

The characteristics of carbonate cements in the drilling core samples from the Sagara oil field

Yoshiaki Araki[1], Satoshi Hirano[2], Hideki Wada[3], Sagara Drilling Program Scientific Party

[1] Geosciences, Osaka City Univ, [2] IFREE, JAMSTEC, [3] Faculty of Science, Shizuoka Univ.

The Sagara oil field in Shizuoka Pref. is the sole oil field along the Pacific coast of the Japanese Arc. Quality of the crude oil is excellent and belongs to the lightweight type. Recently, a research group of Kyoto University discovered alkane synthesis bacteria (HD-1) at Ebie area of this oil field. Other group also discovered in methane hydrate yielded from Nankai Trough, which is near the Sagara oil field. These findings have resulted in renewed attention on the genesis of Sagara oil field.

JAMSTEC and Shizuoka University, and other party have done the drilling survey, which covered a 200m core from the Sagara oil field during the spring of 2002. Although several micro biogeochemical purposes were behind this drilling project, it is essential to understand the sedimentary environment as well as geotectonic. Some carbonate concretions were collected from several depths in the core recovered.

The stratigraphic horizon of this core can be correlated with the reservoir rock of Tokigaya member in the Sagara oil field. It is very important to study the detail of rock facies and their characteristics for recognizing the forming process of the reservoir layer. And several depths of conglomerate layer and sand rock layer are observed carbonate cements. In ordinal, forming carbonate cements is known the relationship of fluid such as crude oil and natural gas in oil field. The mineralization of carbonate cements is important to migration process of oil and gas.

We have done macroscopic analysis of the cores in The Japan National Oil Corp. Petroleum Technology Research Center in summer of 2002.

After that, we have done XRD analysis of the matrix in the cements in the Shizuoka University.

The facies of the whole core is composed of the conglomerate, sandstone and silt stone layers. The sandstone layer is dominant. There are two types of medium sandstones and conglomerate. One is packed carbonate minerals. The other one is not packed. Characteristic of cement in medium size sandstone and conglomerate are described as follows

Carbonate cements is clearly harder than sandstone or silt stone layer.

Matrix of conglomerate is white.

The carbonate cements layers are observed in same grain size layer of granule or very coarse sand.

There is no lamina structure.

The thickness of carbonate cements layer is thicker than other layer.

Carbonate cements layer contains a few shell fragments.

The rock types of gravels are consisted of chert, limestone, and other sedimentary rocks.

The results of XRD analysis of matrix in the cements indicated only calcite, while other carbonate minerals such as aragonite and dolomite were not indicated.

We show the example of no carbonate cements in conglomerate. Massive pebble layers are seen in the depth of 127-128 m and 147-148 m. This core has upward grading structure (very coarse to fine sand), for about 5-10cm thick. In the medium size sandstone layers, cross bedding, convolute or parallel lamination are recognized in several horizons.

The carbonate cements layer is sorted and thicker than other layer. Result of this fact. We thought that sedimentary environments of carbonate cements layer may have long stable term as the similar grain size deposit in this area. in the carbonate cements layer, amount of gravel supply is higher from land.

Carbonate cements may not mineralize in sea water because there is only calcite.

When was the carbonate cements formed? What kind of processes are necessary to form these carbonate cements? The application of carbon isotope analysis and textural analysis SEM etc may help to find the solution of these problems.

The Japan National Oil Corp. Petroleum Technology Research Center is graciously thanked for allowing us to use the core cutter and core observation room. I would like to express my sincere gratitude to Dr. Hiroyuki Tsuji for the permission to use machine and room, and also to Mr. Kazuhito Ooseto and staffs of TRC for their help.