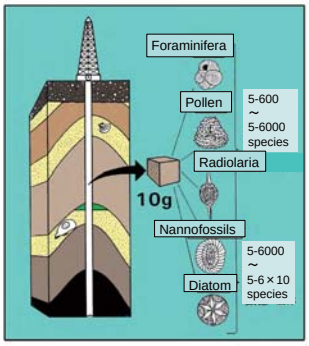
Microfossil Analysis - Applications for Determining Geological Age and Reconstructing Paleoenvironments

Summary

It is important to recognize the distribution of source and reservoir rocks and the migration pathways for hydrocarbon entrapment. Microfossil analyses provide geological age, stratigraphic correlation and paleoenvironmental data. Multi-microfossil analysis provides more detailed geological age data and high-resolution correlation of strata. Microfossil analysis contributes to accurate assessment of the subsurface for oil and gas exploration. Because microfossil analysis can be performed quickly, it is suitable for wellsite operation.

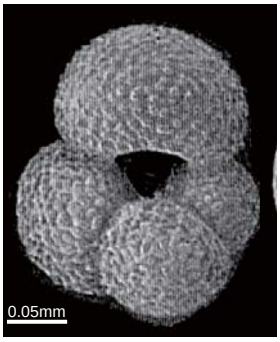
Microfossils



Microfossils can be detected and identified under a microscope. Characteristics that make microfossils useful are:

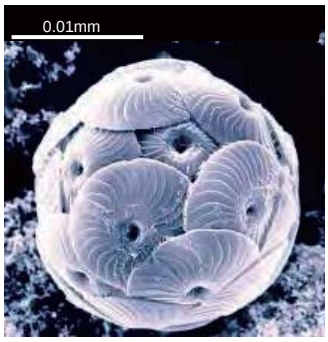
- Their abundance in rock
- The ease and speed with which they can be analyzed
- Their availability for wellsite operation

Foraminifera



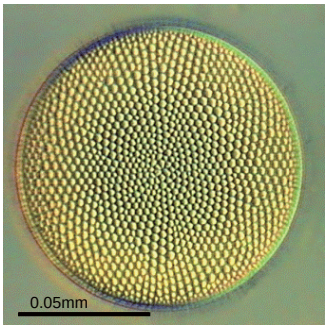
Foraminifera have calcareous tests with chambers and apertures of various shapes, and were the first microfossils used in the oil industry. Both planktonic and benthic foraminifera exist.

Calcareous Nannofossils



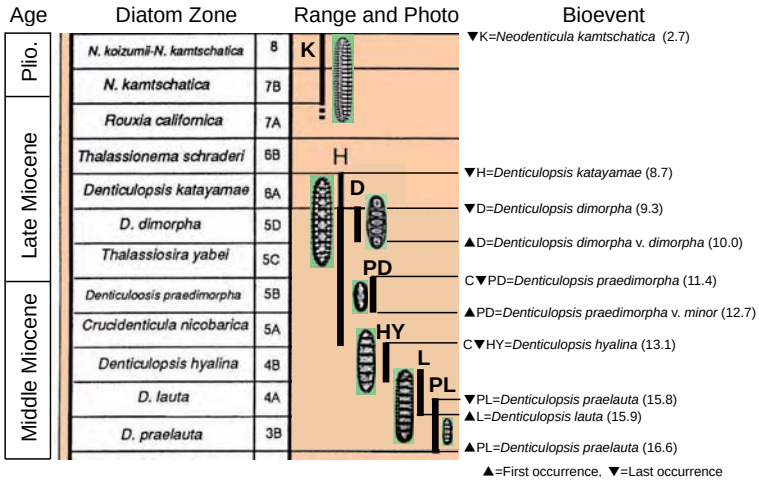
Calcareous nannofossils are formed by phytoplankton as very small calcareous plates (coccoliths), and are particularly useful index fossil because of their worldwide distribution.

Diatoms



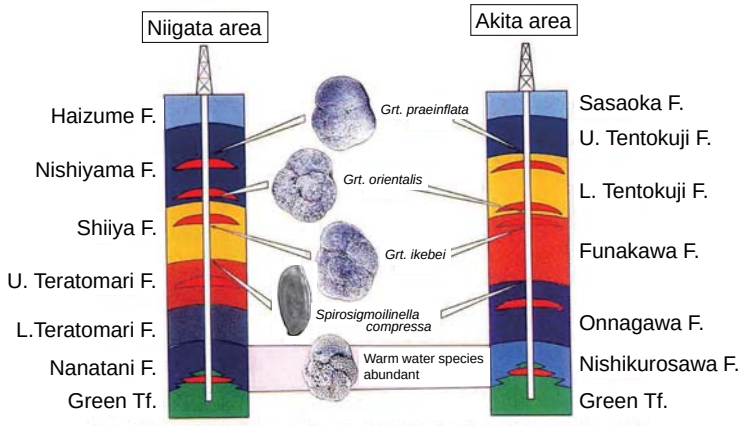
Diatoms are microfossils of phytoplankton with siliceous valves, and an important source material for hydrocarbons. These microfossils are easily identified even from fragments because of their symmetric morphological patterns.

-Geological Age-



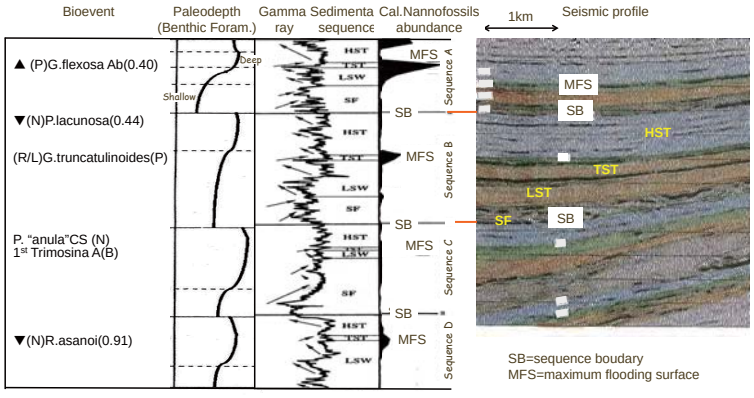
The occurrence of the fossil Diatom *Denticulopsis dimorpha* in a rock sample indicates a Late Miocene geological age, from 10 million to 9.3 million years ago.

-Stratigraphic horizon and correlation-



The occurrence of *Grt. ikebei* from the Niigata area well and its stratigraphic horizons in the Shiiya Formation in the Niigata area and the Funakawa Formation in the Akita area.

-Sedimantary Sequence -



SB=sequence boudary
MFS=maximum flooding surface

This sedimentary sequence was interpreted with multi-fossil analysis, logging data and a seismic profile. Microfossil analysis provides geological horizon, fossil abundance, and paleodepth data. These results contributed to estimation of the reservoir's distribution.

Key points

Analyses of foraminifera, calcareous nannofossils and diatoms can be performed.

(1) From a small rock sample (5-6g to 100g), microfossil analysis results can be obtained, often in a short period of time.
(2) Micropaleontology is a powerful tool for establishing a chronostratigraphic framework and reconstructing the paleoenvironment of a region. Multi-fossil analysis provides more detailed geological age data and high-resolution correlation of strata.
(3) Microfossil analysis contributes to the interpretation of sequence stratigraphy, high-resolution reservoir stratigraphy and paleoenvironmental comparisons.

Microfossil analyses greatly contribute to the assessment of oil & gas distribution.