18. BITUMENS AND ORGANIC CARBON IN SAMPLES FROM DSDP LEG 9 CORES

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Six frozen samples from five holes (78, 80A, 82A, 83A and 84) of the DSDP Leg 9 cruise were analyzed for their contents of organic carbon, gasoline-range hydrocarbons and extractable organic matter including heavy (C_{15+}) sulfur and oxygen compounds. The samples were chosen from a suite of cores especially collected and frozen for analysis of ephemeral properties; these six were taken because their color was darker or their apparent organic carbon contents were greater than other samples available for analysis. Data on organic carbon contents were provided by Woods Hole Oceanographic Institution whose analyst used an indirect method based on the difference in amounts of carbon dioxide evolved during combustion of duplicate samples, one of which was heated beforehand for three hours at 500°C to remove organic carbon (Hunt, 1970). The procedures we employed have been published elsewhere by Dunton and Hunt (1962) and Gehman (1962).

As the attached table shows, the samples had extremely small quantities of each of the organic constituents being investigated. Unfortunately, the solvent extracts were so small that they could not be further divided into hydrocarbon fractions (saturates vs aromatics) and nonhydrocarbons. This also prevented subsequent gas chromatographic or mass spectrometric characterization of the hydrocarbons. The data reveal a severe disagreement in the amount of organic carbon determined by the two different methods. This problem is being studied.

In any case, the amounts of pentane-solubles extracted from these six samples is quite low. The combined total of pentane-soluble bitumens in each sample is lower than the amount of hydrocarbon thought to be necessary to rate it as a source rock of petroleum (Philippi, 1956). Whatever fraction of this pentane-soluble material is hydrocarbon, the hydrocarbon contents for these Leg 9 samples are in the same range as the hydrocarbon contents in previously analyzed DSDP samples and reported by Bray and Evans (1969), Koons (1971) and McIver (1971 a and b).

Moreover, these samples contain no detectable gasoline-range (C_5-C_7) hydrocarbons and would thus be classed as juvenile in the sense that the organic matter has experienced very little thermal diagenesis (that is, maturation).

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TABLE 1

Sample					Total Organic Carbon				
Leg	Hole	Core	Section	Depth in Section, cm	Direct[a] Per Cent	Indirect[b] Per Cent	Gasoline-Range Hydrocarbon ppm	Pentane Soluble (Hydrocarbon Plus NSO cpds) ppm	Pentane Insoluble (Asphaltenes) ppm
9	78	29	6	75-150	0.02	0.43	<0.04[c]	15	13
9	80A	5	5	60-150	0.02	0.53	<0.04	10	6
9	82A	3	5	82-150	0.07	0.16	<0.04	13	14
9	83A	10	4	52-150	0.18	0.24	<0.04	16	20
9	83A	13	4	92-150	0.03	0.20	<0.04	22	16
9	84	16	6	70-150	0.23	0.44	<0.04	24	25

[a]The direct method measures the CO_2 from combustion of organic carbon after acid treatment of the whole sample to remove carbonate carbon (Gehman, 1962).

[b]The indirect method measures the difference in CO_2 evolved from combustion of duplicate samples after one of them has been heated at 500°C for 3 hours to remove organic carbon (Hunt, 1970).

[c]0.04 ppm is the background level for this method (Dunton and Hunt, 1962).