MICROFACIES AND APPLIED ASPECTS EXEMPLIFIED BY TERTIARY LIMESTONES (AZKAND LIMESTONE FORMATION) IN KIRKUK AREA PART 1

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ABSTRACT

Facies concept is served as a basis to reconstruct thematically the ancient depositional environment of Azkand Limestone Formation.

Numerous limestone types of this formation had been systematically studied in detail, due to the various types of the microfacies.

The present paper shows that the sediments of the Azkand Formation were deposited in three different environments namely a continental slope, fore-reef shoal and finally coral-reef; the reef type is of hermatypic scleractinian corals.

INTRODUCTION

The paper focuses on the study of microfacies evolution of the Azkand limestone in Khabaz Oilfield, 12 kilometers SW of Kirkuk district, Northern Iraq.
The diversity of the sediments represents a broad spectrum of carbonate rocks. Therefore valuable data is gained to analyze the depositional basin and its pattern during the Oligocene. In this case, the basin configuration reflects tectonic setting conditioned partly by its tectonic evolution and is lying in the flat area south of Kirkuk, composed mainly of Tertiary sediments.

The studied samples are from the following boreholes (Figure 1):

- Borehole Kz.3 (Long. 44° 17' 50", Lat. 35° 20' 01"
- Borehole Kz.4 (Long. 44° 07' 20", Lat. 35° 31' 38"
- Borehole Kz.9 (Long. 44° 09' 20", Lat. 35° 03' 05"

Furthermore, figures 2, 3 and 4 represent lithological columns in three boreholes.

**MICROFACIES**

The concept of the microfacies is applied to deduce the history of the basin evolution. The laterally and vertically facies variation (Figure 5) is of great importance by reconstructing the ancient depositional basins. Dunham classification (1962) (1), which is modified by Embry and Klovain (1971)(2) had been applied, because the boundstone microfacies is subdivided more in detail.
Figure 1: Location map of the studied boreholes
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Boundstone

It is built up mainly by coral and algal skeletons. Such rock is considered to be autochthonous (2) and subdivided into three types:

Framestone

It is built up mainly by skeletons of hexacorallia; it occurs alternately with reef and forereef facies and identical with SMF 7/FZ 5 (3,4) and with the biofacies 6 (5). (plate I, figure 1).

Bafflestone

It occurred locally in a quiet water environment. The micrite is deposited between the intergrown branches of coral. This facies occurs in the upper part of the borehole Kz.3 and is identical with SMF 7/FZ 5 (3,4). (plate I, figure 2).

Bindstone

It is composed mainly of crustose coralline algae such as Lithophyllum sp. and Lithothamnium sp. The micrite represents the binding material. The occurrence of the facies is not common and randomly distributed in the three boreholes. The facies is identical with SMF 7/FZ 5 (plate I, figure 3).

Grainstone

It is mainly grain supported fabric and cement is often sparitic. The following submicrofacies had been identified:

Miogypsinaoides Grainstone

It is composed mainly of large benthonic foraminifera namely Miogypsinaoides complanata (plate I, figure 5). This species constitutes more than 80% of the rock, while the bioclasts are represented by well-sorted coral clasts (0-5%), oyster shell debris (2-3%) and lastly
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foraminiferal clasts (1-2 %). This facie is widely distributed in the Kz.3 and Kz.9, which is identical with SMF 5/FZ 4.

Sartorio and Venturini, 1988(6) consider this facie to be algal-reef shoal, while Buxton and Pedley, 1989 suspect a fore coral-algal reef environment due to the frequent occurrences of Miogypsinoidea sp. The facies is identical with biofacies 7(5).

Foraminiferal Grainstone

It forms mainly of large benthonic foraminifera, which is indicative for fore coral reef. Various genera had been identified namely Miogypsinoidea sp., Lepidocyclina sp., Heterostegina sp., Spiroctypeus sp. and Kotaia sp. (plate II, figures 4,5).

The identified algae are: Subterranniphylhum thomasi, Lithothamnium sp. and Lithophyllum sp. (plate III, figures 6,7,8).

A lack of the Miogypsinoidea and predominance of Lepidocyclina is recorded in Kz. 4 (plate IV, figure 6). However, the depositional environment is similar to the Miogypsinoidea grainstone namely a coral-algal reef environment.

Packstone

The main characteristics are the large benthonic foraminifera and their clasts, corals and algae are not rare. The various types of submicrofacies of the packstone are indicative for the coral-fore reef environment and are as follows:
Foraminiferal Packstone

It is composed mainly of large benthonic foraminifera such as Miogypsinoides complanata, Lepidocyclina (Nephrolepidina) morgani (plate II, figure 8) and Heterostegina sp.

The bioclasts are mainly of corals, echinoids and oyster shells. The microfacies is widely distributed within Azkand Formation and occurred alternatively with fore-reef shoal facies. This facies is identical with SMF 5/FZ 4 (3,4) and biofacies 7 (5).

Bioclastic Foraminiferal Packstone

It is composed mainly of bioclasts of foraminiferal and oyster shell fragments. The intraclasts are limestone particles which constitute 2-3% of the whole rock. The destruction of the shells is due to the high turbulence of the water.

This facies is restricted to the middle part of the Azkand Formation in the Kz.3, Kz.4 and Kz.9, and identical with SMF 5/FZ 4 and biofacies 7 which represents a coral fore reef environment (plate V, figures 3, 4, 5). Furthermore, this facies represents a transitional one between the fore reef and shoal facies.

Mixed Foraminiferal Packstone

It is characterized by the occurrence of foraminiferal assemblage of fore and back reef type, due to the most probably restricted extension of the reef-proper. The following particles had been differentiated: coral debris 10-15% Lepidocyclina sp. 8-10% and Heterostegina sp. 5-10%.
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This facies refers to a transgressive phase with more transitional characters. The fossil assemblage is not common and reveals a great diversity (plate V, figures 6,7). The facies is identical with SMF 5/FZ 4 and biofacies 5,6 which represent coral-algal reef environment.

Coral Floatstone

The bioclasts are mainly coral rubbles (15-25 %), resulted by destruction and transportation from the coral reefs; the size of the rubble is more than 2 cm. (plate V, figure 8).

The following forms of foraminifera had been identified:

*Miochapsoides complanata, Rotalia vienneti* and *Heterostegina* sp.

This facies is identical with SMF 5/FZ 4 and represents reef flank (fore reef) environment.

Wackestone

The present study shows that this microfacies is restricted to the fore reef environment and presents a transitional one between the fore reef and basinal facies. A series of submicrofacies had been identified namely:

*Lepidocyclina* Wackestone

It is characterized by the occurrence of *Lepidocyclina* (*Nephrolepidina*) *morgani* forming 25-30% of the whole rock (plate II, figure 8; plate VI, figure 1). This species is widely distributed in Kz.3 and Kz.4. The facies is identical with SMF 4/FZ 4 which represents a
fore reef environment, while a similar facies is described from a shoal environment (marine upslope) (7).

A similar facies with planktonic foraminifera had been described by Hallock and Glenn (1985, 1986) (8, 9), which is deposited in a slope and the toe-slope environment under the wave-base. While the present study shows the lack of planktonic forams, which is an argument that this facies is deposited in an up-slope and not in the toe-slope; furthermore this facies is identical with the large orbitoid facies 7 at the fore coral-algal reef environment.

Foraminiferal Wackestone

It is formed mainly of planktonic foraminifera (20-25%), in addition to the forms of benthonic forams namely Miogypsinoideas complanata, Operculina complanata, Lepidocyclina sp. and Lenticulina sp. (plate VI, figure 2, 7); the bioclasts are mainly fragments of benthonic forams. The facies occurred in the lower part of the Askand Formation in Kz.3.

The hand specimen reveals bioturbated structures, where the burrows are filled with Lepidocyclina (Eulepidina) dilatata and Operculina complanata (plate VI, figure 8), some chambers of the planktonic foraminifera are filled with anhydrite (plate VI, figure 5), which is indicative for a very late diagenesis.

This facies is identical with SMF 3/FZ 3 which represents a deep shelf margin and transitional facies from fore reef shoal towards basinal facies. A similar facies is interpreted by Sartorio and Venturini, 1988 to be a fore slope shoal, where a mixture of benthonic and planktonic foraminifera occurs.
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Furthermore, this facies is similar to the biofacies 7,8 where the same mixture is dominant (5).

The present paper reveals similar submicrofacies namely foraminiferal-bioclastic wackestone-packstone which is composed mainly of bioclasts. This facies occurs in the lower part of Azkand Formation in Kz.3 and may represent a transitional one between the biofacies 7 and 8. On the other hand the depositional basin was shallower than the foraminiferal wackestone due to the few occurrence of planktonic foraminifera (plate VII, figures 1-5).
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REFERENCES


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الخلاصة

لقد استخدم مفهوم السحنات كأساس لاعادة بناء بيئة الترسيب القديمة

بتكون أرقان الجبري،

إن عدة أنواع من الحجر الجيري لهذا التكوين تمت دراستها بالتفصيل,

تبعاً للأنواع المختلفة من السحنات الدقيقة.

إن هذا البحث يوضح إن الرواسب تكوين أرقان قد ترسبت في ثلاثة

بيئات مختلفة هي المنحدر القاري، والضحايا أمام الشعاب المرجانية

المبنية بواسطة المرجان السداسي التكافلي.