Microfacies of Abderaz Formation in the Padeha Section, East of Kopet-Dagh

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Abstract

In order to identification of sedimentary facieses and reconstruction of paleoenvironment of Abderaz Formation, an outcrop of this formation near the Padeha Village, East of Kopet - Dagh basin was selected and studied. The Abderaz Formation with the age of Turonian – Santonian that composed of intercalation of shale, marl and chalky limestone, is extended throughout the Kopet – Dagh sedimentary basin. Field and lab scrutinizes are led to recognition of two major terrigenus and carbonate sedimentary facieses that belong to open marine environment. Presence of some bioturbated structures specially in carbonate parts, periodic and suddenly changes in its sedimentary facieses present unstable base for sedimentary basin. Gradual changes in rate of limestone and increase of macrofossil shells' thickness from the base to top of the Formation represent warming up the environment in this time.

Key words: *Kopet-Dagh, Abderaz Formation, Microfacies, Biomicrite.*

Introduction

Abderaz Formation is one of the lithostratigraphic units remained from Late-Cretaceous in Kopet Dagh sedimentary basin. The name of this formation is derived from the name of a village located in the east of Mashhad. Its best outcrop in Mazdavand pass is introduced by Afshar Harb (1994) alternatively from shale and marl with interbedded chalky limestone. The lower border of this and Atamir Formation are of disconformity and its upper border is in the same gradient with Abtalkh Formation and continuous (Aghanabati, 2004). Vahidi Nia (2007) believes that the lower border of this formation is of paraconformity type. The under-study shear located on the east of the type section and the north of Padeha Village, with the eastern longitude of 60º, 44' , 50" and the northern latitude of 36º , 5' , 9". This section follows the general process of North-West to South-East (figure 1). In this section, Abderaz Formation includes shale and marl with a frequency of 4 bands of chalky limestone of a thickness of 518.6m. The lower border of the unit is in paraconformity with Atamir Formation (figure 2) and its upper one with Abtalkh Formation is continuous and gradual which is considered at the end of the last limestone band (figure 3).

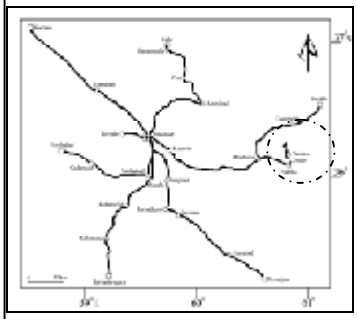

Figure 1- Opportunity route to Section Study

Figure 2- The lower border of Abderaz Formation with Atamir Formation (look to the East)

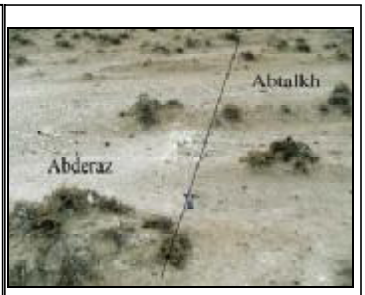

Figure 2- The upper border of Abderaz Formation with Abtalkh Formation (look to the West)

The microfossils were introduced on the basis of Cushman (1945), Postuma (1971), Loeblich and Tappan (1988), Bolli (1989) and Keller and Pardo (2004).

Considering the morphologic and lithographic characteristics, this formation may be divided into eight separate sections:

1. Lower shale including 35.5m. Green dark grey shale.
2. Lower chalk including 9.4m. of limestone
3. Second shale- lower marl including 31.9m.
4. Second chalk including 13.3m.
5. Mid marl including 80.4m.
6. Third chalk including 18.2m.
7. Upper marl including 305.7m.
8. End chalk including 24.2m.

Discussion

The changes of Abderaz Formation from the base towards the top are generally accompanied with increasing the rate of carbonate. They are seen as lithologic changes from shale (at the beginning of the formation) to marl and limy marl (at the end of the formation). Another evidence for this claim is increasing the thickness of lime bands of this unit from the lower to the upper part.

In lateral sequence, the thickness of Abderaz Formation increases from the east towards the west of the basin. While the lower border of this lithostratigraphic unit is reported to be discrete everywhere and indicate the erosive cycle of the early Late Cretaceous period (Aghanabati, 2004) and it becomes younger from west to east. This phenomenon may be associated with the elevation of the east part of the basin during the formation of Abderaz Formation due to the protrusion of Agh Darband region. The upper border is approximately continuous and gradual everywhere. On the basis of the fossil content, the age of this unit in this shear is estimated to be during Late Turonian to Late Santonian. The studies done on sediments of Abderaz Formation in this section indicate two main facieses including detritus and calcareous facieses. Considering the abundance of allochems, calcareous facies includes the following six microfacies, that were entitled on the basis of the classification of Folk (1962) and Dunham (1962).

- Inoceramid biomicrite (Inoceramous wackestone)

The matrix is micritic and in some parts of which there is a little amount of microsparite. About 60-70% of its allochems are the broken pieces of Inoceramous with different sizes. From among the other allochems, we may refer to oligosteginidea and the broken pieces of foraminifers.

- Bioclastic biomicrite (bioclastic wackestone)

In micritic matrix of the rock, there is 30-45% of oligosteginidea with the same varieties of the former facies. The most abundant kind of allochems is of the varieties of benthic and planktonic foraminifers. From among benthic foraminifers, we may refer to *Lenticulina montseri* and from planktonic foraminifers to *Marginotruncana marginata*. We may refer to bivalves' pieces, crinoids, green algae and ostracod from among the other available allochems.

-Biomicritic oilgosteginidea facies (Oligosteginidea wackestone- packstone).

The matrix of the rock is micrite and 50-70% of the allochems are formed from Oligosteginidea. The varieties of this family that are seen in this facies include *Pithnella ovalis*, *Stomiosphaera sphaerica* and *Calcisphaerula innominata*. From the other allochems, we may refer to bivalves' pieces (inoceramous), different varieties of foraminifera, bryozoans and pieces of crinoids.

- Inoceramid biomicrite facies (Inoceramous wackestone- packstone)

The matrix of the rock is micritic and 50-70% of allochems are formed by pieces of bivalves crust especially inocermous in different sizes. From among the other allochems, we may refer to different varieties of Oilgosteginidea, foraminifera, bryozoans, and pieces of crinoids from among the other allochems. A very little percentage of glauconite is seen among the other allochems.

-Oligostginid biomicrite facies (Oligosteginid Packstone)

The matrix of the rock is micritic and most of the allochems are formed of varieties of oligosteginidea. We may refer to different broken and intact varieties of foraminifera, bryozoans, the broken pieces of innoceramous and pieces of crinoids from among the other allochems.

-Bioclastic biomicrite (bioclastic packstone)

In the micritic matrix of the rock of more than 50% of allochems, there are different broken or intact varieties of foraminifera.

There is Oligosteginidea in this facies but they are not abundant. From among the benthic foraminifera, we may refer to *Lenticulina montseri* and from among the planktonic foraminifera to *Marginotruncana marginata*. We may refer to bivalves' pieces from among the other available allochems, crinoids and ostracod.

The microscopic studies show that the sedimentary environment is an open relative deep sea with a unstable floor of basin and turbulent environment. The depth of the basin in various times is variable; although its depth has been reduced several times, but in general, the depth of the basin has gradually increased.

Conclusion

According to this study, Abderaz Formation is composed of 8 unites.

The lower border of this Formation with Atamir Formation is paraconformity and the upper border is continuous with Abtalkh Formation. The studies done on microfossils of this Formation indicate that they belong form Late Turonian to Late Santonian. This formation has two main clastic and calcareous facieses. The comparison of the facies identified with Wilson Standard Model (1975), suggests the sedimentary environment including SMF2 and SMF3 and at the tow of the slope, with a range of medium or low energy. This microfacies introduce FZ2 and FZ3 associated with open sea and the sedimentary environment with a range of medium to deep. The difference of facieses is related to unsteady of the basin when was formed this lithostratigraphic unit.

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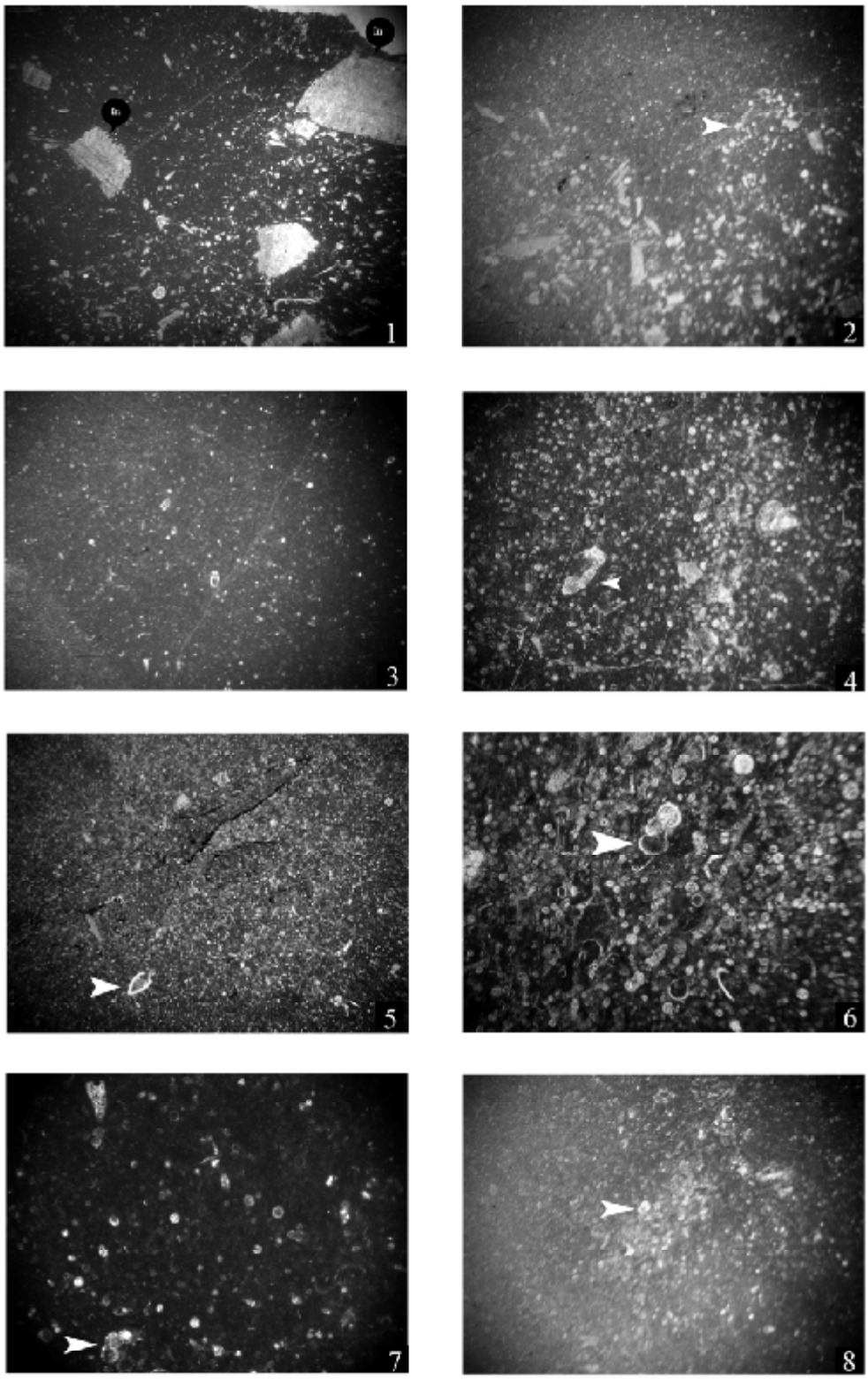
Plate



Plate

1- Inoceramid Wackstone.
Grains: Inoceramus debris (In), foraminifer's debris. ×20. Late Santonian
2- Inoceramid Wackstone-Packstone.
Compacted structur (Arrow). ×20. Late Santonian.
3- Bioclastic Wackstone.
Grains, foraminifera & a few oligostegina, ×10. Late Santonian.
4-Oligosteginid Packstone.
Grains: Foraminifera (white arrow), micritic matrix with compresd & flood of Oligostegina species, bearing lammination. ×45, Turonian.
5- Bioclastic Packstone.
Grains: foraminifera (arrow), oligostegina species, micritic matrix, ×10 Coniacian.
6- Oligosteginid Packstone;
Grains: Foraminifera (white arrow), bivalve debris, micritic matrix with flood of Oligostegina species, fearly lammination. ×45, Turonian.
7- Oligosteginid Wackstone-Packstone.
Grains: foraminifera, oligostegina, some debris of bivalves, ×45 Late Coniacian.
8- Bioclastic Wackstone.
Grains: foraminifera (arrow), some debris of bivalves, ×10, Late Coniacian.