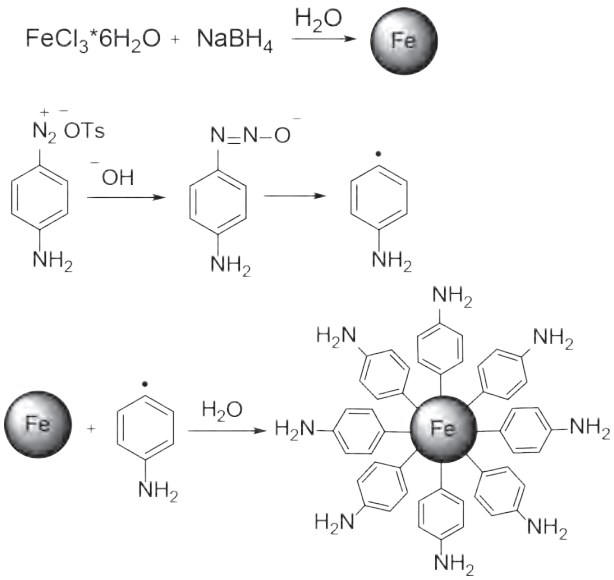
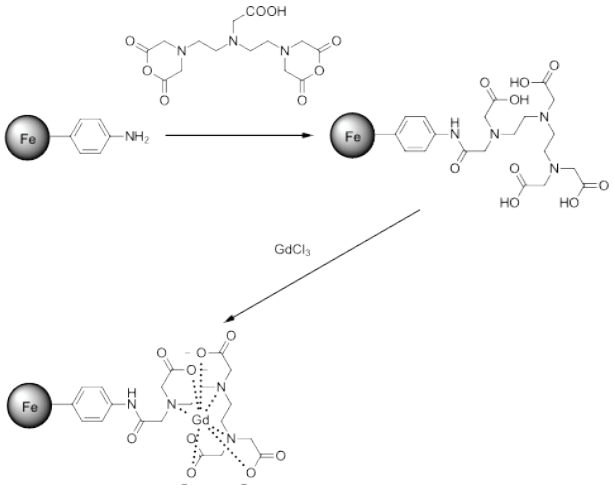


Scheme 1. *Synthesis of ZVI NPs using p-aminobenzenediazonium tosylate*



Scheme 2. *Synthesis of Gd-based MRI contrast compound*

base. Gadolinium (Gd) was chosen as a main contrast agent due to its excellent magnetic properties [3] and ability to form chelates. It was agreed to use diethylenetriaminepentaacetic acid (DTPA) anhydride to form a strong chelate with Gd because it is fairly easy attached to a free amine group of the ADS. The scheme of a process is shown in Scheme 2.

Such substance could become a base for developing new theranostic agent and further research in utilization of ZVI NPs in medical and pharmaceutical fields.

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THE TESTING OF A KINETIC MODEL OF CATALYTIC CRACKING IN THE "C-200" SECTION OF THE KT-1/1 INSTALLATION OF OIL REFINING PLANTS IN KAZAKHSTAN

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The Strategy of the development of the Republic of Kazakhstan until 2030 emphasizes the oil and gas industry, making energy resources a number one priority. This program is the basis for improving the competitiveness of the oil and gas industry of Kazakhstan [1].

Nowadays the Republic of Kazakhstan has three oil refineries – the Atyrau Refinery, the Shymkent Refinery and the Pavlodar refinery, for which the increase in the depth of crude oil refining is an urgent task.

The aim of this work is to test the kinetic model of the process of catalytic cracking in the Section "C-200" of the installation KT-1/1 of the Pavlodar

Table 1. Group composition of vacuum distillate

The group of hydrocarbons	The vacuum distillate, the content of wt%
Paraffins + naphthenes	73.13
Aromatic hydrocarbons	23.31
Alcohol-benzene resin	3.56

oil refining plant in Kazakhstan.

The testing of the kinetic model of the catalytic cracking process requires some information about the group composition of the raw materials and the catalytic cracking products. The laboratory studies were carried out to determine the group composition of the catalytic cracking products.

The kinetic parameters of the catalytic cracking reactions are presented in table 2.

The adequacy of the model calculations is presented in table 3. The adequacy of the model calculations was verified by comparing the calculated and experimental data on the concentration of the streams of hydrocarbon groups after the reactor and the gasoline fractioning.

Table 2. Kinetic parameters for catalytic cracking reactions at T °C = 522.52, P = 0.09 MPa

Reactions	The rate constant		
	$k_{пр}$	$k_{об}$	
The cracking of paraffins C_{13}-C_{40}	0.10	–	sec^{-1}
The cracking of isoparaffins C_{13}-C_{40}	0.67	–	sec^{-1}
The cracking of n-paraffins C_5-C_{11+}	0.17	–	sec^{-1}
The isomerization of paraffins C_5-C_{11+}	$5 \cdot 10^{-4}$	$3 \cdot 10^{-4}$	sec^{-1}
The cracking of isoparaffins C_5-C_{11+}	0.16	–	sec^{-1}
The cracking of olefins C_5-C_{11+}	0.67	$9.3 \cdot 10^{2}$	sec^{-1}
The redistribution of hydrogen	56.05	–	$l \cdot sec^{-1} \cdot mol^{-1}$
The dealkylation of naphthenes	0.22	0	sec^{-1}
The dealkylation of aromatic hydrocarbons	0.44	$3.7 \cdot 10^{-5}$	sec^{-1}
The cracking of naphthenes	0.44	–	sec^{-1}
The condensation of aromatic compounds	2.15	–	$l \cdot sec^{-1} \cdot mol^{-1}$
The formation of coke (polycondensation)	0.62	–	$l \cdot sec^{-1} \cdot mol^{-1}$
The cyclization of olefins	0.05	0.016	sec^{-1}
The dealkylation of aromatic hydrocarbons of gasoline	0.15	$1.3 \cdot 10^{-5}$	sec^{-1}

Table 3. The adequacy of model calculations

Component	The calcul. wt %	Experiment, % wt.	Accuracy (relative), %
High molecular weight paraffins	3.16	3.17	0.35
Medium molecular paraffins	1.58	1.52	4.01
Isoparaffins	11.73	11.91	1.55
Olefins	7.13	7.07	0.82
Gas	33.44	33.50	0.18
Naphthenes	4.16	4.09	1.72
Monoaromatic hydrocarbons	18.66	18.68	0.13
High molecular weight naphthenes	2.36	2.33	1.40
Aromatic hydrocarbons	12.26	12.24	0.16
Gums	0.43	0.41	4.11
Coke	5.08	5.07	0.20

The table shows that the reactions of paraffins cracking (0.10^{-1}), hydrogen redistribution (56.05 $l \cdot s^{-1} \cdot mol^{-1}$), the dealkylation of aromatic hydrocarbons (0.44^{-1}) and naphthenes (0.22^{-1}), as well as the condensation of aromatic compounds (2.15 $l \cdot s^{-1} \cdot mol^{-1}$) and the coke formation (0.62 $l \cdot s^{-1} \cdot mol^{-1}$) occur at the greatest speed.

References

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THE IMPACT OF CATALYST TEMPERATURE FROM REGENERATOR ON THE CATALYTIC CRACKING PROCESS PERFORMANCE

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The yield and composition of the catalytic cracking products are determined by a whole set of records of operation for non-stationary adjoint system "riser-regenerator".

The most important parameters of a technological mode determined by the temperature of the catalytic cracking process are the catalyst temperature after regeneration, feedstock temperature, the ratio of catalyst: feedstock and steam flow into the reaction zone of the riser reactor [1]. Catalyst circulation ratio is determined depending on the temperature of the catalyst after regeneration, which in turn depends on the coke content on the catalyst after the riser reactor. Coke content depends from the composition of the feedstock and temperature mode of the riser reactor.

The purpose of this research is to evaluate the effect of catalyst temperature on the vacuum distil-

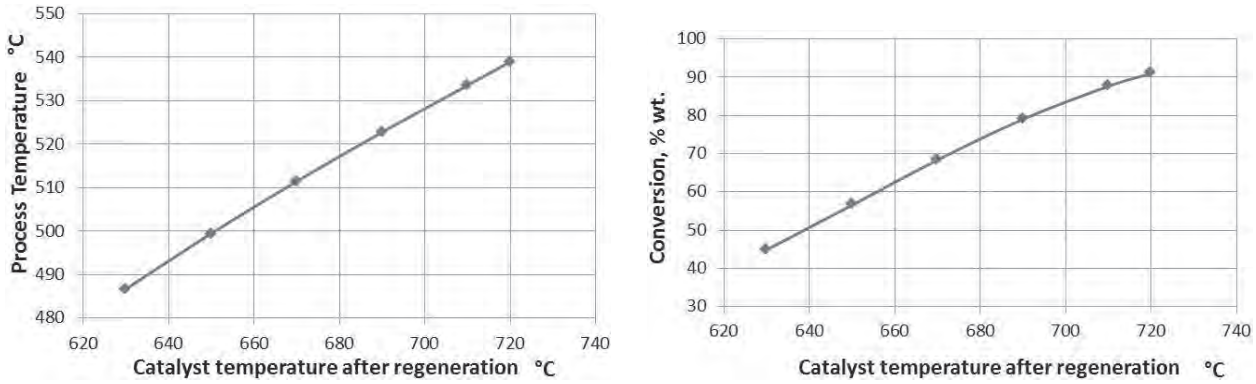

Fig. 1. *The impact of catalyst temperature after regeneration on the process temperature and on the conversion of feedstock*

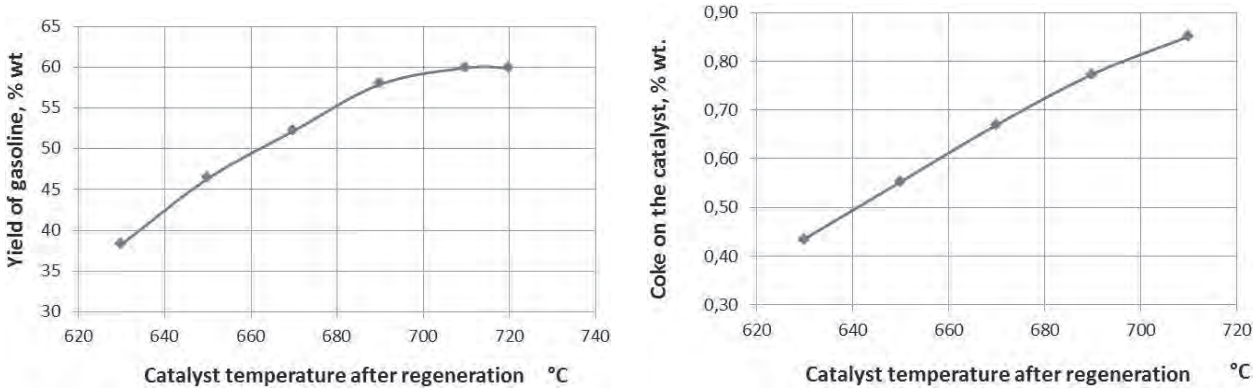

Fig. 2. *The impact of catalyst temperature after regeneration on the gasoline yield and on the coke content on the catalyst*