

EVALUATION OF THE FEASIBILITY OF JOINT PROCESSING ON A ZEOLITE CATALYST OF A VEGETABLE OIL AND STRAIGHT-RUN DIESEL FUEL BLEND

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Currently, there is a need to search for alternative sources of fuel, which is due to the tightening of environmental requirements for commercial petroleum products [1, 2].

Processing of straight-run diesel fuel (DF) with the involvement of vegetable oil (renewable feedstock) on a zeolite catalyst can be an effective solution for obtaining more environmentally friendly, low-freezing diesel fuel.

The aim of the work is to study the feasibility of joint processing of vegetable oil and straight-run diesel fuel blend on a zeolite catalyst.

The process of joint processing of diesel fuel and 50 % vol. sunflower oil (SO) blend was carried out on a laboratory catalytic unit “CATACON” with the following technological parameters: process temperature 475 °C, pressure 0.35 MPa, feedstock consumption 0.5 ml/min, catalyst volume in the reactor 10 cm³.

To study the feasibility of adding SO to diesel fuel during processing on zeolite, the physicochemical properties (density, kinematic and dynamic viscosity), low-temperature characteristics (cloud point, cold filter plugging point (CFPP), pour point), as well as the fractional composition of the processed product were determined.

The results of determining the physicochemical properties of the obtained product showed that the density at 15 °C was 842.7 kg/m³, the kinematic

and dynamic viscosities were 1.52 mm²/s and 1.28 mPa·s, respectively.

According to the value of kinematic viscosity, the obtained product during catalytic processing meets the requirements [3] for the arctic grade DF (requirements – 1.5–4.0 mm²/s), and in terms of density – the winter grade DF (requirements – no more than 843.4 kg/m³).

The results of the low-temperature characteristics determination showed that the resulting product does not become cloudy and does not freeze at a temperature of –70 °C. CFPP of processing product obtained from diesel fuel and 50 % vol. SO blend is also below –70 °C, which meets the requirements for the arctic grade of DF (requirements – CFPP not higher than –45 °C) [3].

As can be seen from the results presented in Table 1, 50 % by volume of the product is distilled at a temperature of 212 °C, which meets the requirements [3] for the arctic grade of DF (requirements – 50 % by volume are distilled at a temperature not exceeding 255 °C).

Thus, it was shown that the joint processing of sunflower oil and diesel fuel on a zeolite catalyst is expedient, which make it possible to involve renewable components (up to 50 % by volume) and obtain products that meet the requirements for low-freezing diesel fuel grades.

Table 1. Fractional composition of the obtained product

Distillate, % vol.	Temperature, °C									
	0	10	20	30	40	50	60	70	80	90
	42	102	128	147	175	212	255	289	327	360

References

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