Table 1. Sulfur content in the studied DF samples

Sample	Sulfur content, mg/kg
DF1	2935
DF2	19

Table 2. CFPP of the studied samples of DF

Sample	DF1	DF2
CFPP, °C	–9	–13

Table 3. CFPP of mixtures of DF samples with additives

Additive	D1	D2	D3	D4	D5
Sample	DF1				
CFPP, °C	–27	–27	–30	–29	–23
Sample	DF2				
CFPP, °C	–26	–33	–28	–23	–23

CFPP is better when adding additives to sample DF1 and was 18.2 °C. For DF2, the average change in CFPP was 13.6 °C.

Thus, we can conclude that for the studied DF samples there is the following dependence of the effectiveness of the additive on the sulfur content: the higher the sulfur content, the greater the effectiveness of the additive.

References

1. *USS 305-2013. Diesel fuel. Technical specifications. – Moscow : Standartinform, 2014. – 12 p.*

CHANGES IN THE COMPOSITION OF ATMOSPHERIC OIL FRACTIONS DURING PROCESSING ON A ZEOLITE CATALYST

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Processing on a zeolite catalyst allows to improve the basic physicochemical properties of petroleum products to levels that meet the standards. Let us say, in [1], a diesel fuel (DF) and the product of its upgrading on a zeolite catalyst of the ZSM-5 type were studied. It has been shown that during processing on a zeolite catalyst, the basic physicochemical properties of diesel fuel can be improved and an Arctic grade of diesel fuel can be obtained [2].

Besides, during catalytic processing, the group composition of the sample was changed: the content of aromatic hydrocarbons and naphthenes increased, while the concentration of n-paraffins decreased. These modifications are associated with changes in the structure of hydrocarbons and the formation of other classes of organic substances.

The purpose of the work is to analyze the composition of atmospheric oil fractions during processing on a zeolite catalyst.

Test samples were atmospheric oil fraction (AF), obtained as a result of simple oil distillation from a field in the Tomsk region and its processed product (PAF) on a zeolite catalyst using a CATACON installation under a pressure of 0.35 MPa, at a temperature of 375 °C and raw material consumption of 3 h^{-1}. Both samples were subjected to chromatography-mass spectrometric analysis on a gas chromatograph. The results of chromatography-mass spectrometric analysis are presented in the Table.

Based on the data presented in the Table, it can be noted that the concentration of n-paraffins decreased 8 times, from 24.93 to 3.46 % wt., but at the same time the content of iso-paraffins increased as a result of catalytic processing from 14.73 to 16.3 % wt. The amount of naphthenes decreased from 20.85 to 15.59 % wt. The amount of olefins increased by 20.75 times, from 0.04 to 0.83 % wt., and alkynes by 3 times – from 0.03 to 0.09 % wt. The content of oxygen-containing hydrocarbons decreased by approximately two times, from 0.83 to 0.42 % wt. The content of aromatic hydrocarbons has increased significantly, in particular, the most significant increase is observed for mono-aromatic hydrocarbons – from 9.58 to 37.51 % wt.

The decrease in the content of n-paraffins in the composition of PAF is associated with reactions occurring at the active centers of the catalyst. During the cracking of n-paraffins. hydrocarbons with shorter chain of this class and olefins are formed and isomerization of n paraffins also occurs. Because of the redistribution of hydrogen in olefins, aromatic hydrocarbons and in small quantities n- paraffins are formed.

In addition to hydrogen redistribution aromatic hydrocarbons are formed as a result of transalkylation reactions. Some of them can enter into an alkylation reaction with olefins. Naphthenes were formed by the mechanism of diene synthesis from olefins; after the redistribution of hydrogen aromatic hydrocarbons were formed.

Table 1. The content of hydrocarbon classes in the composition of AF and PAF

No.	Hydrocarbon class	Relative concentration, % wt.	
		AF	PAF
1	N-paraffins	24.93	3.46
2	Iso-paraffins	14.73	16.30
3	Naphthenes	20.85	15.59
4	Olefins	0.04	0.83
5	Alkynes	0.03	0.09
6	Mono-aromatic	9.58	37.51
7	Mono-aroma-naphthenes	0.72	2.33
8	Bi-aromatic	1.68	3.65
9	Oxygen-containing	0.83	0.42
10	Unidentified	26.62	19.82

Accordingly processing AF on a zeolite catalyst changes the group composition of the mixture making it possible to improve the physicochemical properties of the product.

References

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COMPUTER MODELING OF THE HYDROCRACKING PROCESS TAKING INTO ACCOUNT THE DETAILED COMPOSITION OF THE FEEDSTOCKS

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The oil industry, as one of the most important industries, should dynamically develop, easily adapt to the constantly changing market conditions and introducing new scientific achievements. Hydrocracking is a reflection of development, since this process is easy to adapt to any feedstock, which is becoming increasingly heavier in composition, making it difficult to process into valuable petroleum products [1]. The kinetics of hydrocracking determines the course of the entire process. To correctly predict process performance, the reacting components and their reactions should be described in detail according to the detailed composition and detailed scheme of transformation [2, 3].

The aim of the work is to develop a mathematical model of the hydrocracking process taking into account the detailed composition of raw materials.

The mathematical model was developed based on the transformation scheme of the components in-