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CHEMISTRY AND TECHNOLOGY OF FUEL AND HIGH-ENERGY SUBSTANCES

Keywords: esterification reaction, esters of oxypropylated polyol, lubricating oils, performance characteristics, correlation dependence.

Abstract. At present, with the development of modern technology, the requirements for lubricating oils, especially their viscosity-temperature, thermo-oxidative and lubricating characteristics, are becoming more stringent. In this aspect, the synthesis and study of esters of oxypropylated 2,2,5,5-tetramethylolcyclopentanol (TMCP) with cyclic fragments, active centers, multipolar ester groups is promising, have a certain scientific and practical significance. The esters were synthesized by the esterification reaction of oxypropylated TMCP with aliphatic monocarboxylic acids C_4–C_8, and their physicochemical, viscosity-temperature, thermal-oxidative and lubricating properties were studied. After determining the viscosity-temperature properties, it was established that they have a low pour point (minus 38 – minus 43°C), an average viscosity at 100°C (ν_{100} = 23.50–40.22 mm^2/s), a high viscosity index (133–150 units) and flash point (305–380°C). When determining the thermo-oxidative stability of esters, it was found that they have low acid numbers after oxidation (2.51–3.28 mg KOH/g), corrosion of electrodes AK-4 (0.06-0.16 mg/cm^2), ШХ -15 (0.08–0.11 mg/cm^2) and the precipitate is insoluble in isooctane is low (0.120–0.248% of the mass), the volatility is 0.30–0.50% of the mass. The lubricating properties of esters were also determined: critical load $P_к$, H = 750–900, spot wear diameter D_i, mm at P = 196H = 0.50–0.65. Oxypropylated esters in comparison with reference esters – TMCP ester with caproic acid and pentaerythritol ester (PET) and mixture of fatty acids (MFA) fr. C_5–C_6 surpass them in almost all parameters, are higher molecular weight and promising, and this makes it possible to create on their basis high-temperature lubricating oils special purpose, components or additives to other lubricating oils.

Keywords: cyclopentadiene, cyclohexanol, alkylation, optimization, modeling.

Abstract. Based on the experimental data, a regression mathematical model has been developed for the process of obtaining cycloalkyl-substituted cyclopentadienes by catalytic alkylation of cyclopentadiene with cyclohexyl alcohol, reflecting the influence of the main technological factors (the ratio of the starting reagents, temperature, the amount of catalyst) on the yield of the target product. The statistical analysis of the obtained model is carried out, the adequacy of the developed model to the experimental data is proved. The optimal values of the input parameters are found, at which the maximum value of the yield of cycloalkylated cyclopentadienes is reached.

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Keywords: phytoremediation; oil; oil destructors; hydrocarbons; biodegradation; pollution; rhizosphere; hydrocarbon-oxidizing microorganisms.

Abstract. This article provides a brief description of one of the modern technologies – phytoremediation, based on the rehabilitation of soils and water, polluted mainly by oil and heavy metals, and is a cleaning process, based on the use of the root zone of green plants (in this case, wormwood) with the simultaneous saturation of the soil biota with various types of oil-degrading microorganisms, isolated from the soils of the study area, and various heterotrophic microorganisms, the main role of which is to assimilate the products of intermediate oxidation of hydrocarbons.

Keywords: oil from West Absheron field, oil fraction, viscosity index, hydrocracking, selective refining, additives, aromatic, naphthenic and paraffinic hydrocarbons.

Abstract. The article presents the results of a studying the physical and chemical properties of oil from the Western Absheron field, as well as the quality of oil fractions of this oil for the period 2014–2020. It is shown that in terms of its physicochemical properties, this oil is comparable to the previously studied oils from the fields of the Darwin Kupesi and Pirallahi oil and gas bearing regions.
The oil fractions of this oil 350–500°C are distinguished by a low viscosity index and a low pour point.
The use of combined processes of hydrocracking and selective purification makes it possible to increase the viscosity index from 0 to ~ 60 units, while using only selective purification – from 24 to 46 units. After adding the appropriate additives, it is possible to obtain motor oils of the 15W/40 type with VI up to 105 units, which correspond to the analogue of "Lukoil-standard" oil.
The conditions for obtaining dearomatized oils from the oil fraction of Western Absheron 300–350°C have been developed.
For deep dearomatization of the light fraction 300–350°C, a two-stage adsorption purification was carried out to the content of aromatic hydrocarbons ≤3.0%. This fraction can be used as a raw material for the production of white oils, cosmetics and pharmaceuticals. At the same time, the ratios of aromatic,

naphthenic, paraffinic hydrocarbons (54.4/42.6/0.3) were calculated and the empirical formula $C_{18.9}H_{31.3}$ was given, which corresponds to foreign counterparts.
The disadvantage of these methods is the insufficiently high stepwise yield of the target fractions (up to 50%). In the presence of hydrogenation processes (hydrocracking, hydroisomerization), oil fractions of oil from Western Absheron can serve as raw materials for the production of valuable products – both white and motor oils.

PETROCHEMISTRY: TECHNOLOGY, PROCESSES

Pp. 33–36

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Synthesis and transformations of cooligomers styrene with di-olefins modified by glycidyl ethers of 4-izopropenylphenol

Keywords: styrene, diolefins, glycidyl ethers, co-oligomers, structuring, diethylenetri-amine, sorbents, uranyl-ions.

Abstract. The article presents the results of our studies on the synthesis of co-oligomers of styrene and diolefins (butadiene-1,3; isoprene) in the presence of small amounts of a modifying co-monomer – glycidyl ether of 4-isopropenylphenol (GE 4-IF). The process of triple co-oligomerization was carried out in an aromatic solvent (ethylbenzene) in the presence of initia-tor ditrebutyl peroxide (DTBP) (2% per mixture of monomers) at 140°C for 30 hours. The ratio of the solvent to the mixture of monomers was 2:1 wt. The amount of GE4-IF in the reaction mixture varied from 2.5 to 10%. It was found that while using the of butadiene-1,3 and isoprene at the optimal content of GE4-IF 5%, the yields of triple co-oligomers are 98.6% and 90.5%. Co-polymers structured by diethylenetriamine were studied as sorbents for extracting uranium salts from aqueous systems under static conditions (at 25°C). It was found that at pH=8 the degree of extraction of uranyl ions is 90.4%.

CHEMOTOLOGY

Pp. 37–40

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Technical and environmental aspects of the new requirements for the performance properties of promising motor oils

Keywords: transport; exhaust gas toxicity; fuel economy; automotive engine oils; lubricants; oil viscosity; engine.

Abstract. The modern development of transport is at the stage of energy transition to its zero-carbon operation with the use of alternative energy sources instead of traditional liquid fuel. It is assumed that the operation of transport using electric motors and hydrogen fuel cells in the future will be able to represent a significant segment of the global economy. Manufacturers of heavy-duty vehicles and buses are currently actively investing in so-called carbon neutrality technologies and are activating the technical capabilities of options for using electric vehicles for heavy operating conditions.
At the same time, along with the electrification of vehicles, the popularity of traditional piston internal combustion engines remains, including in hybrid car models. The new environmental regulations Euro-7, which are part of the European "Green Agreement", include stricter emission standards for all gasoline

and diesel cars, vans, trucks and buses. This is part of the EU's commitment to support the goal of achieving carbon neutrality by 2050.
In connection with the latest achievements in the design of diesel engines, the development of a new category of PC-12 engine oil for heavy-duty diesel engines is officially underway in order to replace the oils of the existing categories CK-4 and FA-4 according to API. The category of oils in the projected specification is planned to be divided into subcategories that provide conditions for their use in heavy-duty transport: off-road conditions, including those with a high temperature load, assuming a high oil viscosity at 150°C and a shear rate of 106 s-1 (High Temperature High Shear – HTHS), and highway operation.
It is assumed that the new PC-12 specification will provide increased thermal-oxidative stability of oils and improved compatibility with elastomers in both subcategories, as well as wear tests with the inclusion of new methods.

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The modern viscosity modifiers of engine oils

Keywords: modern viscosity modifiers; viscosity index improvers; engine oils; polymers; ethylene-propylene copolymers; polymethacrylates; hydrogenated styrene isoprene copolymers; permanent viscosity loss; temporary viscosity loss.

Abstact. This article discusses the peculiarities of chemistry and architecture of polymers – modern viscosity modifiers of engine oils, the proposed mechanism of their action, influence the rheological, dispersing properties, energy- and resource saving properties of engine oils. The quality scores such as tightening efficiency and shear stability and concepts of permanent and temporary viscosity loss are considered. The short characteristics of the bench test methods of polymers shear stability concerns.