Characteristic of all obtained products is a decrease in the content of naphthenes relative to the feedstock. However, for products obtained from SGC №1, with increasing process temperature a decrease in the content of naphthenes is observed, and for products obtained from SGC №2, an increase in the content of naphthenes is observed, which is probably due to the isoparaffins cyclization reactions content of which in SGC №2 is higher.

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STUDY OF PHYSICOCHEMICAL PROPERTIES DYNAMICS OF KAZAKHSTAN AND WEST SIBERIAN OIL VACUUM GAS DURING HYDROPROCESSING

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Nowadays modern oil refining industry is challenged to solve many economic and technology problems. This is caused by both increasing demand for high-quality motor fuels and the growing proportion of high-sulfur heavy oils in the total amount of crude oil extracted and refined in Russia as well as in many other countries of the world. Thus, there is a rapid increase of the importance of hydrocatalytic processes in oil refining.

Hydrotreating is a very important large-tonnage process in modern refineries. Various straight-run fractions and gas oils of secondary origin are hydrotreated. The improving of hydrotreating technology was due to tightening of environmental requirements and laws. This trend was caused, in its turn, by the fact that large amounts of harmful gases and liquids are emitted after the combustion of fuel into the atmosphere [1].

The purpose of the work was to determine the composition and chemical properties of vacuum gas oil obtained during the distillation of fuel oil from Kazakhstan and West Siberian oil mixture. The process of distillation is then followed by further processing on the catalytic cracking facilities with preliminary hydrotreating in the KT-1/1 deep oil production unit.

Therefore, the research object is vacuum gas oil obtained from Kazakhstan and West Siberian

Table 1. Physico-chemical properties of vacuum gas oil

Sample	Sulfur content, wt.%	Kinematic viscosity at 50 °C, mm^2/s	Density at 20 °C, g/cm^3	Molecular weight, g/mol
Non-hydrotreated vacuum gas oil	1.04–1.655	21.942–28.044	0.9014–0.9068	312.3–361.3
Hydrotreated vacuum gas oil	0.078–0.152	24.257–28.888	0.8899–0.8927	338.5–342.1

Table 2. The group composition of vacuum gas oil

Sample	Hydrocarbon type composition		
	Paraffin hydrocarbons, wt.%	Aromatic hydrocarbons, wt.%	Resinous components, wt.%
Non-hydrotreated vacuum gas oil	48.80–52.33	42.73–45.17	4.87–6.92
Hydrotreated Vacuum Gas Oil	56.80–61.53	35.44–40.46	2.38–3.03

oils (fractional composition – 350–570 °C). A study concerning the changes in the physicochemical properties and hydrocarbon composition of vacuum gas oil during hydrotreating at the combined unit KT-1/1 was conducted. The obtained data is presented in tables 1 and 2.

The following methods were used during the work: liquid adsorption chromatography method for separating a fraction into a hydrocarbon type composition; cryoscopic method on KRION 1 to determine the molecular weight; SPECTROSCAN S X-ray fluorescence energy dispersive sulfur analyzer for determination of total sulfur content; Stabinger viscometer SVM3000 (Anton Paar) for determining the density and viscosity of petroleum products.

During hydrotreatment, vacuum gas oil is fed to the top of the reactor and gradually passes through the catalyst bed. At high temperatures and pressure hydrogen binds sulfur on the catalyst converting it to hydrogen sulfide. It also saturates aromatic hydrocarbons with hydrogen, turning them into naphthenic ones [2].

As can be seen from the above data, the sulfur content decreases to 0.078–0.152 wt. %. The hydrocarbon composition of the vacuum gas oil changes with content of the saturated hydrocarbons increase and decrease of the content of aromatic hydrocarbons and resins.

The data obtained will then be used to develop a mathematical model of the catalytic cracking process of vacuum gas oil, which will take into account the conversion of hydrocarbons and sulfur compounds. Also this model will be applicable to optimize the technological modes of operation of the apparatus of the reactor-regenerative unit, control the catalyst, and increase the efficiency of the catalytic cracking process.

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DEVELOPING OF ARYL GLYCOSIDES ACYLATION METHODS

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Glycosides, a broad class of natural organic compounds, are extremely interesting objects for chemical research. They are mostly bioavailable and thus can alter this parameter for other organic compounds. Aryl glucopyranosides (and other glycosides with phenolic (aryl) residue as an aglycon) can be modified at 4 positions at least, depending on a structure of aglycon, and all these compounds might have different bioactivity also different from original glycoside [1–2].

One of such natural glycosides is vanilloloside **5** (Scheme 1) which itself shows almost no anti-cancer activity [1] whilst its 6–O ester saccharumoside-B and other analogs with different acyl groups shows high antiproliferative effect on the same cancer cells [2]. There are also natural glycosides acylated at aglycon positions with prospectively high biological activity [1–3]. Besides, aryl glycosides are of low toxicity [4] and have variety of other bioactivities: anti-inflammatory [5], antibacterial [1], etc.

As aryl glycosides are common constituents of different plants, the most common way to obtain them is extraction. However, it is not very efficient, and tends to be expensive as the extraction requires kilograms of plant parts to give milligrams of product [6]. To obtain the pure product from extract it should be separated from other substances with similar structures and properties, and very often it is not pure enough to be used in further tests. Moreover, the plant itself might be expensive or hard to get collected, or even protected from collection by law. The chemical synthesis in this case gives higher yields, is easily scaled up, and can be started with easily available reagents such as glucose **1a** and vanillin **2**, etc. The resulting products can also be used as chemotaxonomic markers in biological research [7].