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Abstract

Full Text

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N. E. PODKLETNOV

INDIVIDUAL AROMATIC HYDROCARBONS OF THE GASOLINE FRACTIONS OF SAKHALIN CRUDES

(Presented by Academician A. V. Topchiev on 14 VI 1957)

Owing to their genetic features and distinctive chemical composition, characterized in particular by a high content of light aromatic hydrocarbons (¹), the crudes of Sakhalin are an interesting object of investigation.

In the present communication are given the results of determining the individual composition of the aromatic hydrocarbons contained in gasoline fractions, collected within the range from the initial boiling point to 175°, from crudes of three industrial fields of northeastern Sakhalin, namely: Eastern Ekhabi (bed 29), Ekhabi (bed XIX), and Paromai (bed V). Thus, crudes of two genetic types out of the three distinguished for Sakhalin (²) were selected for study.

The investigation was carried out according to the scheme applied by A. V. Topchiev and co-workers in the study of Nebit-Dag crude (³).

Separation of the aromatic hydrocarbons was carried out by a chromatographic method on silica gel (grain size 100-200 mesh, activity with respect to benzene up to 14 ml), in accordance with the recommendations of G. S. Landsberg and B. A. Kazanskii (⁴).

The separated aromatic hydrocarbons were subjected to precise fractionation on a column with a Levin packing, with an efficiency of 50 theoretical plates, and were investigated by means of combination-scattering spectra; and, for determining the amount of naphthenic hydrocarbons entrained during single chromatography, by the dispersion method.

Most of the combination-scattering spectra of individual hydrocarbons with which the spectra of the fractions were compared were taken from the work of G. S. Landsberg and co-workers (⁵).

The values of the partial dispersions of the individual aromatic hydrocarbons were taken on the basis of literature data (⁶). The dispersion of the fractions

under study was determined with an Abbe refractometer with an ultrathermostat at 20°.

The results obtained are given in Table 1.

It was found that the gasoline cuts collected up to 175° contain 9.64% aromatic hydrocarbons in the case of Eastern Ekhabi crude, 9.55% for Ekhabi, and 13.48% for Paromai.

Altogether, 14 hydrocarbons were identified in each crude, all of which are present in measurable amounts. In addition, 4 groups of hydrocarbons were found, characterized by the type of alkyl substitution (⁷).

Spectral analysis confirmed the absence of aromatic and unsaturated hydrocarbons in the separated fractions.

The results obtained (as well as the data on seventeen crudes of Soviet- of the Union (⁸)) indicate great unevenness in the content of individual aromatic hydrocarbons and a significant predominance of mono- and disubstituted benzenes.

Five hydrocarbons account for: in the case of East Ekhabi oil, 68.6% (calculated on the sum of the isolated aromatic hydrocarbons), Ekhabi 67.6%, and Paromai 72.0%.

Table 1

Aromatic hydrocarbons of gasolines up to 175° from the oils of East Ekhabi, Ekhabi, and Paromai

Hydrocarbon	Content, wt. %, based on the sum of aromatics: East Ekhabi	Content, wt. %, based on the sum of aromatics: Ekhabi	Content, wt. %, based on the sum of aromatics: Paromai	Content, wt. %, based on gasoline up to 175°: East Ekhabi	Content, wt. %, based on gasoline up to 175°: Ekhabi	Content, wt. %, based on gasoline up to 175°: Paromai
Benzene	14.4	10.5	13.2	1.39	1.00	1.80
Toluene	25.1	26.6	22.1	2.43	2.52	3.02
Ethylbenzene	8.9	7.2	9.0	0.85	0.67	1.23
<i>p</i> -Xylene	2.9	3.9	4.2	0.28	0.38	0.56
<i>m</i> -Xylene	11.4	11.9	18.7	1.09	1.14	2.55
<i>o</i> -Xylene	5.4	4.7	7.8	0.52	0.45	1.06
Sum	28.6	27.7	39.7	2.74	2.64	5.40
C₈H₁₀						

Hydrocarbons	Content, wt. %, based on the sum of aromatics: East Ekhabi	Content, wt. %, based on the sum of aromatics: Ekhabi	Content, wt. %, based on the sum of aromatics: Paromai	Content, wt. %, based on gasoline up to 175°: East Ekhabi	Content, wt. %, based on gasoline up to 175°: Ekhabi	Content, wt. %, based on gasoline up to 175°: Paromai
Isopropylbenzene	3.1	2.6	2.1	0.30	0.25	0.29
<i>n</i> -Propylbenzene	3.1	2.6	2.1	0.30	0.25	0.29
<i>m</i> -Ethyltoluene	4.9	2.6	2.6	0.48	0.25	0.36
<i>p</i> -Ethyltoluene	none	none	0.5	none	none	0.07
<i>o</i> -Ethyltoluene	3.7	1.2	1.8	0.36	0.12	0.24
1,3,5-Trimethylbenzene	4.4	5.2	9.0	0.42	0.49	1.09
1,2,4-Trimethylbenzene	8.8	11.4	2.5	0.85	1.09	0.33
1,2,3-Trimethylbenzene	2.0	2.6	0.7	0.19	0.25	0.10
Sum	26.9	25.6	19.2	2.60	2.45	2.48
C₉H₁₂						
Sum of mono-substituted	0.7	1.7	0.4	0.06	0.17	0.06
Sum of 1,4-substituted	1.7	3.6	0.7	0.16	0.35	0.10
Sum of 1,3-substituted	1.3	1.7	none	0.13	0.17	none
Sum of 1,2-substituted	1.3	2.6	4.7	0.13	0.25	0.62
including: without substituents	14.4	10.5	13.2	1.39	1.00	1.80

	Content, wt. %, based on the sum of aromatics: East Ekhabi	Content, wt. %, based on the sum of aromatics: Ekhabi	Content, wt. %, based on the sum of aromatics: Paromai	Content, wt. %, based on gasoline up to 175°: Ekhabi	Content, wt. %, based on gasoline up to 175°: Ekhabi	Content, wt. %, based on gasoline up to 175°: Paromai
Hydrocarbons with 1 sub- stituent	37.1	38.0	33.6	3.64	3.61	4.60
with 2 sub- stituents	32.6	32.2	41.0	3.15	3.11	5.56
with 3 sub- stituents	15.2	19.2	12.2	1.46	1.83	1.52

Toluene, benzene, and *m*-xylene were found in the greatest amounts in all three oils.

By applying chromatography, precise rectification, examination of combination-scattering spectra, and dispersometry, it was possible to establish the qualitative and quantitative individual composition of the aromatic hydrocarbons contained in gasoline fractions boiling up to 175°: in East Ekhabi oil—95%, Ekhabi—90.4%, and Paromai—94.2%.

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Sakhalin Complex
Scientific Research Institute

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