23. C_4-C_7 ALKANE YIELDS

John M. Hunt, Department of Chemistry, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

ABSTRACT

Thirteen samples from Holes 336, 338, 345, and 348 were analyzed for C_4 to C_7 hydrocarbons using a cold (room temperature) dispersion technique. Two samples were reanalyzed using the boiling water technique previously reported (Hunt, 1974). The yields of hydrocarbons from the latter method were about 50% to 90% higher.

RESULTS AND DISCUSSION

In the analytical method previously reported (Hunt, 1974), one step involves heating the sediment container in a boiling water bath for about 30 min. Previous studies on ancient sedimentary rocks from oil-producing basins had indicated that this treatment removed the hydrocarbons adsorbed on sediment particles, while still being well below cracking temperatures.

In order to determine to what extent these hydrocarbons are removed at room temperature, 17 samples were subjected to the same analytical procedure, except the cans were shaken at room temperature and the gas withdrawn for analysis without further treatment. Six samples were rerun with the boiling water step. In this latter standard procedure, the gas is withdrawn while the can is hot. Four of the samples were from the Black Sea and are not reported here. Two, from Holes 338 and 345, are shown in Table 1 with the hot samples listed in the last two columns.

The yield at room temperature was from two-thirds to one-half of the yield for the heated samples. Also, cooling a heated can and resampling the cold gas yielded fewer hydrocarbons. It appears that some hydrocarbons are retained in the water phase, or possibly on the can walls at room temperature. Hydrocarbon ratios were not altered by the different treatment as much as the yields, as seen below.

	338-32-3		345-23-4	
	Cold	Hot	Cold	Hot
Isopentane/n-pentane	0.05	0.015	1.4	1.7
2-methylpentane/3-methylpentane	0.67	0.73	1.8	2.2
Methylcyclopentane/methylcyclohexane	1.9	1.4	1.4	1.2

An increase in yield of hydrocarbons with depth and age was noted particularly in Holes 338 and 345, although it was not evident in Hole 336. The first sample from Hole 336 was Plio-Pleistocene terrigenous sediments and volcanics, while the rest are Eocene greenish-gray mudstones. Samples from Holes 338 and 345 are generally greenish-gray mudstones. Samples from Holes 338 and 345 are generally greenish-gray carbonate muds with the ages for the sediment at Holes 338 and 345 extending into the Eocene, and for Hole 348 into the Oligocene. The hydrocarbon yields from all four holes are much lower than from those analyzed from holes near Australia, and holes in the Red Sea and Gulf of Aden, even allowing for the probable increase from heating. It appear that none of the sections analyzed has sufficient hydrocarbon potential to be of significance as a possible petroleum province.

It is interesting, however, that even at these low yields there are 23 hydrocarbon structures forming by low-temperature diagenetic reactions in the sediments.

REFERENCE

Hunt, J.M., 1974. Hydrocarbon and kerogen studies. *In* von der Borch, C.C., Sclater, J.G., et al., Initial Reports of the Deep Sea Drilling Project, Volume 22: Washington (U.S. Government Printing Office), p. 673-676.

TABLE 1
C_4-C_7 Alkane Yields from Leg 38 (ng/g Sediments)

	Site, Core, Section													
	336-5-5	336-25-1	336-33-4	336-35-4	338-5-5	338-13-5	338-32-3	345-1-2	345-14-4	345-23-4	348-3-5	348-29-0	338-32-3[a]	345-23-4[a]
Isobutane	0.02	0	0.13	0	0	0	0.10	0	0.03	0.29	0.14	0.01	0.25	0.59
n-Butane	0	0	0.01	0.02	0.02	0.07	0.01	0.04	0	0.28	0	0.02	0.18	0.57
Isopentane	0.01	0.02	0.01	0	0	0.02	0.04	0.01	0.02	1.14	0.04	0.02	0.02	2.39
n-Pentane	1.07	1.27	1.63	1.43	0.57	0.89	0.87	1.11	1.70	0.83	2.25	1.75	1.25	1.41
2, 2-Dimethylbutane	0.02	0	0.02	0.02	0	0.02	0.01	0.03	0.02	0.06	0.01	0.01	0.53	0.16
Cyclopentane	0.03	0.14	0	0.03	0.17	0.08	0.11	0.02	0.01	0.09	0.01	0.03	0.11	0.16
2, 3-Dimethylbutane	0.24	0	0.06	0	0.03	0	0.12	0.09	0.01	0.19	0.20	0.02	0.16	0.37
2-Methylpentane	0.10	0.04	0.06	0.06	0.03	0.14	0.12	0.06	0.12	0.54	0.17	0.09	0.16	1.04
3-Methylpentane	0.10	0.02	0.07	0.06	0.01	0.05	0.18	0.06	0.11	0.30	0.19	0.08	0.22	0.48
n-Hexane	0.26	0.11	0.17	0.12	0.12	0.37	0.23	0.14	0.32	0.38	0.39	0.30	0.38	0.71
Methylcyclopentane	0.11	0.01	0.08	0.04	0.01	0.07	0.12	0.05	0.12	0.94	0.09	0.07	0.16	1.76
2, 2-Dimethylpentane	0.03	0.01	0.02	0.04	0.01	0.02	0.06	0	0.02	0.06	0.03	0.01	0.02	0.07
2, 4-Dimethylpentane	0.36	0.18	0.22	0.28	0	0.23	0.70	0.28	0.26	0.58	0.73	0.31	0.74	0.68
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0.12
3, 3-Dimethylpentane	0	0	0	0.01	0	0.01	0.02	0.01	0	0	0	0	0	0.01
1, 1-Dimethylcyclopentane	0	0.02	0.01	0.03	0.02	0.05	0.02	0.01	0.01	0	0	0.01	0.01	0.02
2-Methylhexane	0.02	0	0	0.02	0	0	0.09	0.01	0.01	0.08	0.04	0	0.09	0.10
2, 3-Dimethylpentane	0	0	0	0	0	0	0.09	0	0	0.13	0.08	0.05	0.05	0.22
3-Methylhexane	0	0	0	0.02	0	0	0.04	0.03	0	0.18	0	0.02	0.03	0.37
1, trans-3-Dimethylcyclopentane	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0.22
1, trans-2-Dimethylcyclopentane	0.02	0.03	0.01	0.04	0.03	0.06	0.02	0.03	0.02	0.43	0.02	0.03	0.03	0.79
n-heptane	0.12	0.12	0.15	0.14	0.11	0.15	0.10	0.19	0.17	0.12	0	0.13	0.12	0.20
1, cis-2-Dimethylcyclopentane	0	0.01	0	0.02	0.02	0.05	0	0	0	0.07	0	0.02	0	0.15
Methylcyclohexane	0.04	0.03	0	0.09	0.06	0.09	0.06	0.07	0.15	0.69	0	0.05	0.12	1.48
Total	2.55	2.02	2.65	2.47	1.21	2.37	3.11	2.24	3.10	7.47	4.40	3.03	4.63	14.1

[a]Hot samples.