temperature range was +45 ... +60 °C, because of the fact, that in order to further cooling of the flue gas flow, it is necessary to reduce the temperature of the cooling water to values not exceeding +30 °C, which is difficult in case of air-cooling technology, specifically in the summer time.

As a result of the CO_2 capture process simulation in Aspen HYSYS software, two facts were established. On the one hand, the higher the flue gas temperature, the greater the amine consumption required for efficient CO_2 capture. On the other hand, a decrease in the temperature leads to an increase in the cooling water consumption. The results of simulation are shown in Figure 1.

Since amine solutions are characterized by a higher cost compared to cooling water, for choosing the optimal capture temperature the absorbent consumption factor was taken into account.

It is also known that in case of high temperature, the rate of amine's degradation increases, which also leads to a decrease in energy efficiency.

Thus, it was established that the optimal CO_2 capture conditions, providing a sufficient degree of extraction with minimal power consumption and amine consumption, are T = 45 °C and P = 130 kPa (Abs.).

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PRODUCTION OF PETROLEUM HYDROCARBONS BY HYDROREFINING OF VEGETABLE OIL

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Currently, there is significant growth and continuous development of the transport system, which, in turn, causes great demand for commercial motor fuels and their components.

An increase in the consumption of motor fuels entails a reduction in oil reserves, which is the feedstock for their production. There is a decrease in the quality of extracted petroleum feedstock, as well as an increase in capital and operating costs for its production and processing.

In addition, active mining of natural minerals has a negative impact on the environment.

In this regard, research aimed at creating technologies for producing various types of fuel from renewable feedstock is becoming relevant [1].

One of these areas of research is the production of fuel hydrocarbons from vegetable oils [2].

This work shows the fundamental possibility of obtaining petroleum hydrocarbons by processing vegetable oils, such as sunflower (SO), corn (CO) and rapeseed (RO), on a hydrotreating catalyst at the following technological parameters: temperature 375 °C, pressure 7 MPa, volumetric feed rate raw materials 1 h^{-1}, hydrogen consumption 30 ml/min.

The possibility of obtaining fuel hydrocarbons from vegetable oils is confirmed by determining the composition of catalytic processing products using chromatography-mass spectrometry (table).

As can be seen, a large share in the composition of processed products is accounted by n-paraffins, as well as unreacted and partially reacted fatty acids, which are part of vegetable oils. In addition, a small content of iso-paraffins and olefins was found in the obtained products.

Table 1. Group hedrocarbon composition of the catalytic processing product

Group	Content in the product, % wt.		
	P_{RO}	P_{SO}	P_{CO}
N-paraffins	43.33	40.47	40.40
Iso-paraffins	3.18	5.47	4.08
Olefins	5.38	1.55	1.36
Organic acids	32.37	36.58	42.17

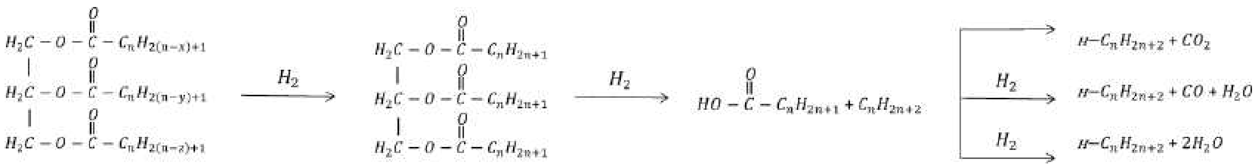

Fig. 1. *Mechanism of vegetable oils conversion on a hydrotreating catalyst*

The obtained results are consistent with the mechanism of vegetable oils conversion on hydrotreating catalysts (figure).

Fatty acids that make up vegetable oils are first hydrogenated during hydrotreating and then undergo thermal decomposition reactions to form predominantly monobasic fatty acids. The resulting monobasic acids, in turn, undergo decarbonization, decarboxylation, and hydrodeoxygenation reactions, resulting in the formation of long-chain n-paraffins. Long-chain n-paraffins undergo cracking reactions, which result in the formation of n-paraffins with a shorter hydrocarbon chain length.

Thus, the work shows the possibility of obtaining fuel hydrocarbons from vegetable oils, in particular, long-chain n-paraffins, which can be used as raw materials for the production of commercial fuels.

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RESEARCH OF YTTRIUM OXIDE POWDER SYNTHESIZED IN PLASMA FROM NITRIC ACID SOLUTION WITH ADDED ORGANIC COMPONENT

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A key focus of materials science is the technologies producing different nanopowders. Such materials have unique properties. Yttria, commonly applied in different ways, offers high light transmission, melting temperature, thermal stability, and mechanical properties when incorporated into ceramics [1].

There are some methods for producing nanosized oxides – laser, chemical, hydrothermal, and sol-gel. All these methods have drawbacks (e. g. multi-stage, time-consuming, non-uniform phase distribution).

Therefore, it is promising to apply gas-discharged plasma for synthesizing metal-oxide powders. It can help to eliminate drawbacks – reduce energy consumption, and boost productivity by incorporating an organic element (e. g. acetone) into the initial solutions.

The study determined the best ratios of acetone and yttrium nitrate $Y(NO_3)_3$ in water-organic nitrate solutions and identified optimal conditions to prevent the formation of unoxidized carbon in the final products, because of the acetone presence.

To carry out the experiments on plasmachemical synthesis some solutions were prepared. It was used the water yttrium nitrate solution of maximum concentration of salt. Then the organic component was added to create water-organic nitrate solution. Prepared solution was treated in gas-discharge plasma of air in accordance with calculated ratio. After solution dispersing, its heating, evaporation of water medium with salt crystallization the stage of thermolysis began. Desired component – yttria