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ETHERIFICATION OF BULGARIAN GASOLINE FRACTION

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As compared with reformates and alkylates, the octane numbers of cracking gasolines are relatively low (clear RON=90-92, clear MON 79-80). Since, moreover, the European regulation provides for a decrease of the tetraalkyl lead content of gasolines, in a first stage to 0.15 g Pb/1, and will subsequently forbid any lead content in a part of the motor fuels, it seems that the octane specifications of premium gasoline will be difficult to comply with when using cracking gasolines.

In order to meet with these requirements without too much increasing the severity of the refining operations, other means shall be found to increase the octane quality of these gasolines.

Generally, these cracking gasolines, for sweetening requirements, are separated into light and heavy fractions. The light cracking gasolines contain a substantial amount of olefins, for example 30-40%, including tertiary olefins, isoamylenes, isohexenes and isoheptenes.

The aim of this work is to improvement the olefin etherification is obtained in an integrated process combining a fluidized catalytic cracking reaction and a fluidized catalyst etherification reaction wherein zeolite catalyst particles are withdrawn in partially deactivated form from the ether reaction stage and added as part of the catalyst in the FCC reaction.

The basic tasks, which our team were tried to solve were:

- The determination of experimental condition of the etherification process in laboratory stage;
- The investigation of obtained products – research and motor octane number, iodine number, g J_2/100g density at 15 °C, distillation characteristics and etc. exploration parameters;

As a basic raw material was used gasoline fraction from fluid catalytic cracking which was produced from "Lukoil Neftohim" Burgas. In Table 1 are given the physico-chemical properties of the basic fraction.

Table 1. Physico-chemical properties of gasoline fraction from FCC

Parameter	Test method	Value
1.Distilation characteristics	BSS EN ISO 3405:2011	
i.p, °C		47
up 70 °C, %(v/v)		28.0
up 100 °C, %(v/v)		53.0
up 150 °C, %(v/v)		85.0
e.p, °C		200
2. Benzene, %	BSS EN12177 + AC : 2003	1.0
3. Sulfur, ppm	BSS EN ISO 20846:2012	23.0
4. Hydrocarbon content, %	ASTM D 1319 2012	
-olefin		14.5
-arene		20.25

5.Density, -at 15 °C, g/cm^3	BSS EN ISO 3675:2004	0.741
6. VPR, кPa	ASTM D 323: 2010	63.6

The physic-chemical characteristics of obtained product are given in Table 2.

Table 2. Physico-chemical characteristics of obtained product after modification of gasoline fraction

Parameter	Test method	Value
1.Distilation characteristics	BSS EN ISO 3405:2011	
i.p, °C		41
up 70 °C, %(v/v)		32.0
up 100 °C, %(v/v)		55.5
up 150 °C, %(v/v)		83.0
e.p, °C		183
3. Sulfur, ppm	BSS EN ISO 20846:2012	12.0
4. Hydrocarbon content, %	ASTM D 1319 2012	
-olefin		6.1
-arene		18.0
5.Density, -at 15 °C, g/cm^3	BSS EN ISO 3675:2004	0.737

The method of etherification was the follow: basic gasoline fraction and methanol in ratio = 1:1 were put in three –necked flask, then put in the catalyst as Amberlist 35 H^+ acid form in ratio raw material: catalyst = 10:1; 12:1 and 15:1. The three – necked flask is connected with condenser and thermometer. We included heating and the reaction began after 5-10 min, when the temperature began 50-62 °C, heating stopped, the flask is cooled and the obtained product is separated.

The results from Table 2 have shown that olefin and arene hydrocarbons decreased therefore it may be realize etherification of basic gasoline fraction.

It`s established the experimental condition of the etherification processes in laboratory stage. The optimal temperature was measured about 52 °C, ratio raw material: catalyst = 12:1 and contact time 25 min.

For the first time is obtained product from gasoline fraction with decreased content of olefin though modification with methanol in Bulgaria.

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