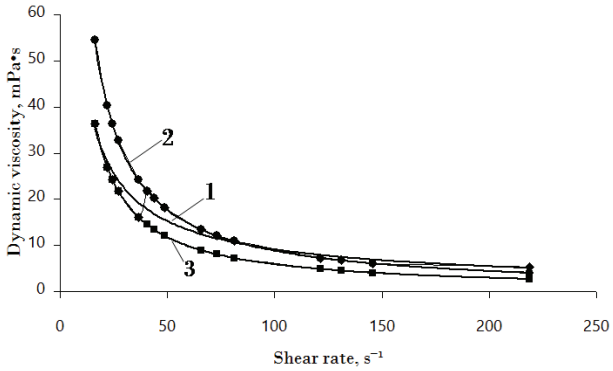

Fig. 3. *Dynamic viscosity of CWS: 1 – CWS, $\mu = 588\gamma^{-1}$, 2 – CWS + 0.04% T-900, $\mu = 882\gamma^{-1}$, 3 – CWS + 2% T-900, $\mu = 279.7\gamma^{-0.74}$*

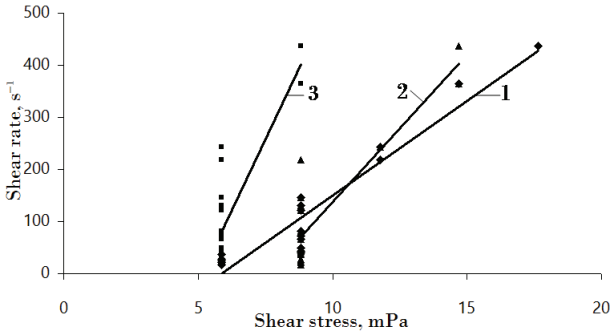

Fig. 4. *Dynamic viscosity of CWS: 1 – CWS, $\mu = 588\gamma^{-1}$, 2 – CWS + 0.04% T-900, $\mu = 882\gamma^{-1}$, 3 – CWS + 2% T-900, $\mu = 279.7\gamma^{-0.74}$*

er law model equation $\mu = K\gamma^{n-1}$ at a shear rate of 10–220 s^{-1}, where μ – Dynamic viscosity, K – consistency index, γ – shear rate, n – flow index.

The analysis of the experimental data has shown that at sufficiently low concentrations of different carbon additives the viscosity of the CWS can be increased as much as decreased. The CWS supplemented with carbon (2% by weight) has a viscosity less than the initial slurry. In constant, addition of 0.04% by weight slightly increases the viscosity. At the same the time flow type remains unchanged and is characterized by shear rate as a function of shear stress $\gamma = f(\tau)$, (Figure 4). This viscoplastic fluid flow is close to the Newtonian flow.

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THE INFLUENCE OF HYDROGENATE COMPOSITION ON THE CATALYZATE QUALITY IN REFORMING PROCESS

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Composition of the feedstock (hydrogenate) has the highest value at the reforming process, wherein technological process parameters are based on the optimal catalyst operation. Composition of hydrogenate consists of hydrocarbons with number of carbon atoms from 6 to 10. The most valuable components are naphthenic hydrocarbons such as hexane type (i.e. alkyl derivatives of cyclohexane), and their content of the hydrogenate ranges from 15 to 35% (wt.). It should be noted that the high content of aromatic hydrocarbons (such as toluene, xylenes, benzene and others) in the feedstock initiates by side processes (e.g. coke formation on the surface of a platinum catalyst).

Modeling system AKTIV+C used in order to assess efficiency of using hydrogenate of various compositions. This system describes and simulates the reforming process to produce highly aromatic (high-octane) gasolines. Using this modeling system has been made possible to carry out calculation not only of quality indicators produced reformate but also catalytic activity of the reforming process and concentration of coke on the catalyst surface, and to determine yields of components in the product stream of the technological scheme for each reactor.

Calculation results of the reforming process on a model for the given composition of hydrogenate

Table 1. The calculation result of reforming process on the model (composition of components), % wt.

Raw component \ reactor	R-1	R-2	R-3	R-4	Product
H_2	0	1.2	2.3	3.5	4.5
C_1-C_3	0	1.1	0.8	0.6	0.3
nC_4-C_6	0	5.5	3.9	2.5	0.9
nC_7	12.1	10.1	7.1	4.5	1.7
nC_8	8.7	3.2	2.2	1.4	0.5
nC_9	1.6	0.7	0.5	0.3	0.1
nC_{10}	1.5	1.7	1.2	0.8	0.3
iC_4-C_6	0	6.8	6.2	4.5	2.4
iC_7	7.5	12.6	19.3	13.8	7.5
iC_8	12.1	4.5	4.1	2.9	1.6
iC_9	7.3	0.5	0.5	0.3	0.2
iC_{10}	0.8	0.6	0.6	0.4	0.2
Methylcyclopentane	0.2	2.3	0.6	0.1	0
Dimethylcyclopentane	8.2	5.4	1.5	0.3	0.1
Cyclohexane	2.2	0.8	0.2	0.1	0
Methylcyclohexane	16.7	5.0	1.4	0.4	0.1
Naphthenes (C_8)	8.3	2.0	0.5	0.1	0
Naphthenes (C_9)	5.2	4.4	1.2	0.3	0.1
Naphthenes (C_{10})	0.8	3.0	0.8	0.2	0
Benzene	0	1.1	1.7	2.4	3.0
Toluene	3.5	12.1	19.3	27.0	34.1
Xylenes	2.6	10.0	15.9	22.3	28.1
Aromatics (C_9)	0.3	4.0	6.4	9.0	11.4
Aromatics (C_{10})	0.3	1.0	1.6	2.3	2.8

for a 4-reactor scheme presented in Table 1.

The composition of hydrogenate determines the reformate quality. According to the Table 1, increasing of the content of branched chain hydrocarbons and aromatic hydrocarbons is observed after the passage of the first reactor by hydrogenate (while the total aromatics content does not exceed 25–28% by weight. The most consumable paraffins are normal octane and iso-octane, and naphthene is methyl cyclohexane. It is typical for other types of feedstock (hydrogenate). The gradual decrease in the content of naphthenic and paraffinic hydrocarbons is observed with a further passage of feed through reactors R-2, R-3 and R-4. It is accompanied by increased concentration of aromatics. Total aromatics content is about 70–78% at the outlet from R-4. It determines an increasing for the octane number of a hydrocarbon mixture with 40–60 points to 95–105 points on the research method (RON).

Research of depending on the composition of reformate from the initial composition of hydrogenate allows to determine features of the rectification to produce fraction 85–140 °C. Inclusion in the process narrower fractions $C_7 - C_9$ promotes to increase the aromatics content in reformate to 85–90% by weight.

Qualitative and quantitative composition of hydrogenate from the refinery allows to define (using a modeling system) possible yield, com-position and properties of the product.

References

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