Thus, it is difficult at the moment to judge the nature of the interaction. The results suggest that both chemical reaction and fluorine adsorption can be performed on the carbon surface. Further research will focus on the nature of the interaction and its properties and criteria. One such experiment will be a multi-temperature reaction kinetics study that classifies this interaction as chemical. In case of adsorption, the type and laws of adsorption (chemical or physical adsorption) must also be defined.

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MODELING OF STABLE GAS CONDENSATE ZEOFORMING

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Nowadays, the oil refining industry produces a significant part of marketable products and semi-finished products, which constitute an important share of Russia's GDP. The production plants of this industry are usually based on catalytic chemical processes that use multicomponent mixtures of organic substances as feedstock.

Mathematical models of such processes, which sufficiently fully consider the process thermobaric conditions, the reactor's geometry, and the loss of catalyst activity, can provide significant support at the design stage.

This work describes the kinetic model development for the process of stable gas condensate on a zeolite catalyst. Gas condensate is a relatively light hydrocarbons that are in a supercritical state in reservoir conditions (in the gas phase). Stable gas condensate is obtained after removing light gases from gas condensate.

It is necessary to collect a theoretical and experimental information from the literature for the first developing stage of mathematical model. The collection of experimental data was carried out, which were obtained on a laboratory catalytic unit of a flow type. The information about feedstock composition and (or) the content of the main components in products are also required for developing a kinetic model.

The hydrocarbon blends compositions were described by a list including 50 components. Based on the complex analysis of materials, a formalized scheme of chemical transformations was compiled. This scheme represents 180 thermodynamically possible chemical reactions. The system of differential equations was written in Python to perform calculations according to the law of mass action.

Using the evolutionary algorithm proposed by John Holland in 1975 [1], the inverse kinetic problem was solved by selecting the rate constants values of chemical reactions, which are included as coefficients in the system of differential equations describing the reaction rates.

Kinetic constants were matched for experiment, which was carried out with technological parameters: temperature of 375 °C, pressure of 0.25 MPa, feedstock volumetric flow rate 2 h^{-1}.

Table 1. The group compositions of the product

Component group	Sample 1 (exp.)	Sample 1 (calc.)	Sample 2 (exp.)	Sample 2 (calc.)
isoparaffins	40.004	41.520	42.000	42.365
n-paraffins	24.101	24.497	30.551	26.204
olefins	2.197	2.283	4.984	2.201
aromatic compounds	24.136	22.587	13.291	21.240
naphthenes	9.554	9.112	9.175	7.991

The group compositions of the products calculated (calc.) in the developed model and obtained experimentally (exp.) by gas chromatography in accordance with [2] are presented in the table.

The sample 1 (exp.) composition of zeoforming products was used in for kinetic constants match. The resulting set of kinetic constants made it possible to calculate the concentrations in the product using the kinetic model. It can be seen that the composition presented in the group form describes the experiment with satisfactory accuracy. The error for individual pseudo-components for sample 1 is 5 10 % (rel.). This set of rate constants was also used to calculate the composition of sample 2. The calculation results are characterized by less satisfactory accuracy, especially for the aromatic hydrocarbons group.

It should be noted that the solution of the inverse kinetic problem by selection endows the model with a statistical character, which limits its predictive ability.

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COMPARISON OF DETONATION CHARACTERISTICS OF ZEOFORMING PRODUCTS OBTAINED FROM STABLE GAS CONDENSATE WITH VARIOUS COMPOSITIONS

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Every year the increasing consumption of commercial petroleum products is observed. With the increase of the amount of passenger cars the demand for various petroleum products rises. However more and more oil fields are depleted simply due to their long-lasting exploitation, meanwhile as for new ones, they are estimated to have the significant gas inclusion.

In the process of commercial gas preparation these oil fields with significant gas inclusion, which deliver commercial gas into the main gas pipeline, also obtain by-product – stable gas condensate (SGC).

SGC is a product obtained during low-temperature condensation and rectification of unstable gas condensate in the process of natural gas processing and having hydrocarbons with a number of carbon higher than 5 in its composition.

During this work three samples of SGC which had been obtained from various oil fields in Western Siberia of Russia were analyzed. For these three samples were studied such properties as RON (Research Octane Number), MON (Motor Octane Number), RVP (Reid Vapor Pressure), density under 15 °C and benzene content. These parameters are strictly regulated by the Russian standard USS 32513-2013 "Motor fuels. Unleaded gasoline. Technical conditions" [1]. The analyze results are shown in the table 1.

After analyzing table 1 data we've came to the conclusion that these SGC samples are characterized by comparatively high octane numbers, a low RVP values and extremely little benzene content. This conclusion makes these samples the promising raw material for catalytic processing in order to obtain the blending component of gasoline.

Zeoforming is known as one of the most low-cost and promising methods of processing light hydrocarbon raw materials into components of passenger cars gasoline. The process is carried out under average temperature and reduced pressure on a zeolite catalyst. During the work zeoforming was implemented at a laboratory catalytic plant at a temperature of 375 °C, a pressure of 0.25 MPa and a volumetric feed rate of 2 h^{-1}. We used zeolite of ZSM-5 type which was crushed to a size of