of 350-450 °C; the feed rate was of 1 h^{-1}, under a hydrogen pressure of 3 MPa, and with a hydrogen/feed ratio = 100 (vol.). Before the experiment, the catalyst was reduced by hydrogen at 500 °C for 5 hours.

Analysis of liquid products was carried out on the Crystal 5000 chromatograph and analysis of gaseous products was carried out on the Chromos 1000 gaseous chromatograph.

Results and discussion

The results of the study of the porous structure and specific surface area for the Ni/Al-HMS (20) – bentonite sample are presented in Figures 1 and in Table 1.

The nitrogen adsorption/desorption isotherms on the studied sample belong to type IV according to the classification of Brunauer, Emmett and Teller [1], the presence of a hysteresis loop in it, and a narrow pore size distribution indicates their mesoporous structure. For the studied sample, the maximum on the pore size distribution curve is observed at 4.1 nm. The average pore size for the studied sample is due to the presence of a small number of macropores in them. On the pore effective diameters distribution curve, three maxima are observed, one of which corresponds to the mesoporous aluminosilicate, the second - to bentonite and the third - to the promoting additive.

According to data provided in Table 1, the synthesized material has a high specific surface area of 570 m^2/g, a large specific porosity of 0.8 cm^3/g.

Studies of the mechanism of the conversion of hydrocarbons in the presence of bifunctional catalysts based on mesoporous aluminosilicate in the temperature range of 350-450 °C were carried out using the examples of liquid and gaseous hydroisomerization products for diesel fractions of oil from the Zhetybai and Kumkol deposits, as they are mainly consist of paraffinic hydrocarbons. It should be noted that the content of the diesel fraction of Kumkol oil is represented by more low-boiling hydrocarbons comparing with diesel fraction of Zhetybai oil [15-16].

Experimental data on the content of the products of the hydroisomerization process Kumkol and Zhytybai oil diesel fractions are presented in Tables 2-4.

The main direction (according to Tables 1-2) of the conversion of the Kumkol oil diesel fraction at a temperature of 350 °C is isomerization processes with the formation of 2,2-dimethylhexane, methylhexane, etc., aromatization and alkylation processes, with the formation of alkylated benzene and its homologues . Along with this, cyclization and hydrogenation processes take place, as evidenced by the presence in the composition of products of significant quantities of naphthenes (8.9 mass. %) and olefins (5 mass.%). The presence of insignificant amounts of diene hydrocarbons (0.2 mass. %) is also noted. Methylcyclohexane and 1-3-trimethylcyclopentane (cis and trans) are mainly found in the composition of naphthenic hydrocarbons.

Increasing the temperature up to 450 °C leads to a change in the direction of the process. Along with isomerization, cracking processes are observed with the formation of smaller fragments of methane hydrocarbons, dehydrogenation, hydrogen disproportionation and cyclization reactions also occur, as evidenced by the data on the qualitative and quantitative composition of gaseous products.

The qualitative composition of naphthenic hydrocarbons is mainly represented by methylcyclohexane, 1,1-dimethylcyclopentane and 1-methyl-3-n-propyl-cyclopentane (cis). The composition of olefinic hydrocarbons mainly consists of 2-methylhexane-2 (cis), 2,4-dimethylpentane-1 and decene-4 (trans) + decene-1 (cis). The amount of olefins (4 mass. %), dienes (by 4.5 times) also increases, and appearance of cycloolefinic hydrocarbons (1.4 wt. %) can be observed.

Similar results were obtained in the study of the qualitative and quantitative composition of the products of hydroisomerization of the diesel fraction of oil from the Zhetybai deposit *(table 4)*. As in the case of hydroisomerization of the Kumkol oil diesel fraction, the main direction of hydrocarbon conversion at 350 ° C is isomerization, in addition there is decomposition of methane hydrocarbons into smaller fragments, as evidenced by the data of the qualitative and quantitative composition of the gaseous products of the process *(Table 3)*. They consist of 27.7 mass. % of low molecular weight paraffinic hydrocarbons, including: CH_4, C_2H_6, C_3H_8, C_4H_{10}, significant amounts of H_2. The amount of low molecular weight olefinic hydrocarbons reaches 36.5 mass. %. The processes of cyclization, dehydrocyclization and dehydrogenation also proceed in parallel. However, the main process, apart from decompositon, is the process of aromatization. Increasing the temperature up to 450 °C affects not only the deepening of the cracking process, but also the direction of the process. In the composition of liquid catalyzate, the amount of aromatic hydrocarbons decreases with a significant increase in naphthenes and olefins. Diene hydrocarbons also appear in small quantities. In the gas phase, the amount of hydrogen and olefins increases. The results indicate that at this temperature there is a significant decomposition of methane hydrocarbons with the rapid flow of many parallel reactions (dihydrogenation, hydrogen disproportionation, cyclization).

Thus, it has been established that the synthesized Ni / Al-HMS (20) – bentonite catalyst is characterized by a more developed specific surface area and mesoporous structure. According to the results of the catalytic activity of the synthesized Ni / Al-HMS (20) -bentonite sample, it was shown that regardless of the nature of the original oil, the optimum temperature for hydroisomerization of the Kumkol and Zhetybai oil diesel fraction is 350 °C, the yield of isoparaffins is 37 and 32 %, respectively.

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