

**TOPIC OF THE ISSUE: LUBRICANTS**

**Pp. 6–10**

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**Comparative assessment of the qualities of commercial and synthetic transformer oils**

**Keywords:** petroleum transformer oils; ionic liquid; selective solvents; synthetic fluids.

**Abstract.** Petroleum transformer oils previously produced in the USSR met the requirements of GOST 982-80. Balakhany oil and Dossor low-paraffin oil of the Emben field were the raw materials for obtaining transformer oil. The composition of transformer oils is taken into account when choosing raw materials and their regeneration. Т-1500u – transformer oil of improved quality, is used in electrical equipment up to 500 kV and up to 750 kV. GK oil is a hydrocracking transformer oil, used in voltages up to 1150 kV, contains ionol. τsp is oil from West Siberian oils, used up to 220 kV. This oil is of relatively low quality, characterized by a high sulfur content, low oxidation stability, and high dielectric loss tg. In the Institute of Petrochemical Processes of ANAS, research has been carried out on the selective purification of transformer oil distillate from Balakhany oil using a new highly effective solvent – ionic liquid (IL) – a quaternary ammonium salt of formic acid and a number of amines – morpholine, aniline or di-, triethylamines. The optimal conditions for the selective purification of the distillate have been developed. Due to the shortage of high-quality transformer oils, as well as the high cost, in recent years, oils have been imported from Sweden and Austria.

An ionic liquid as a solvent is highly selective. The analysis of the extract from selective purification showed that it does not contain naphthene-paraffins, the content of aromatic hydrocarbons in the extract is 65 %, and when purified with furfural it is 40.8 %. The ionic liquid is environmentally friendly.

**Pp. 12–14**

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**Features of the modern process of evaluation of motor oils**

**Keywords:** internal combustion engine (ICE); engine oils; classification; evaluation methods; certification.

**Abstract.** Changes in the design and parameters of modern internal combustion engines in order to achieve high economic, environmental, and other indicators lead to a tightening of the operating conditions of engine oil. Engine oil is an integral part of the internal combustion engine and from the point of view of modern views is positioned as an engine part. Currently, all internal combustion engine oils are generally tested, classified and evaluated according to generally accepted criteria and parameters. Without specifying and analyzing a whole layer of materials related to research, testing, evaluation of motor oils accumulated over more than a century, the article briefly discusses some general aspects of the classification and evaluation of oils for automotive equipment in leading foreign countries and the Russian Federation.

**Pp. 15–22**

**Novotrozhdina N. N., Ramazanova Yu. B.-A., Gakhramanova G. A., Musayeva B. I., Safarova M. R., Ismayilov I. P.**

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### **Study of phosphorus-containing compounds as anti-seize and anti-wear additives for transmission and engine oils**

**Keywords:** dithiophosphates; anti-seize and anti-wear additives; lubricating properties; functional groups.

**Abstract.** Dithiophosphoric acid esters containing various functional groups have been synthesized. On the basis of allyloxybenzyl- and allyloxymethylbenzylchlorides, as well as sodium diisopropyldithiophosphate, allyloxybenzyl- and allyloxymethylbenzylalkyldithiophosphates were obtained, respectively. 5-methyl-2-hydroxyphenylcarbonylmethyldiisopropyldithiophosphate was synthesized by the interaction of 5-methyl-2-hydroxy-chloroacetophenone and sodium diisopropyldithiophosphate. The synthesized compounds were studied as anti-wear and anti-seize additives for lubricating oils. Were also investigated their thermo-oxidative and anticorrosive properties. It was found that all synthesized compounds provide an improvement in the anti-wear and anti-seize properties of petroleum oils, and the efficiency depends on the presence of certain functional groups in the molecules of additives.

**Pp. 23–27**

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### **Features of technical requirements for operational properties automotive engine oils in new specifications**

**Keywords:** automotive motor oils; performance properties; specification; method of test; engine; fuel economy; exhaust emissions.

**Abstract.** Analytical information on the state of the art in the development and implementation of new foreign requirements in the specifications for motor oils for serial and future automobile engines, taking into account global trends in environmental protection, is presented.

## **CHEMISTRY AND TECHNOLOGY OF FUEL AND HIGH-ENERGY SUBSTANCES**

**Pp. 28–33**

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### **Study of the composition and environmental aspects of the use of pyrolysis distillate of the Ustyurt gas chemical complex**

**Keywords:** hydrocarbon crude pyrolysis naphtha; automobile gasoline; pyrolysis; polyethylene; polypropylene; cryoscopy.

**Abstract.** The development of technologically efficient and economical methods of using liquid pyrolysis products is a task of current interest. Despite the apparent variety of developments, the proposed methods are reduced either to obtaining a set of fractions, which are subsequently used as technical products, or to obtaining a wide range of individual compounds.

The complexity and wastelessness of oil refining and petrochemistry, which has become especially acute due to the increasing negative impact of human activities on the environment, provides for the complete

utilization of all material flows with the maximum extraction of useful components, the use of technologies, catalysts and reagents that exclude the formation of harmful emissions and waste. Currently, one of the most common methods for producing lower olefins (ethylene, propylene, butylenes) is the pyrolysis of hydrocarbons of various origins (gas, straight-run gasoline, a broad fraction of light hydrocarbons, etc.).

A set of classical and modern research methods was used in the work, which makes it possible to determine the physical, physicochemical characteristics, functional composition, to study the processes occurring in the initial oil and gas products and in the pyrolysis distillate subjected to various refining processes, in particular, dearomatization, and also to establish chemical compositions, structure, chemical nature and their stability.

The article presents the results of analyzes to determine the physicochemical characteristics of naphtha obtained via pyrolysis of the Ustyurt gas chemical complex and the results of research on the use of pyrolysis naphtha as motor gasoline.

## **PETROLEUM PRODUCTS: COMPOSITION, PROPERTIES AND APPLICATION**

**Pp. 34–41**

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### **Influence of surfactants on the wettability of watered viscous oils of some fields in Azerbaijan**

**Keywords:** water-cut oil; surfactants; molasses; vinasse; wettability; contact angle; fluidity.

**Abstract.** The results of comparative experimental studies of the effect of various widely used surfactants, as well as sugar refinery waste – after yeast molasses and vinasse on the wettability of the interaction surface during the in-field pipeline transport of oils from fields in the southern region of Azerbaijan and can be successfully used, especially in winter, to regulate fluidity highly emulsion and low solidifying oils. It is shown that the addition of the considered reagents leads to an increase in the contact angle cosine. The effect of the proposed reagents on the fluidity of oil samples with bound and free water, the composition of aqueous solutions of various reagents, as well as the pH of solutions of these reagents on the fluidity of oil samples has been evaluated.

## **CHEMISTRY AND TECHNOLOGIES OF OIL-REFINING**

**Pp. 42–49**

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### **Involvement of products of thermal processing of polymer waste into the raw material pool of oil refinery plants**

**Keywords:** polymer waste; thermolysis; recycling; ecology; petroleum refining.

**Abstract.** The directions of involving the products of thermal processing of polymer waste into the raw material pool of oil refineries are considered. A detailed analysis of fractions 85-180 °C, 180-360 °C and 360-KK °C, isolated from thermolysis products, has been carried out. Fractions 85-180 °C, 180-360 °C of thermolysis oil are characterized by a high content of organosulfur compounds, which necessitates their hydrotreating before use. After desulfurization, gasoline and diesel fractions can be used in the composition of gasoline and diesel fuels, respectively. The diesel fraction of 180-360 °C of thermolysis

oil has a high cetane number and can be considered as a cetane-increasing component. Fraction 360-KK °C thermolysis oil is a potential component of catalytic cracking feedstock. The highest degree of conversion and the yield of valuable components (gasoline, propylene, butane-butene fraction) are achieved during cracking of feedstock containing 30 wt. % of the heavy part of thermolysis oil.

## **PETROCHEMISTRY: TECHNOLOGY, PROCESSES**

**Pp. 50–53**

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### **Issue of kerosene supply into live reflux flow of main rectification column of atmospheric vacuum pipestill process units**

**Keywords:** kerosene; gasoline; circulating reflux; distillation proportion; rectification.

**Abstract.** In this article the possibility of supplying the kerosene fraction into the live reflux line of the K-2 column of the atmospheric vacuum pipestill units is reviewed. According to the results of mathematical calculations in the Petro-SIM software, the fraction 140-240°C was determined as optimal for supplying into the top live reflux line of the K-2 column of the atmospheric vacuum pipestill unit. This action makes it possible to reduce the load on the condensing system of the K-2 column of the atmospheric vacuum pipestill units; the heat potential of the hotter kerosene flow also increases, both for heating oil and for generating low-pressure steam. The article describes the advantages of the method.

## **CHEMOTOLOGY**

**Pp. 54–61**

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### **Comparative evaluation of various testing methods for FCC catalysts**

**Keywords:** zeolites; catalytic cracking; catalyst deactivation; oil refinery.

**Abstract.** The article discusses modern methods of stabilization and testing of the activity of cracking catalysts (FCC). Laboratory methods for evaluating cracking catalysts using fixed and fluidized bed reactors are compared, and their advantages and disadvantages are discussed. The correspondence of material balances of cracking was experimentally determined using various laboratory methods and a pilot plant with a riser reactor in comparison with data of industrial unit. Based on the analysis of the results obtained, recommendations are given for the most relevant testing of cracking catalysts.