

15. CARBON ISOTOPE ANALYSIS

The measurement is carried out on one or more of the following mixtures; topped oil; saturate fraction; aromatic fraction; NSO fraction. The organic matter is combusted at 860 Deg. C in oxygen and the carbon dioxide formed is purified and transferred to an isotope mass spectrometer. The carbon isotope ratio is measured relative to a standard gas of known isotopic composition. In our case the standard gas is prepared from the NBS No. 22 oil. However, since the isotopic relationship between NBS No. 22 oil and the international reference PDB limestone are known, the values are adjusted to be relative to PDB limestone.

Although carbon isotope data has been commonly used for oil:oil and oil:source rock correlation its most significant application is the identification of the source of gas according to the following criteria (Fuex, 1977):

<u>$\delta^{13}C$ (PDB)</u>	<u>Gas Type</u>
-85 to -58	Biogenic methane
-58 to -40	Wet gas/associated with oil
-40 to -25	Thermal methane

16. VITRINITE REFLECTANCE MEASUREMENT

Vitrinite is a coal maceral which responds to increasing levels of thermal maturity. This response can be measured by the percent of light reflected off a polished surface of a vitrinite particle immersed in oil. Reflectance measurements are made on a number (40 if possible) of vitrinite particles in each sample, in order to establish a range and mean for reflectance values. Immature rocks have low reflectance values (0.2% Ro to 0.6% Ro), with mature values ranging from 0.6% Ro to 1.2% Ro. Very mature values are between 1.2 % Ro and 1.8% Ro, while severely altered rocks have reflectances above 1.8% Ro.

Vitrinite reflectance results are best obtained from coals or rocks deposited in environments receiving large influxes of terrestrially-derived organic matter. Unfortunately, these environments are not conducive to the accumulation of large quantities of oil-prone organic mater. Also vitrinite reflectance cannot be performed on rocks older than Devonian Age, due to the absence of land plants in the older geological time periods.

17. VISUAL KEROGEN

Visual kerogen assessment is carried out by the coal petrologist and/or the palynologist. In the case of the petrologist the assessment is made in reflected light using the plug prepared for vitrinite reflectance measurement, and reports the relative amounts of alginite, exinite, vitrinite and inertinite particles.

Visual study of kerogen by the palynologist is carried out in transmitted light and can indicate the relative abundance, size and state of preservation of the various recognizable kerogen types and hence indicates the source character of a sedimentary rock. In addition, the colour of the kerogen is related to the thermal maturity of the sediments and is often used as a maturation indicator.

The preparation of slides for visual kerogen assessment by the palynologist firstly involves concentration of the organic matter by removal of the rock matrix using hydrochloric and hydrofluoric acid treatment and heavy liquid separation. The organic concentrate is then mounted on a glass slide using Petropoxy.