limestone, dolomite and anhydrite in places and with variable porosity, where the carbonate facies form from lime mudstone, dolomitic and dolomitized wackestone also milliolid wackestone and pellet packstone. The Dhiban Formation was deposited mainly in Sabkha and restricted environments, it consists essentially of anhydrite interbedded with partly crystalline limestone and dolomitized limestone with variable porosity. The Jeribe Formation was deposited mainly in restricted and shallow open marine environments. This formation consists mainly of crystalline limestone partly dolomitized with pore filling anhydrite, in addition to dolomitized and dolomitic mudstone. It characterized by abundant of skeletal grains of wackestone and packstone especially milliolid, in addition to percent molluscs,



algae and bioclasts also nonskeletal grains such as peloid, pellets and intraclast.

### Dolomite and Dolomitization:

Dolomites are calcium carbonate rocks composed of more than 50 percent of the mineral dolomite  $\text{Ca Mg}(\text{CO}_3)_2$ . Dolomites occur in close association with limestone and many stratigraphic units as interbeds in the limestone, they are also commonly associated with evaporate (Boog, 2010). Dolomite form within two main types primary or secondary. Primary dolomite are defined as those which formed at the time deposition, this dolomite is recognized with fine grains size of less than 1-20  $\mu\text{m}$ . and occurrence many arid hypersaline coasts (Sabkha environment) and form warm humid coasts. This type occurrence such as Arabic Gulf, pool of Red sea and Lagoon of Australia. Secondary dolomite are defined as those that are obviously of postdepositional origin. It have an irregular distribution and cross-cutting sedimentary structure. Unlike primary dolomite this type has crystals of more than 20  $\mu\text{m}$  in diameter. that Euhedral or subhedral or Anhydrous-hapes. This has resulted in part from the bulk volume shrinkage (as calcite replacement by dolomite) and in dissolution of residual calcite during the final stage, hence Conversion of limestone to dolomite rock by replacing a portion of the calcium carbonate with magnesium carbonate is called Dolomitization.

There are several models for secondary dolomitization have been proposed, most of the models are based on the idea that dolomitization take place when brines of high Mg:Ca ratio flow through permeable limestone. There are four of the models proposed for the processes of dolomitization that

include 1) Evaporate brine residue/ seepage reflux. 2) Meteoric-Marine/groundwater Mixing model. 3) Burial compaction/ Formation water model. The first model and second are lower scale while third and fourth models large scale Dolomitization occur (Nichols 2009).

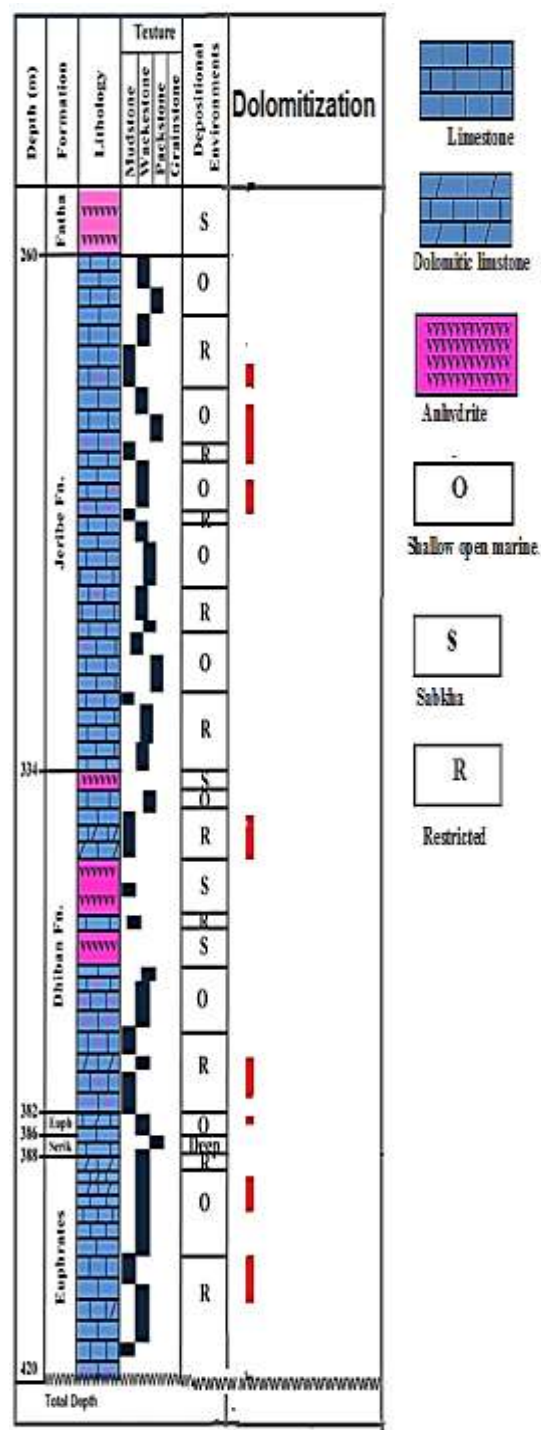


Fig.(3) Distribution of microfacies, paleoenvironments and diagenetic processes of dolomitization at (Hr. 41) well..... Scale:1:800



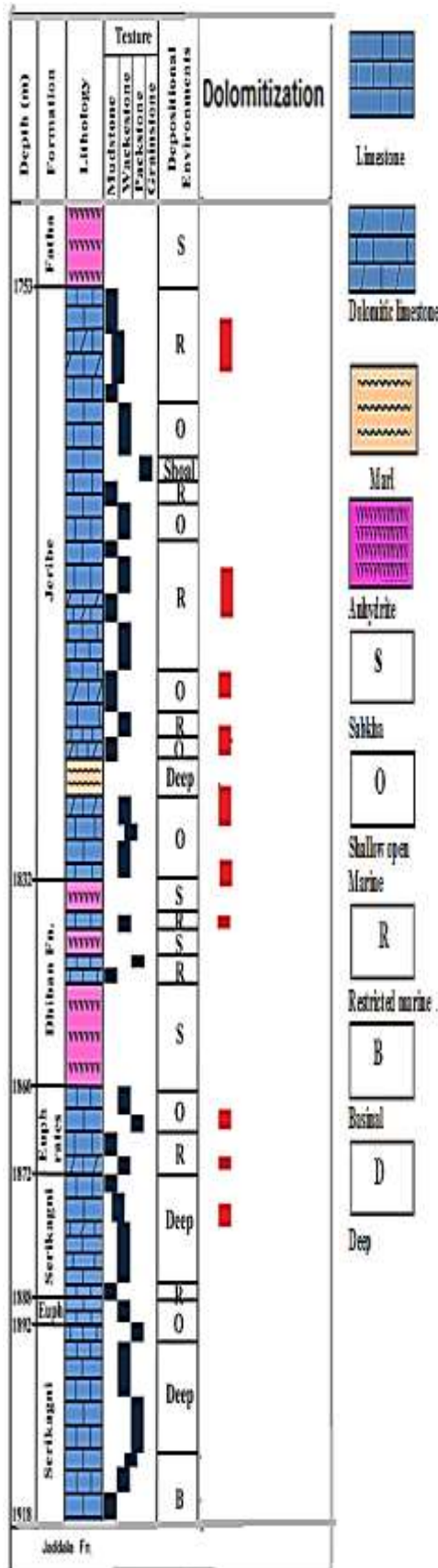


Fig . ( 4 ) Distribution of microfacies ,paleoenvironment and diagenetic processes of dolomitization at( Ja-26) well. .... Scale: 1:800

To be complete the classification of Dolomitization dependent on Randazzo and Zachos 1984 Fig(5a & 5b) for recognized texture is using and defined by Friedman 1965 which include three groups of dolomitization textures that include:

1)Aphanotopic fabric group is consisting of **Classification of texture dolomitization:**

less 0.002mm. crystal size. 2)Equigranulas fabric group which containunimodal of size crystals that include:

a)Idiotopic texture , b)Hypidiotypic texture , c)Xenotopic texture. 3)Inequlgranular fabric group that has polymodel size of crystals.

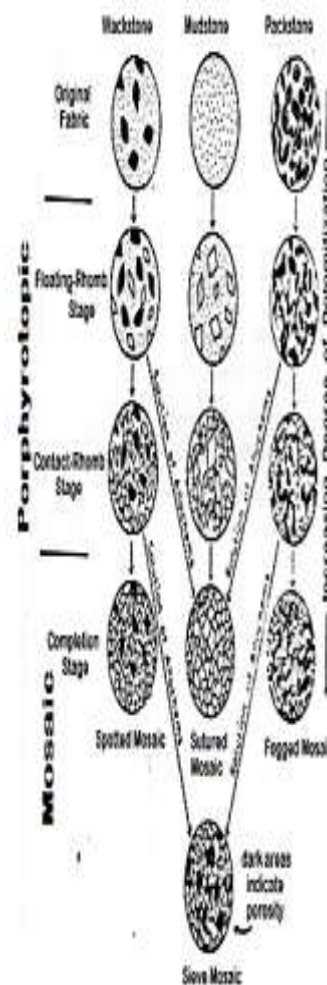
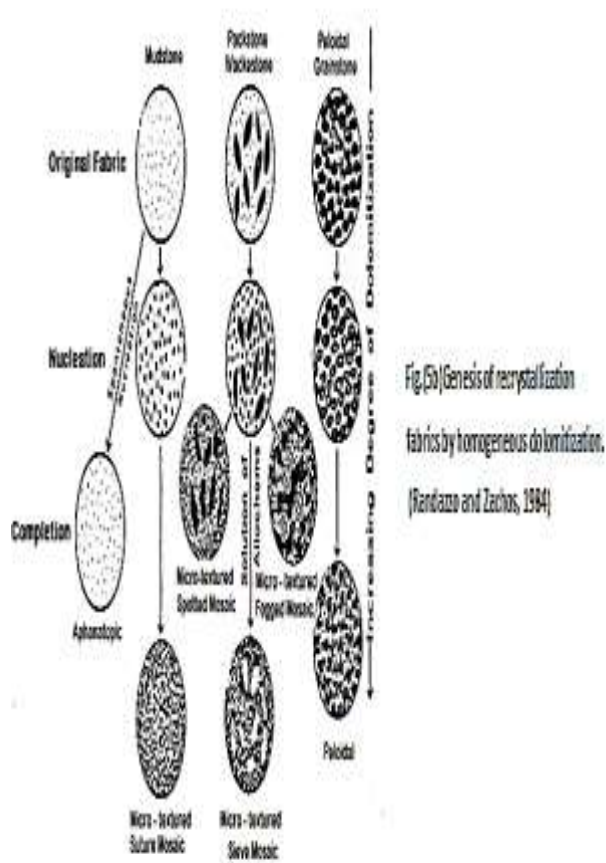


Fig.(5a)Genesis of recrystallization fabrics by heterogeneous dolomitization. (Randazzo and Zachos, 1984)



Randazzo and Zachos expand in Friedman's classification 1965 as figure (5a and 5b). The important dolomitization texture is recognized in this research include:

### 1) Micro texture sutured-mosaic fabric:

This texture type recognized by Equigranular fabric group that has unimodal crystal and is consisting of high titial xenotopic texture and general with few or without pore and it result from homogeneous dolomitization process in lime mud stone Fig.(5b) and is shown occurrence some nuclear dolomite crystal within texture Plt.(1-A).

### 2) Sutured mosaic texture:

This texture recognize abundant of inequigranular fabric with polymodal crystal size semi-titil with rare porosity that result of heterogeneous dolomitization Fig.(5a) processes of

lime mud stone or solution of allochems packstone and wackstone carbonate. Plt.(1-B).

### 3) Sieve-mosaic fabric and micro texture sieve fabric:

This texture recognize with xenotopic texture to titil idotopic texture with high moldic porosity(Plt.1-C) and this texture particle same to sucrosic or sugary texture that is described for Sibley, 1982 and he point to this texture characters by high pore. This texture represents the end stage of homogeneous and heterogeneous dolomitization. It's products from dissolution process of grains witch resist the dolomitization process at early stages and occurrence within lime wackestone and lime packstone Fig.(5a &5b) which this dissolution increased of porosity of the rock there for this texture is recognized in this research. Sometime Micro-texture sieve mosaic consists of dissolution of the grains with formed dolomitization process which different from Sieve-mosaic fabric that consist of fine to very fine crystals dolomite and result from homogeneous dolomitization to lime wackstone and lime packstone (Randazzo and Zachos,1984). Plt.(1-D).

### 4) Floating-Rhomb Fabric:

Floating-rhomb fabric characterize with Idiotopic crystals and initial aggregate within fine grains matrix (Plt.2-A). This fabric formed during end diageneses stages that occurrence in lime mudstone or fossiliferous lime wackestone within groundmass that consist of micrite or inter fossil skeletal itself (Plt.2-B), also this fabric is formed within Selective dolomitization in part of skeletal fossils or collection of fine mud carbonate.

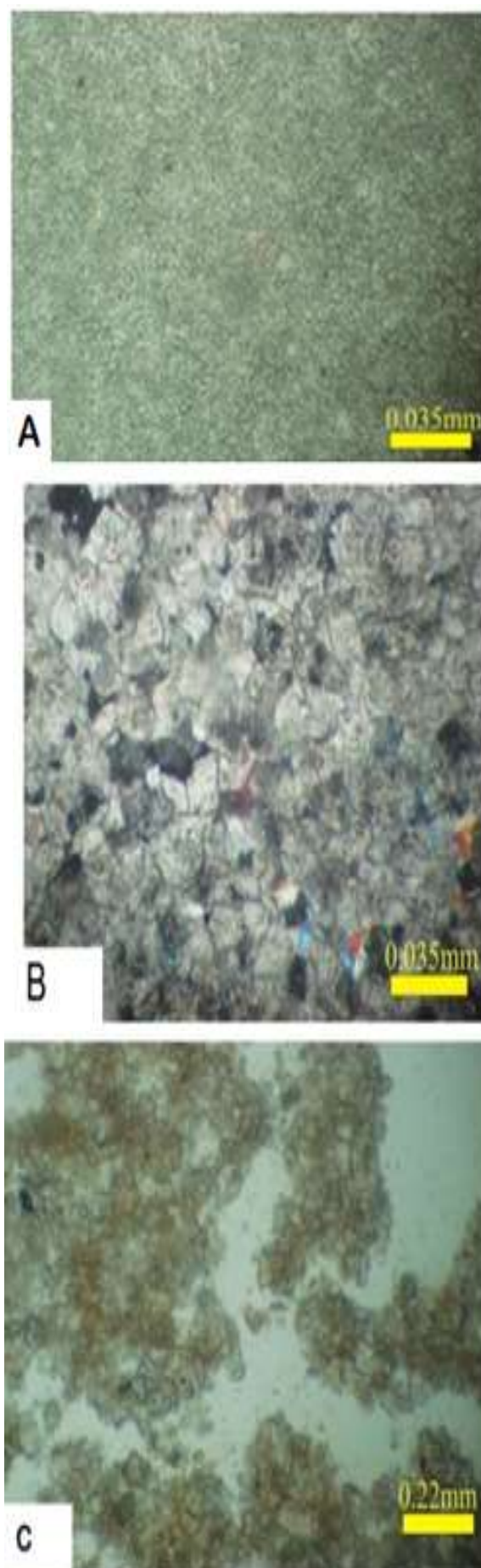
### 5)Contact-Rhomb Fabric:

This fabric is recognized by contact Hypidiotopic crystal and initial within fine grains of matrix. this type of texture is less distribution from Floting-Rhomb fabric because dissolution process of grains at Floting-Rhomb fabric and change this texture to sutured Mosaic within perfect dolomitization process. Fig.(5b) Plt(2-C).

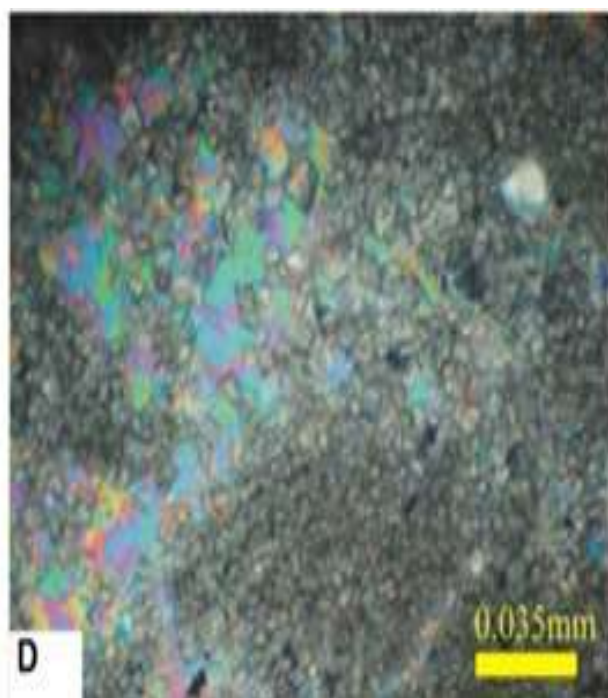
Also to be complete characterize another dolomites textures out of Randazzo and Ranchos classification which include only Selective dolomitization.

The Selective dolomitization refer to partial dolomitization process of microfacies such as take place a dolomitization process to part of groundmass and another part of groundmass isn't effect of dolomitization, or take place dolomitization of groundmass while skeletal grains stay resistance to dolomitization except some of crystals dolomite occurrence in primary chambers of forams (Plt.3-A). The Selective Dolomitization dependant different components of deposits which large size of calcite crystals that Low-Mg are more resistance of dolomitization process from high-Mg Calcite and aragonite crystals while the effect of dolomitization process to cryptocrystalline is faster than effect of the coarse grains because increase of surface are which exposure to dolomitization solutions(Sibley , 1982).The type of Selective dolomitization support to determined the age of dolomitization process where if the groundmass effect in dolomitization and sprite isn't effect in dolomitization that refer to early stage of dolomitization process (Plt.3-B), on the other hand if the cement is effect in the dolomitization process it refer to end stage of dolomitization(Plt.3-C) that is mean after berrier and lithification process.

Plate-1





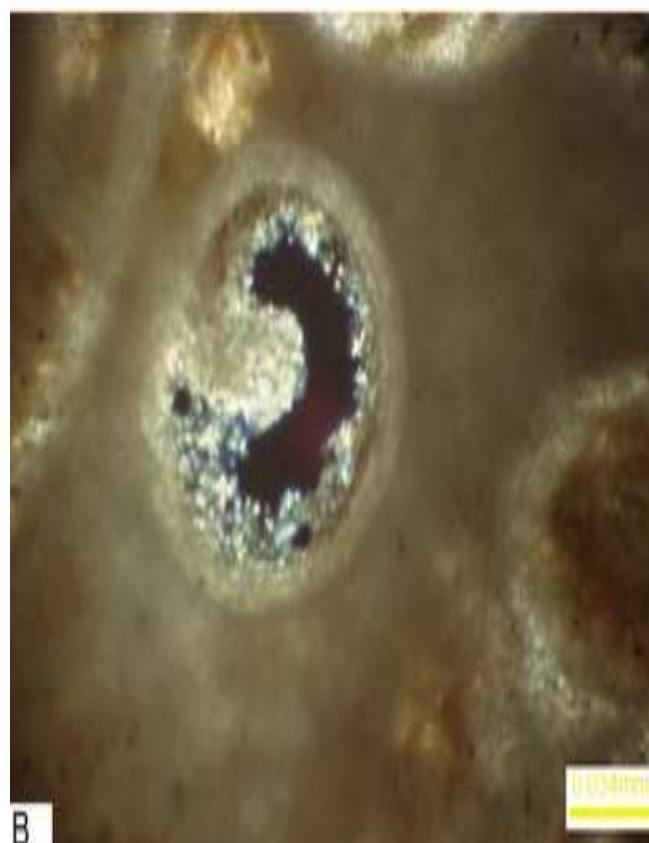


**D** A- Dolomitized mudstone displaying Micro texture sutured-mosaic fabric (Ja-26 at 1794-1795m.) Jeribe Fn.

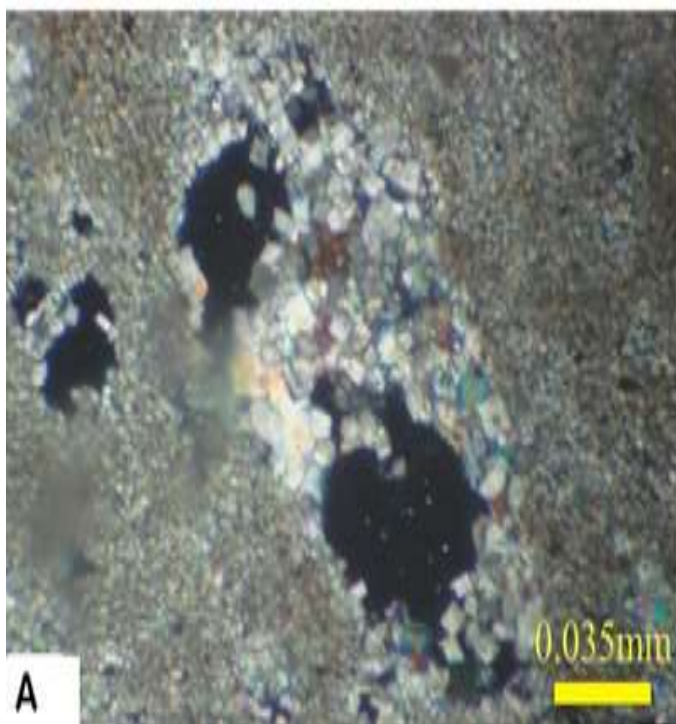
**B**—Intercrystalline porosity displaying Sutured mosaic fabric (Ja-26 at 1796-1797m.) Jeribe Fn.

**C**- Dolomitic wackestone displaying Sieve-mosaic fabric (Hr-41 at 382m.) Euphrates Fn.

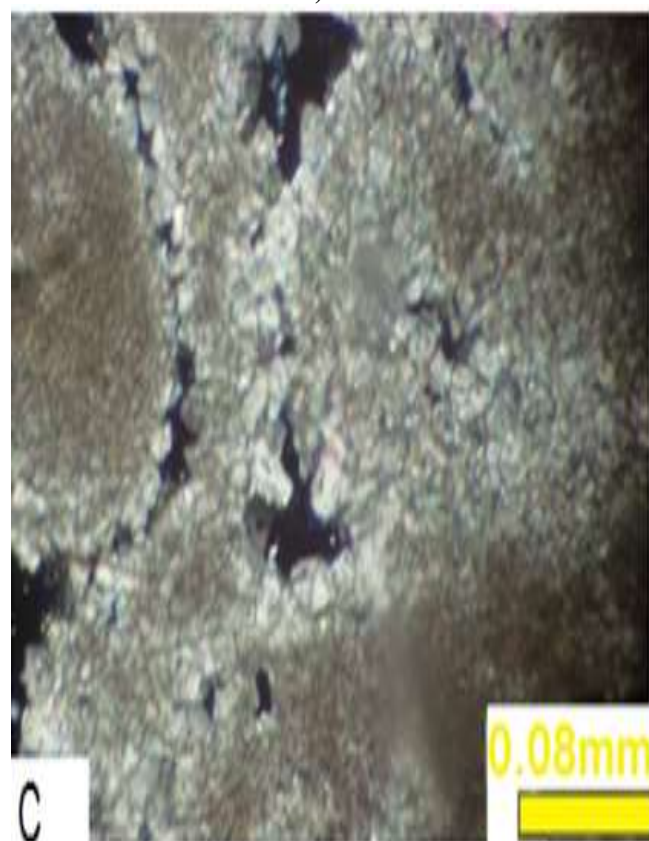
**D**-Dolomitic mudstone with fill anhydrite displaying micro- textured sieve mosaic (Ja-26 at 1844-1845) Dhiban Fn.  
Plate -2



**B** B- Fossiliferous lime Wackestone displaying floating-rhomb fabric inter skeletal of Vuge gastropoda (Hr-41 at 306 m.) Jeribe Fn.



**A** A- Dolomitized mudstone displaying floating-rhomb fabric characterize with Idiomatic crystals (Ja-26 at 1860 m.) Euphrates Fn.

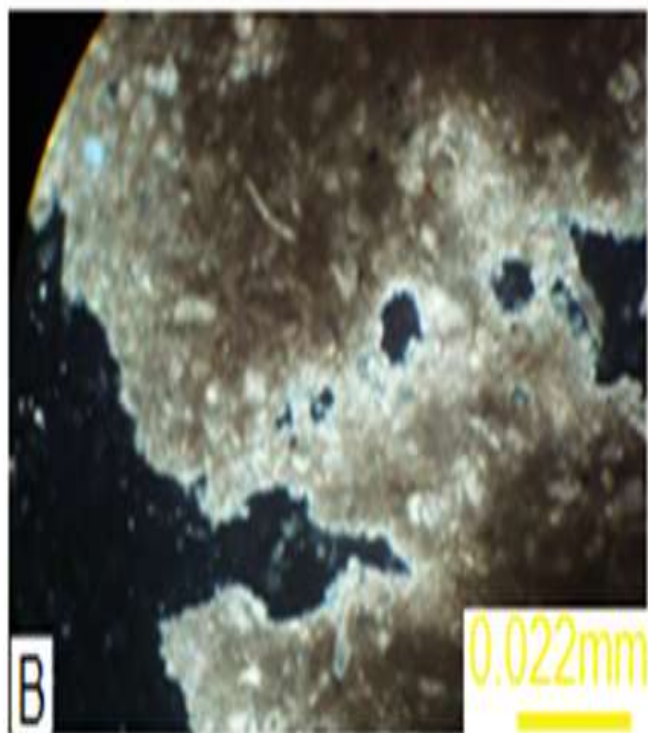


**C** C- Dolomitic mudstone displaying contact-rhomb fabric (Ja-26 at 1803-1804m.) Jeribe Fn.

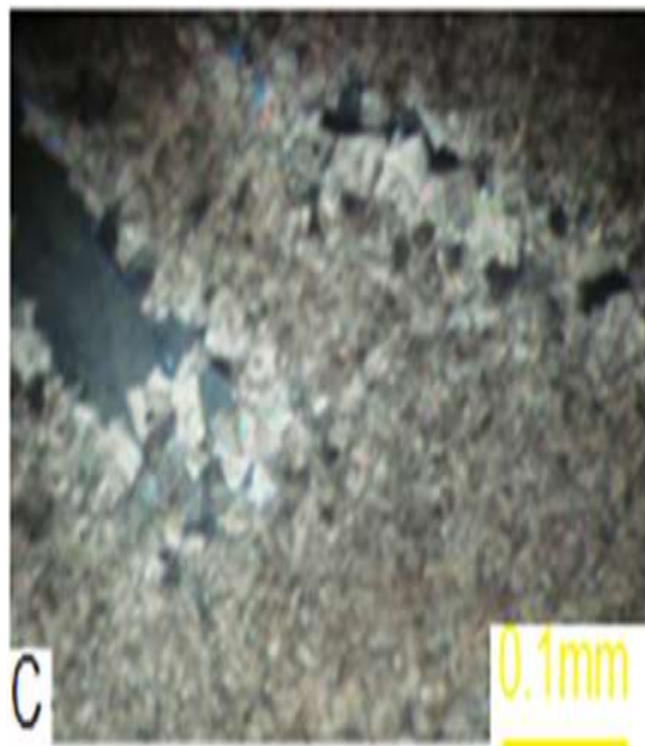
**Plate-3**



**A- - Fabric-selective moldic pores displaying Selective dolomitization process where crystals of dolomite in chambers of milliolid (Hr-41 at 303 m.) Jeribe Fn.**



**B- Planctonic Wackstone- packstone displaying Selective dolomitization process in groundmass of facies and don't effect planctonic fossiliferous in Selective dolomitization (Ja-26 at 1909-1910m.) Serikagni Fn.**



**C- Lime mudstone is appeared floating-rhomb fabric and spary cement is effected in Selective dolomitization process that point to late stage of dolomitization. ( Ja-26 at 1870-1871m.) Serikagni Fn.**

here are two processes of dolomitization that include heterogeneous and homogeneous in addition to a wide range of early to late stage of dolomitic fabric area . The textures of heterogeneous dolomitization include fabric ranging from early- stage floating rhomb fabric to later –stage contact – rhomb. These fabrics often grade in to mosaic fabric which appear to represent the complete stage of dolomitization. The sieve mosaic represent the late stage of heterogeneous and homogeneous dolomitization while micro texture sieve mosaic represent the late stage of homogeneous dolomitization and micro texture suture mosaic fabric is produce of homogeneous dolomitization process to lime mudstone.

The Selective dolomitization point to early stage of dolomitization if the groundmass is effected by dolomitization process while spary cement is effected



by Selective dolomitization process that point to late stage of dolomitization.

The economic significance of dolomitization as a host for oil and mineral deposits result from porosity changes which occurred during diagenesis. The replacement of calcite by dolomite involves a contraction increase in porosity of about (12-13) percent.

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## تصنيف ووصف أنسجة الدلمتة لدورة المايوسين الأسفل- الأوسط في كركوك/ (بئر جمبور-26؛ بئر حمير-41)

سلام عبيد ابراهيم

### الخلاصة:

إن فهم العمليات التحويرية لها أهمية اقتصادية وذلك لأنها تحدد الخواص الفيزيائية للصخور الكربونية والتي تستخدم للإغراض الصناعية. تم دراسة أنسجة الدلمتة المهمة والتي تقع ضمن منطقة الدراسة في بئر جمبور-26؛ وبئر حمير-41 في منطقة كركوك لدورة المايوسين الأسفل- الأوسط؛ إضافة إلى صعوبة تشخيص البنيات والمتشكلة من آليات أو ميكانيكية الدلمتة حيث هناك عدة ميكانيكيات معروفة لتكون عملية الدلمتة. اعتماداً على تصنيف راندز- زاكوز 1984 تم التعرف على خمسة أنواع من الأنسجة المتدلمتة والتي تتضمن: النسيج الدرزي الدقيق، النسيج الموزائيكي الدرزي، النسيج الموزائيكي المنخلي، النسيج المنخلي الدقيق ونسيج المعينات المتلامسة الطافية.