

Table 2. Thermodynamic characteristics of hydrogen redistribution reactions in olefins with ethylbenzene formation

No.	Reaction	ΔG at P=2.5 atm.		
		648 K	673 K	698 K
1	2 (Hexene-2)+3 (Heptene-2)=3 (Ethylbenzene)+9 (Methane)	–766.87	–785.35	–810.44
2	7 (Hexene-2)+2 (Heptene-2)=4 (Ethylbenzene)+12 (Ethane)	–920.65	–938.14	–977.93
3	7 (Propene)+5 (Hexene-2)=3 (Ethylbenzene)+9 (Propane)	–658.18	–652.40	–663.20
4	8 (Propene)+6 (Hexene-2)=3 (Ethylbenzene)+9 (Butane)	–606.97	–593.25	–599.35
5	9 (Propene)+7 (Hexene-2)=3 (Ethylbenzene)+9 (Pentane)	–543.05	–521.03	–522.13
6	10 (Propene)+8 (Hexene-2)=3 (Ethylbenzene)+9 (Hexane)	–496.22	–466.41	–433.73
7	11 (Propene)+9 (Hexene-2)=3 (Ethylbenzene)+9 (Heptane)	–422.38	–383.88	–375.41
8	12 (Propene)+10 (Hexene-2)=3 (Ethylbenzene)+9 (Octane)	–395.22	–338.24	–325.31

**Fig. 1.** Formalized scheme of xylenes and ethylbenzene formation

References

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DIRECTIONS OF CONVERSION OF DIESEL FRACTION HYDROCARBONS, DURING THEIR HYDROGEN-FREE PROCESSING ON ZEOLITE

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The active development of the Arctic territories and the Northern Sea Route led to the need to increase the production of low-freezing diesel fuels. The development of a process for processing straight-run diesel fractions (DF) into low-freezing fuels without the use of hydrogen-bearing gas and expensive catalysts is an urgent task. The aim of this work is to study the directions of the conversion of DF hydrocarbons during their processing on a zeolite catalyst. For this, a process of hydrogen-free processing of three straight-run DFs with various compositions (Feedstock 1–3) on a zeolite catalyst

was implemented at a laboratory catalytic unit. The process technological parameters are temperature 375 °C, pressure 0.35 MPa, feedstock space velocity 0.5 ml/s.

Table 1 shown the fractional composition of straight-run DF, determined according to [1].

Table 1. Fractional composition of straight-run DF

Distillation volume, ml	Temperature, °C		
	Feedstock 1	Feedstock 2	Feedstock 3
10	170	190	183
50	242	261	263
90	348	329	369

The group composition of straight-run DFs and the resulting products was determined by the aniline method, Figure 1 shows the results.

Obtained results show that in the products of the processing on a zeolite catalyst, as compared to the feedstock, the content of paraffinic hydrocarbons decreases, while the content of aromatic and naphthenic hydrocarbon increases. It should be noted that the highest content of naphthenes is observed in Product 3, and the highest content of aromatic hydrocarbons in Product 2. This fact can be explained in terms of the composition of the processed feedstock. On the zeolite catalyst, cracking and hydrogen transfer reactions in olefins are most active, resulting in the formation of either aromatic hydrocarbons or diolefins. Diolefins with olefins subsequently do into diene reactions, as a result of which naphthenes are formed.

The length of the hydrocarbon chain of the resulting olefins and diolefins directly depends on the length of the hydrocarbon chain of the paraffins

from which they are obtained. For the formation of naphthenes by the diene reactions, longer-chain diolefins are preferred, at the same time the formation of aromatic hydrocarbons in hydrogen transfer reactions, from a thermodynamic point of view, is most likely from olefins with a shorter hydrocarbon chain.

Thus, it can be seen that Feedstock 2 is characterized by the lightest fractional composition and, as a consequence, in the product obtained on its basis, the highest content of aromatic hydrocarbons that formed during the reactions of hydrogen transfer in olefins is observed. Feedstock 3, on the contrary, is characterized by the heaviest fractional composition, and the product obtained on its basis contains the greatest amount of naphthenes. Feedstock 1 takes an intermediate position both in terms of the initial fractional composition and the content of aromatic hydrocarbons and naphthenes in the product obtained on its basis.

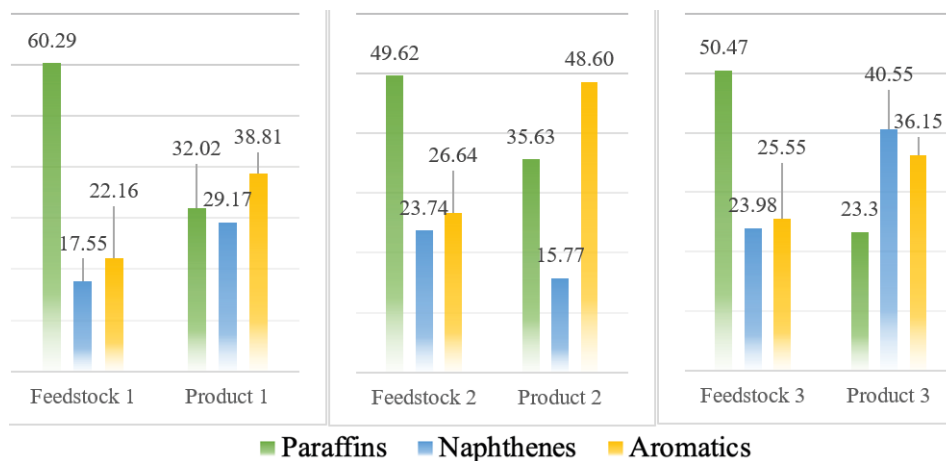


Fig. 1. Group composition of straight-run DFs and products of their processing on the zeolite catalyst, %wt

References

1. ISO 3405:011 "Petroleum products – Determination of distillation characteristics at atmospheric pressure".