

IN SIGHT

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Development of a regional market of petroleum products using information logistics technologies

Keywords: oil products market, hydrocarbon raw materials, oil and gas chemical complex, import substitution, information and analytical system, logistics chains

Abstract. For today in Russia domestic production of oil products does not satisfy the growing demand of the domestic market, there is a low degree of saturation of the market of products of domestic oil and gas chemistry. In general, the demand for petrochemical products in Russia is projected to quadruple by 2030. Russia is inferior to many developed and developing countries in terms of production and export of chemical and petrochemical products. Insufficient capacity of the domestic market is observed.

The oil and gas chemical complex is the basis of Tatarstan's economy. At the same time, a low share of processed oil is observed. There is a high demand for hydrocarbon raw materials and insufficient satisfaction of it due to the absence of a number of strategic product pipelines.

At the chemical enterprises of Tatarstan only 25% of the republican resources of hydrocarbon raw materials are processed. At the same time, for the needs of chemical enterprises in Tatarstan, about 40% of the required raw materials are imported. In particular, raw materials are also imported, which is produced in the republic. But for a number of reasons, regional manufacturers do not possess information, where it is possible to purchase the products they need in the republic.

The development of the republican logistics network «supplier-consumer» will increase the share of processing of own hydrocarbon raw materials. To solve this problem, it is proposed to create a unified corporate information and analytical system within the framework of the oil and gas chemical cluster containing current information on the presence and needs of the republic's enterprises in hydrocarbon raw materials and other petrochemical components.

On-line system will allow suppliers of raw materials and manufacturers of petrochemical products to react quickly to the demand and supply of a particular hydrocarbon product. The work of this system will contribute to the formation and expansion of the intra-republic logistics network «supplier-consumer» in the field of hydrocarbons within the first year of the project by 5-10%.

Realizing all of the above, we can expect the expansion of the regional market of petroleum products, the deployment of import substitution, increasing the competitiveness of Russian products, the development of intra-republican logistics networks.

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**PETROLEUM PRODUCTS:
TECHNOLOGY, INNOVATION, MARKET**

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Study of catalytic activity of ionic liquid triethylamine hydrochloride – aluminum chloride modified inorganic salts in the reaction of isomerization *n*-hexane

Keywords: triethylamine hydrochloride, chloride of aluminium, supercyclone, isomerization of hexane, ionic liquid, catalytic activity, selectivity of the catalyst

Abstract. The paper presents the results of studies on the effect of inorganic salts, mainly sulphates of the metals on the catalytic activity of ionic liquid triethylamine hydrochloride – aluminum chloride in the liquid phase reaction of isomerization of *n*-hexane. The isomerization process is carried out in a batch reactor made of stainless steel and the analysis of the obtained products was performed using gas chromatograph GC-2010 Plus, Shimadzu. The optimal process temperature with a maximum yield of the target isocomponent. We propose a probabilistic mechanism of formation of complex compounds at the time of synthesis of the catalyst, which enhances the catalytic activity. Investigated the thermal properties of catalytic systems by means of differential scanning calorimetry.

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How to optimize the performance of lubricating greases by selecting suitable base oil blends

Keywords: traction coefficient, low temperature flowability, oxidation stability, elastomer compatibility, Thickener content, naphthenic oil, paraffinic oil, lithium based grease.

Abstract. Mineral oils used by grease manufacturers can be divided into two major groups, naphthenic oils and paraffinic oils. These categories of base oils have their own advantages and disadvantages depending on the applications and conditions. The most important advantages of the naphthenic oils over the paraffinic oils, with the same viscosity and similar aromatic content, are better low-temperature flowability and better solvency.

The contribution of having base oils with good solvency towards the thickener is that less thickener is needed to obtain a certain consistency of the finished product. For instance, a typical NLGI grade 2 lithium based grease, based on a solvent neutral 500, Gr I oil, may contain 9-14 wt% thickener; while 6-8% thickener is required for an equivalent viscosity oil of naphthenic nature.

Using blends of Naphthenic oil and paraffinic group one oil (Gr I) have successfully been used during the past decade in India. However, the author believes that the surplus of paraffinic Gr II and Gr III base oils is one among a number of market trends that brings some great opportunities to the grease formulators, if they look for blends where naphthenic oils are regarded as part of the solution for a sustainable formulation. A number of key parameters important for the performance of the finished product could be obtained within reasonable cost.

The purpose of this work was to compare «side by side» three base oil blends where paraffinic Gr I, Gr II and Gr III, in combination with naphthenic, were used for preparation of lubricating greases. Since the target viscosity was 150 mm²/s at 40°C, a naphthenic oil was used in order to reach this viscosity.

The overall results obtained, reveal some interesting aspects of the use of Gr II as a substitute to Gr I for preparation of greases. The outcome of this work emphasizes that blends should be regarded as a great opportunity for grease formulators who are looking for some further development of their current formulations and furthermore, the lubricating grease based on the blend of paraffinic Gr II and naphthenic oil performs better than others.

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Optimization of alkylation process of *para*-chlorphenol of 1-methylcycloalkens

Abstract. Influence of temperature, reaction duration, molar ratio of initial components and catalyst amount were studied for the purpose of determining optimal yield and selectivity of the target product of 2-(1-methylcycloalkyl)-4-chlorphenol. Cycloalkylation reaction was carried out in the range of 60–140°C and reaction duration in 2–6 h, 0,5–1 : 3 molar ratio of PChF to methylcyclopenten (1-MCP), methylcyclohexene (1-MCH) in 5-15% catalyst amount (on the PChF taken).

Mathematical treatment of experimental data allowed obtaining particular dependence of yield on the temperature, reaction duration, molar ratio of initial components, amount of catalyst in the form of second-order regression equation.

Generalized equation of output parameter of optimization was made up, taking into account simultaneous influence all of the input variables. Methodics of probabilistic-determined planning of the experiment was used for this reason. As a result of computer calculations, maximum yield of the target product amounted to 82% and selectivity – 92% according to input variables: the reaction temperature – 110°C, reaction duration – 4 h, molar ratio of initial components of PChF to 1-MCP as 1:1, catalyst amount – 7% for catalytic cycloalkylation of *para*-chlorphenols with 1-methylcyclopenten.

Cycloalkylation of PChF with 1-VCH was also studied. Cycloalkylation process was carried out at the conditions: temperature of 80-140°C, reaction duration – for 2–6 h, molar ratio of initial components as 0.5÷2:1, catalyst amount – 5–15% (on taken PChF).

Mathematical treatment of experimental data allowed obtaining particular dependence of yield and selectivity on temperature, reaction duration, ratio of initial components, catalyst amount in the form of second-order regression equation.

Methodics of probabilistic-determined planning of the experiment was used for making up a generalized equation of optimization output parameter for taking into account simultaneous influence all of input parameters. As a result of computer calculations, it was determined that maximum yield of the target product amounted to 86%, and selectivity – 95% at input variables conditions: the reaction temperature – 120°C, the reaction duration – 5 h, molar ratio of PChF to 1-MCH as 1:1, catalyst amount – 10% for catalytic cycloalkylation reaction of *para*-chlorphenol with 1-methylcyclohexene.

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Distillation of heavy bituminous oil in the presence of ultradispersed catalytic systems

Keywords: ultradispersed catalyst, 2-ethylhexanate Nickel, distillation of high sulfur bituminous oil Ashalchinskoye field.

Abstract. Investigated possibility of application of ultra-dispersed catalytic systems for processing high-sulfur bituminous oils processing on an example of Ashalchinsk field oil of the Republic of Tatarstan. Ultradispersed catalytic system was obtained by thermo destructive distillation of vacuum gas oil in the presence of 2-ethylhexanate Nickel. Its use in the amount of 10% by weight on oil thermal destructive distillation allows to increase the yield of distillate fractions with their boiling temperature at normal conditions 112-220°C from 43 to 73%.

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Peculiarities of action of functional additives in the engine oils on the interphase boundary

ECOLOGY and INDUSTRIAL SAFETY

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Estimation of explosion and elaboration of measures on lowering the risk of explosion of reactor of the catalytic cracking unit G-43-107

Keywords: catalytic cracking, reactor, unit G-43-107, fire hazard, fault tree, explosion probability.

Abstract. The present article considers the problem of provision of industrial safety of the process of catalytic cracking. The analysis of the possible causes and the development of emergency situations has been carried out. On the basis of the data of probability estimation of the reactor explosion to ensure the operation safety and to reduce the risk of emergency situations occurrence it is suggested to install the system «reactor - burner» with a controlling device in a reactor, that will in an emergency send the excess of the product to gas holder with its further sending to burner.

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CONFERENCES. SEMINARS. EXHIBITIONS

Russia and CIS countries: joint projects with Chinese partners / Post-release forum (19.09.2017, Peking)

Without innovation does not go far / Post-release 12-th international conference "Rubbers, tires and RTI 2017" (10.10.2017)

The results of the 17th International specialized exhibition "Advanced automation technologies. PTA-2017" (31.10-02.11.2017, Moscow)