

Source Rock Analysis

-- Evaluating Exploration Potential



Summary

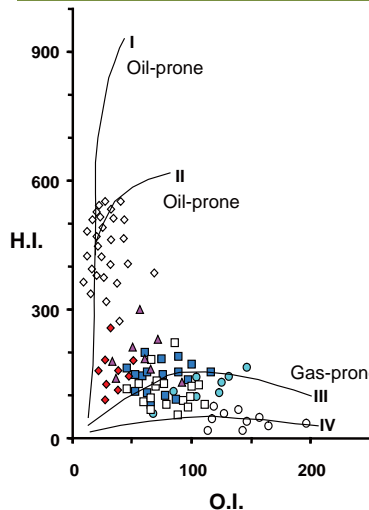
Petroleum source rocks are fine-grained, organic-rich rocks that have the potential to generate petroleum. All oil and gas fields require source rocks as an element of their petroleum system. Source rock potential is evaluated based on three parameters (organic amount, organic type, and maturity). Analytical instruments, such as elemental analyzers, Rock-Eval® instruments, and vitrinite reflectance microscopes, are used for analysis of outcrop samples, well cuttings, and cores. The resulting data are fundamental for oil and gas exploration.

Amount of Organic Carbon



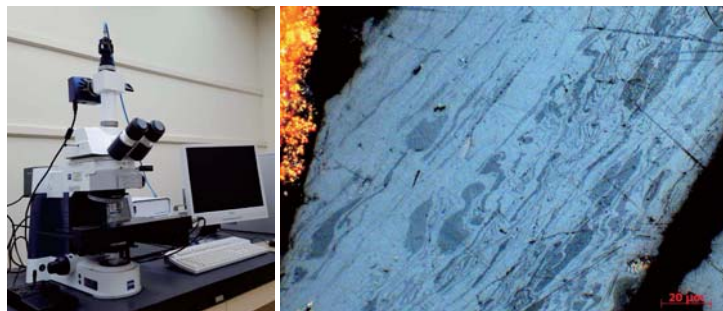
Total Organic Carbon (TOC) content is the most important parameter to indicate the amount of petroleum generation. Carbon in source rock samples is converted to carbon dioxide (CO₂) gas during oxidative combustion. Organic carbon content in the source rock can be calculated by measuring the amount of CO₂ produced.

Type of Organic Carbon (Rock-Eval®)



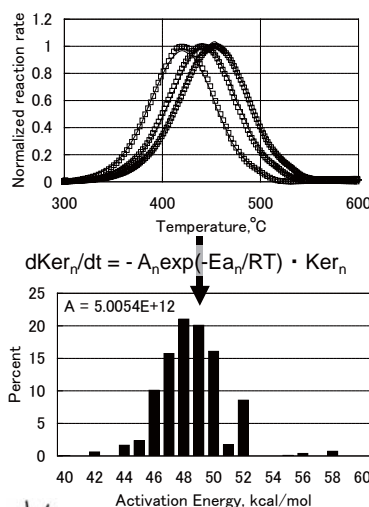
Rock-Eval® is a unique instrument used in the petroleum industry. The organic types (oil-prone or gas-prone) and maturity of source rocks can be estimated using Rock-Eval® pyrolysis.

Maturity (Vitrinite Reflectance)



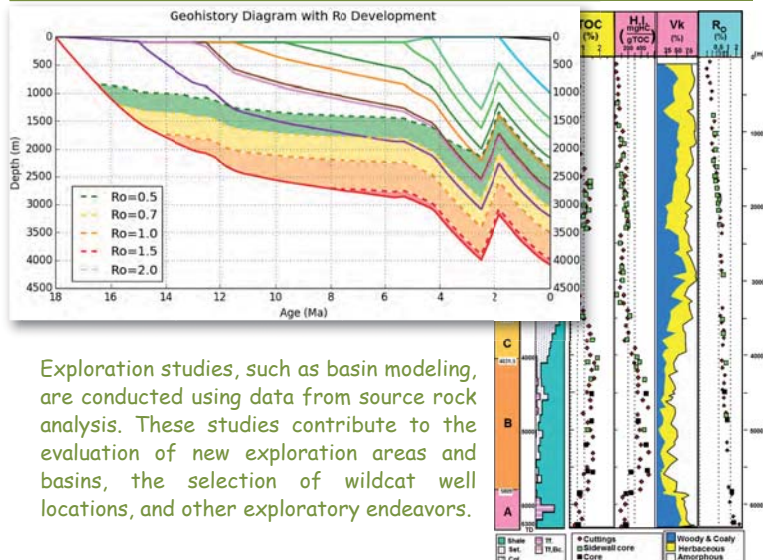
Vitrinites, which are carbonaceous materials derived from the woody parts of plants, are found in most source rocks. Vitrinite reflectance can be used as an indicator of source rock maturity because of its high correlation with the thermal record of the rock. Evaluation of the thermal history of a basin is conducted through basin modeling using maturity data derived from vitrinite reflectance measurements.

Source Rock Kinetics Analysis



We can evaluate how and when in their depositional history the organics in source rocks generated petroleum by calculating the kinetic reactions of kerogens. More detailed features (the timing of generation, for example) can be identified with this method than can be identified based on the organic type analysis described above.

Application in Exploration Geology



Exploration studies, such as basin modeling, are conducted using data from source rock analysis. These studies contribute to the evaluation of new exploration areas and basins, the selection of wildcat well locations, and other exploratory endeavors.



Key Points

Source rock analyses are mainly conducted for evaluation of the three factors described below:

- (1) The amount (quantity) of organics: the more organics, the more petroleum generation
- (2) The type (quality) of organics: oil-prone or gas-prone
- (3) The maturity of organics: whether they could generate or have already generated petroleum

We cannot properly evaluate petroleum systems without source rock analysis because source rock data are fundamental to petroleum exploration.

Our source rock data are carefully analyzed to accurately enhance exploration studies, such as basin modeling, migration and accumulation analysis, and the selection of wildcat well locations.