

# Summaries

UDC 544.45

**Ilyin A.P., Root L.O.**  
**HIGH-TEMPERATURE CHEMICAL FIXATION  
 OF AIR NITROGEN**

It was ascertained that nitrides are formed as independent crystalline phases at high temperature combustion of powdered metals, boron and silicon, mixtures of aluminum powder with elementary substances, oxides and salts in the air. Based on the results of the differential thermal analysis of aluminum nanopowder in various gaseous media the authors have proposed that nitride formation is connected with the decrease of air oxygen activity owing to the effect of intrinsic radiation of burning powder transforming photochemically triplet oxygen into valent-inactive singlet state. The formation of metal nitrides, boron and silicon is the result of these processes. The content of these metals in combustion products amounts to 30...80 wt. %.

UDC 544.016.2:543.572.3

**Pivovarov D.A., Golubchikova Yu.Yu., Ilyin A.P.**  
**OBTAINING METAL POWDERS AND THEIR OXIDES  
 BY THERMAL DECOMPOSITION OF OXALATES Cu, Ni, Co**

The authors have studied the processes and products of thermal decomposition of oxalates Cu, Ni, Co. It is ascertained that thermal decomposition occurs in the range of 260...365 °C. Oxides are the products of oxalates thermal decomposition in the air; powdered metals with oxide admixture are formed in the medium of intrinsic gaseous products of thermal decomposition. Thermolysis product dispersion ability depends on sizes and characteristics of original oxalates crystals.

UDC 544.478:-.45

**Zhdanova M.V., Mostovschikov A.V., Ilyin A.P.**  
**THE ACTION OF IRON AND MANGANESE OXIDE ADDITIVES  
 ON SAW DUST COMBUSTION**

The authors studied the action of catalytic additives of iron oxide (III) and manganese dioxide on the process of birch saw dust combustion in the air. They obtained the increase of thermal effect by 17 % from combustion with complex catalyst Fe<sub>2</sub>O<sub>3</sub>·MnO<sub>2</sub>. According to mass-spectrometry data the catalyst accelerates the transition of gaseous products into CO<sub>2</sub> at the first stage of combustion. It is connected with pre-oxidation of combustion products with the catalyst to thermodynamically more efficient products.

UDC 546.82:546.74:54-19:546.28:66.088:620.193

**Psakhye S.G., Lotkov A.I., Meysner L.L.,  
 Meysner S.N., Ilyin A.P., Abramova P.V.,  
 Korshunov A.V., Sergeev V.P., Sungatulin A.R.**  
**THE ACTION OF MODIFICATION OF NITINOL SURFACE  
 LAYERS WITH SILICON IONS ON ITS CORROSIVE  
 RESISTANCE IN ARTIFICIAL BIOLOGICAL MEDIA**

Using the electrochemical (potentiostatic and potentiodynamic) methods the authors have studied the corrosive resistance of nitinol samples. Their surface has been modified with silicon in conditions of ion implantation (flow density is  $2 \cdot 10^{17}$  ion/cm<sup>2</sup>), in physiological solution 0,9 % NaCl and artificial blood plasma. It was shown that nickel concentration decreases considerably in surface layer to the depth of ~20 nm, siliceous layer is formed at the depth of 10...80 nm with maximum concentration of 30 at. % at the depth of 30...35 nm owing to ion-beam processing of TiNi. The authors ascertained the considerable increase of repassivation potential of TiNi-Si modified samples in the test solutions being on the average of 0,9 V (sat. ch.s.e.) in comparison with the repassivation potential of the test alloy samples treated

by mechanical, chemical and electrochemical methods. It was shown that the surface of TiNi-Si samples is resistant to decomposition with pitting, spots, micro-cracks formation at corrosion tests under conditions of potentiostatic holding at repassivation potential. Having compared the results of corrosion tests with the data of cyclic voltammetry for TiNi, Ti and Ni as well as thermodynamic calculations the authors demonstrated high resistance of the modified surface of TiNi-Si samples to nickel ion extraction into solution.

UDC 546.62:546.72:546.74:66.094.3-926-217:542.943:543.573

**Korshunov A.V.**  
**SIZE AND STRUCTURE EFFECTS AT METAL  
 PARTICLE OXIDATION**

Using the differential thermal analysis the author has studied the laws of oxidation of Al, Fe, Ni, Cu, Mo, W powders with different dispersion ability being heated in the air. It is shown that at transition from micron to submicron and nanodispersed dimensional range the oxidation laws for metal particles are determined to a larger extent by the curvature size of metal/oxide interface and oxide characteristics (composition, structure, morphology, thermal stability). Based on the set of results of discrimination of formal kinetic models and electron microscopic data the author has determined that the increase of ratio value of oxide and metal molar volumes results in decreasing the diffusion limitation influence on oxidation rate and leveling the size dependence of the process kinetic constants for the particles of submicron and nanodispersed ranges. The article introduces the estimation of temperature ranges in which the oxidation process of finely dispersed samples may be considered in quasi-isothermal approximation and the influence of heating rate on behavior features. Based on the results of modeling the kinetic dependences considering the type of particle diameter distribution function the author demonstrates the possibility to determine the dimensional range of particles being totally oxidized at certain temperature.

UDC 546.62:539.374:544.653

**Korshunov A.V., Naydyenkin E.V.,  
 Abramova P.V., Shulepov I.A.**  
**THE FEATURES OF ELECTROCHEMICAL BEHAVIOR  
 OF ALUMINUM WITH ULTRA-FINE GRAINED STRUCTURE**

Using the methods of d. c. and a. c. voltammetry the authors have studied the electrochemical behavior of aluminum with ultra-fine grained structure (the sizes of elements with grained-subgrained structure are 0,5...4,0 μm) obtained by equal channel angular pressing. Based on the results of electrochemical investigations and the data of Auger spectrometry it is shown that owing to increase of diffusion permeability towards oxygen the rate of plastically deformed aluminum transition into a passive state grows due to the formation of thicker surface oxide layer in comparison with the original coarse crystalline sample. As it follows from the results of corrosion test in artificial sea water a higher resistance towards pitting formation at potentials exceeding considerable the repassivation potential ( $E_{re} \approx -0,7$  B, sat. ch.s.e.) is typical for Al with ultra-fine grained structure.

UDC 666.94.015.42

**Lotov V.A.**  
**THE CHANGE OF PHASE COMPOSITION OF CEMENT-WATER  
 SYSTEM AT HYDRATION AND HARDENING**

It is shown that the use of volumetric phase characteristics when studying the cement-water system allows carrying out quantitative estimation of cement stone structure characteristics and representing graphically in ternary coordinate system the change of phase composition of this system at hydration and hardening.

UDC 54.057

**Gryaznova E.N., Shiyan L.N., Yavorovsky N.A.  
STRUCTURE AND PROPERTIES OF ALOOH NANOFIBERS  
MODIFIED BY MANGANESE IONS**

The authors have studied the main properties of ALOOH fibers modified by manganese ions. The method of introducing the modifying component into nanofiber volume at its synthesis was investigated. The article demonstrates that the occurrence of manganese ions (II) in solution influences both the aluminum interaction with liquid water and the nanofiber structure. At manganese concentration growth in the solution the amorphism degree of the modified samples increases, the specific surface area decreases and the metallic aluminum content rises. The presence of manganese ions in the volume of the modified nanofibers is connected with cocrystallization at their growth.

UDC 542.06;544.77

**Machekhina K.I., Shiyan L.N., Korobochkin V.V.,  
Smirnov A.P., Voyno D.A.  
COLLOID IRON REMOVAL FROM GROUNDWATER  
USING CARBON DIOXIDE**

The authors have developed the method for destructing stable colloid consisting of iron hydroxide (III), the compounds of silicon and organic substances of humus nature by decreasing pH solution to 4,5. The given value of pH was achieved by CO<sub>2</sub> solution in water with carbonic acid formation in non-equilibrium conditions. Iron hydroxide (III) formed after colloid destruction is removed at filters and carbon dioxide returns to the cycle. The authors proposed the mechanism for destructing iron colloids represented by chemical reactions. Their behavior was proved by calculations of equilibrium constants and Gibbs energy.

UDC 546.719

**Kalinin A.Yu., Andreev G.G.  
INVESTIGATION OF RHENIUM DESORPTION FROM ION  
RESIN AMBERSEP 920U FOR COMPLEX PROCESSING  
OF SOLUTIONS OF URANIUM UNDERGROUND LEACHING**

The article considers the possibility of rhenium elution from ion resin Ambersep 920U by solutions of substances applied in uranium production. The authors have determined the quantitative characteristics of perrhenate-ion desorption by solutions of sodium hydroxide, sulfuric acid and ammonium nitrate. Equilibrium state and kinetics of rhenium desorption is studied in static mode. It is ascertained that the internal diffusion is determinative stage of the process. The authors have studied the coefficients of rhenium internal diffusion in anion.

UDC 544.653.1

**Korobochkin V.V., Usoltseva N.V., Balmashnov M.A.  
PHASE COMPOSITION OF NANOSIZED PRODUCTS  
OF NON-EQUILIBRIUM ELECTROCHEMICAL  
OXIDATION OF COPPER AND ALUMINUM**

The authors have studied the phase composition of precursors of copper-aluminum oxide system obtained from electrolysis products of metallic copper and aluminum under alternating current. It is ascertained that aluminum oxy hydroxide is the aluminum oxide precursor independently of synthesizing technique; the base copper carbonate, the base carbonate of copper-aluminum (carbonate method) or copper oxide (I) (oxide method) are the precursor of copper oxide

UDC 546.62'41

**Selyunina L.A., Nalivayko T.M., Mashkova K.P.,  
Arustamyan A.S., Mishenina L.N.  
THE ACTION OF SOL-GEL PROCESS PARAMETERS  
ON FORMATION OF CALCIUM ALUMINATE SURFACE**

Calcium aluminate has been obtained by sol-gel method. The authors studied the action of precursor processing technique, cooling rate of final product, introduction of lithium fluoride as a low-melt additive on morphology of calcium aluminate surface. The dimension of CaAl<sub>2</sub>O<sub>4</sub> specific surface was estimated by gas-solid analyzer TristarII.

UDC 661.883.1

**Kazantsev A.L., Poylov V.Z., Shenfeld B.E.  
THE ACTION OF CONDITIONS FOR ZIRCONIUM OXYCHLORIDE  
THERMOHYDROLYSIS ON PHASE COMPOSITION,  
MORPHOLOGY AND SIZE OF PARTICLES OF REACTION  
PRODUCT IN THREE-DIMENSIONAL SPACE**

The authors determined the dependences of morphological, dimensional and structural parameters of zirconium dioxide particles on thermohydrolysis conditions by the methods of scanning electron microscopy, X-ray spectral analysis and X-ray diffractometry.

UDC 539.26:546.236

**Bakibaev A.A., Rustembekov K.T., Dyusekeeva A.A.  
CRYSTAL CHEMISTRY AND STRUCTURE  
OF DOUBLE SODIUM SELENATES**

Double sodium selenates were synthesized from carbonates of sodium, zinc (copper) and selenic acid by solid phase method. The types of syngony and parameters of unit cell were determined by the method of X-ray phase analysis. Based on IR-spectroscopy and quantum chemical calculations the authors proposed the structure of compounds.

UDC 541.11:546.236/244

**Rustembekov K.T., Dyusekeeva A.A.  
THERMOCHEMISTRY OF MAGNESIUM-CADMIUM  
SELENATE AND TELLURITE**

Using the technique of dynamic calorimetry in the range of 298,15...673 K the authors have studied the heat capacity at constant pressure of magnesium-cadmium selenate and tellurite. The equation of dependence  $C_p^0 - f(T)$  were derived and thermodynamic functions were determined. The abrupt anomalous jumps connected probably with phase transitions of the II type were observed on the dependence  $C_p^0 - f(T)$ .

UDC 544.653.22

**Perevezentseva D.O., Gorchakov E.V.  
ELECTROLYTIC BEHAVIOR OF GOLD MICRO- AND NANO-  
PHASES ON THE SURFACE OF GRAPHITE ELECTRODE**

The authors have studied the electrolytic behavior of gold micro- and nano-phases on the surface of graphite electrodes recorded in different ranges of potential change: -1,0 to +0,5; -1,0 to +1,0; -1,0 to +1,5; -1,0 to 2,0 V. They proposed the mechanism of stepwise electrochemical oxidation and recovery of gold phase structure on the surface of graphite electrode in 0,1 M NaOH. The article demonstrates the shift of cathodic maximum potentials by 0,3 V to the range of positive potentials on a graphite electrode modified by gold nanoparticles. The shift of the cathodic maximum potentials is conditioned by the change of phase structures on the surface of the electrode. The authors have determined the maximum at the inverse sweep at the cathodic branch of cyclic voltage-current dependence when using the graphite electrode modified by gold nanoparticles in the range of potential change from -1,0 V to +1,0 V. The occurrence of this maximum is conditioned by final oxidation of Au<sub>2</sub>O to Au<sub>2</sub>O<sub>3</sub>.

UDC 544.653.22

**Gorchakov E.V., Ustinova E.M., Kolpakova N.A.  
ELECTROLYTIC OXIDATION OF AU-PD MICRODEPOSIT  
FROM THE SURFACE OF GRAPHITE ELECTRODE**

The authors have studied the composition of binary electrolytic microdeposit and proposed the method for calculating the potential shift value in the case of electrooxidation of components from binary gold-palladium alloy. The microdeposit composition was estimated by this value and the potential of alloy component electrooxidation maximum. The comparison of the design data obtained when using Pauling equation with the experimental data obtained at microdeposit electrooxidation allowed estimating the phase composition of microstructural compounds formed at the electrode. Studying the electrooxidation of electrolytic gold-palladium deposit the graphite electrode was used as the main electrode and chloride-silver one was

used as the comparison electrode. It was shown that maximum overlapping is observed at any gold-palladium ratio of at voltage-current dependence. One maximum is formed at voltage-current dependence at considerable content of gold and palladium.

UDC 544.653.22

**Ustinova E.M., Gorchakov E.V., Kolpakova N.A.  
APPLICATION OF In AS A METAL-ACTIVATOR  
FOR DETERMINING PLATINUM  
IN GOLD-BEARING RAW MATERIALS**

The authors have proposed the method for determining platinum in gold-bearing raw materials using the method of stripping voltammetry. Indium is proposed as a metal-activator as platinum is not oxidized from the surface of graphite electrode. It is shown that at indium platinum content ratio 50000:1 the maximum is formed on voltage-current dependence. It may be used in analytical purposes. Gold ions (III) in solution influence harmfully at platinum defining in geological objects. Gold occurring in minerals was recovered using ultraviolet radiation.

UDC 543.421

**Zherin I.I., Andrienko O.S., Egorov N.B.,  
Indyk D.V., Amelina G.N., Akimov D.V.  
SPECTROPHOTOMETRIC DETERMINATION  
OF LEAD BROMIDE AND DIMETHYLLEAD BROMIDE  
WITH 4-(2-PYRIDYLAZO) RESORCINOL**

The article describes the technique of spectrophotometric determination of lead bromide (II) and dimethyllead bromide (II) with 4-(2-pyridylazo) resorcinol. The authors obtained the light absorption spectra of lead bromide and dimethyllead bromide with 4-(2-pyridylazo) resorcinol, calculated the values of molar coefficient of light absorption for complexes of lead bromide and dimethyllead bromide with 4-(2-pyridylazo) resorcinol.

UDC 543.422.3

**Saranchina N.V., Gavrilenko N.A.  
SOLID-PHASE SPECTROPHOTOMETRIC  
DETERMINATION OF PALLADIUM (II)  
USING 1-(2-PIRIDYLAZO)-2-NAPHTHOL  
IMMOBILIZED INTO POLYMETHACRYLATE MATRIX**

The authors have studied the interaction of palladium (II) with 1-(2-pyridylazo)-2-naphthol immobilized into polymethacrylate matrix. They have determined the optimal conditions of interaction of metal extracted from solution by matrix with the agent in solid phase and optical characteristics of the complex. The article demonstrates the possibility of solid phase-spectrophotometric determination of palladium (II). The detection level calculated by 3s-criterion amounts to 0,06 mg/l, the range of the determined concentrations is 0,1...1,0 mg/l at the volume of the analyzed solution 50 ml.

UDC 543.5/6

**Dychko K.A., Ryzhova G.L., Tyunina M.A.,  
Khasanov V.V., Daneker B.A.  
DEFINITION OF LIPIDS IN PELOIDS BY GAS  
CHROMATOGRAPHY-MASS SPECTROMETRY  
APPLYING WATER VIBROMAGNETIC EXTRACTION**

The authors have developed a new ecologically-safe method of water vibromagnetic extraction of hydrophobia and hydrophilous biologically active substances from peloids of various genesis (sapropel and sulphide-silt muds). They developed the techniques for determining polar and non-polar lipids saturated and unsaturated fatty acids, humic acids by the methods of gas chromatography-mass spectrometry, thinlayer chromatography, IR-spectrometry and gravimetric analysis. The article demonstrates the intensification of water vibromagnetic extraction.

UDC 678.724.23.66.095.262.002.51

**Skvortsevich E.M., Koval E.O., Mayer E.A.  
PROPERTIES OF HIGH VISCOSITY BRANDS  
OF POLYETHYLENE WITH LOW DENSITY OBTAINED  
BY «POLIMIR» TECHNIQUE**

The article introduces the results of works on increasing branded range of high pressure polyethylene at «Tomskneftekhim» improving the manufacturing procedure. The authors have compared the values of quality indices for high viscosity polyethylene brands with widely used foreign analogues.

UDC 678.743.2

**Trubchenko A.A., Koval E.O., Matsko M.A., Mayer E.A.  
INTERPRETATION OF MELTING ENDOTHERM  
POLYMODALITY FOR POLYPROPYLENE BRANDS**

The formation of hexagonal  $\beta$ -,  $\beta_2$ -phases and monocline  $\alpha$ -,  $\alpha_2$ -phase of polypropylene has been determined by the method of X-ray phase analysis when defining the temperatures of phase transitions of the second melting by the method of differential scanning calorimetry. It is proved that the presence of  $\beta$ -nucleating agent – calcium stearate initiating structural polymorphism in polymer is the main reason of melting endotherm polymodality.

UDC 678.743.2

**Ionov A.R., Dudchenko V.K., Trubchenko A.A.,  
Munteanu D., Novoshinsky I.I., Mayer E.A.  
INDUSTRIAL TESTS FOR A NEW MODIFICATION OF TI-MG  
CATALYST OF POLYPROPYLENE POLYMERIZATION**

The article considers the composition, properties and main areas of application of modern catalytic systems of the IV and V generations for industrial production of polymers based on propylene. Time dependence of reactor media exchange has been studied at «Tomskneftekhim» for continuous suspension process of polymer synthesis. The authors carried out the comparative experimental-industrial tests of LYNX catalyst modifications for further exchange of the applied brand. In comparable conditions the sets of base polymers were turned out; a complex of comparative investigations in molecular structure and customer quality indices were carried out for them. The authors stated the conclusion on possibility of the exchange of the applied Ti-Mg catalyst by a new modification meeting the requirements of REACH.

UDC 547.313:542.97

**Zilbershteyn T.M., Kardash V.A.,  
Suvorova V.V., Golovko A.K.  
SELECTION OF CONDITIONS FOR ETHYLENE TRIMERIZATION  
UNDER THE ACTION OF Cr-PYRROLE CATALYST**

The article considers the influence of temperature, catalyst concentration and other parameters on activity and selectivity of Cr-pyrrole catalyst in ethylene trimerization as well as on technical and economic parameters of a future process of obtaining hexene-1 by the given reaction. The authors have selected the preferable conditions for the process and proposed the method for removing catalyst residues from co-products of ethylene trimerization.

UDC 665.658.62

**Afanasyeva Yu.I., Krivtsova N.I., Ivanchina E.D.,  
Zanin I.K., Tataurschikov A.A.  
THE DEVELOPMENT OF KINETIC MODEL  
OF DIESEL FUEL HYDROREFINING**

Based on thermo-dynamic analysis of hydrogenation of sulfur-containing compounds occurring in diesel fuel the authors have estimated the probability of reaction and designed the formalized conversion diagram considering the conversion of all classes of sulfur-containing compounds. The kinetic model of diesel fuel hydrorefining was developed and checked for adequacy based on this diagram.

UDC 66.01

**Ivanchina E.D., Ivashkina E.N., Frantsina E.V., Romanovsky R.V., Dolganov I.M.**  
**MONITORING THE OPERATION OF DEVICES FOR PRODUCING LINEAR ALKYL BENZENES UNDER CONDITIONS OF OPTIMAL WATER CONSUMPTION IN DEHYDROGENATION REACTOR**

Using the developed kinetic model of the process the authors have carried out the monitoring of dehydrogenation device operation under conditions of constant and increasing water consumption. It is shown that the process at rising water consumption in the reactor allows increasing the duration of the device working cycle at average by 15 %.

UDC 66.011

**Ivanchina E.D., Chekantsev N.V., Chuzlov V.A., Smolyanova Yu.A.**  
**OPTIMIZATION OF HYDROCARBON MATERIAL COMPOSITION AT ISOMERIZATION OF PENTANE-HEXANE FRACTION USING COMPLEX MATHEMATICAL MODEL HYSYS – IZOMER**

The article introduces the method of material composition optimization of pentane-hexane fraction isomerization by regulating the operating parameters of the reactors and separation columns operation using the complex mathematical model HYSYS – IZOMER. The selection of optimal technological conditions of conjugated processes of hydrocarbon catalytic transformation and distillation allows decreasing the content of heptane hydrocarbons and so extending the life cycle of the catalyst SI-2 at the industrial plant L-35-11/300. This conclusion is proved by the results of modeling different operation modes of isomerization reactor and the column. The raw material composition optimization allows carrying out the process due to the decrease of  $C_{7+}$  content.

UDC 66.011

**Kirgina M.V., Korolenko M.V., Ivanchina E.D., Chekantsev N.V.**  
**OPTIMIZATION OF COMMERCIAL PATROL PRODUCTION PROCESS AT «GAZPROMNEFT-OMSK OIL REFINERY PLANT»**

The article introduces the possible variants of optimization of compounding process for high-octane petrol at the enterprise «Gazpromneft-Omsk oil refinery plant» using the computer modeling system «Compounding». The mathematical model for calculating the knock characteristics of petrol considering intermolecular interaction of the mixture components is in the base of optimization.

UDC 541.64:66.095.261.4

**Bondaletov V.G., Lyapkov A.A., Ionova E.I.**  
**SIMULATION OF FRACTION  $C_9$  OLYGOMERIZATION OF STRAIGHT-RUN PETROL PYROLYSIS**

The authors have carried out the simulation of oligomerization of the principle unsaturated components in fractions 130...200 °C of liquid pyrolysis products in straight-run petrol in toluene under the action of catalytic system  $TiCl_4: AlEt_2Cl$  by the results of the kinetic experiments. Considering the data of both material and thermal balance the experimental data were adequately described. The solution of the inverse kinetic problem allowed determining the missing parameters of the model and specifying the values of constants obtained experimentally from the data of the experiment.

UDC 541.64:66.095.261.4

**Bondaletov V.G., Lyapkov A.A.**  
**SIMULATION OF THE REACTOR SYSTEM FOR CARRYING OUT THE OLYGOMERIZATION OF FRACTION  $C_9$  OF PETROL PYROLYSIS**

The article considers the mathematical model of the reactor system for oligomerization of the main unsaturated components in frac-

tions 130...200 °C of liquid pyrolysis products in straight-run petrol in toluene under the action of catalytic system  $Al(C_2H_5)_2Cl:TiCl_4$ . It follows from comparison of isothermal and adiabatic reactors that maximal conversion degree is achieved more rapidly in adiabatic reactor at comparative parameters but the peak temperature in adiabatic reactor is in this case higher than 80 °C for all the examined diameters and consumptions of monomer mixtures. It is shown that at the same values of monomer consumption and the reactor length the highest conversion degree is achieved in apparatus with larger diameter.

UDC 54.03

**Surkov V.G., Golovko A.K., Mozhayskaya M.V.**  
**THE ACTION OF MECHANICAL EFFECT CONDITIONS ON THE CHANGE OF OIL PARAFFIN COMPOSITION**

The article introduces the results of investigation of mechanical effect conditions influence on conversion of high-molecular oil compounds. The increase of intensity and time of mechanical effect results in growth of solid paraffin content in oils. It is shown that mechanochemical treatment of high-paraffin oils at temperatures to 180 °C results in insignificant change in material composition, first of all in decrease of solid paraffin content.

UDC 547-3:552.578.3:66.084.2

**Savelyev V.V., Golovko A.K.**  
**MECHANODESTRUCTION OF ORGANIC SUBSTANCE OF OIL SHALE IN WATER AND ETHANOL MEDIA**

The article introduces the results of investigation of oil shale organic substance destruction by the example of Khuut-Bulag deposit, Mongolia, at their mechanical treatment in water and ethanol media. It is shown that at shale mechanical treatment in water and ethanol media the bitumoid yield increases from 8 to 33 wt. % in comparison with the original sample. Hydrogen is the main component of gaseous phase formed at shale mechanical treatment; hydrocarbon compounds (oils) are the main compounds of bitumoids. Hydrocarbons in bitumoids are represented mainly by n-alkanes with the number of hydrogen atoms  $C_{12}-C_{35}$ .

UDC 665.66:665.666.42

**Krivtsov E.B., Golovko A.K.**  
**KINETICS OF OXIDATION OF OIL DIESEL FRACTION SULFIDES WITH OZONE-OXYGEN MIXTURE**

The article introduces the results of oxidation desulfurization (the combination of oxidation with ozone-oxygen mixture with further adsorption refining) of straight-run diesel fraction with high initial content of sulfur. The article demonstrates the changes in group composition of saturated and aromatic hydrocarbons, sulfides of saturated and aromatic character at sample oxidation and further adsorption refining of the products obtained. The authors have determined the laws of changing the sulfide individual composition occurring at sample oxidation and further solvent refining of the products obtained.

UDC 665.61:553.985:547.91

**Vu Van Hai, Serebrennikova O.V.**  
**THE COMPOSITION OF SATURATED HYDROCARBONS OF BITUMENS IN NORTHERN KHAKASSIA**

The authors have studied the composition of alkanes, cyclohexanes, pregnanes, steranes, diasteranes, bi-, tri-, tetra- and pentacyclic terpanes of natural bitumens underlying in basalt strata in the north of Khakassia. It is shown that certain varieties of bitumens differ in composition and content of hydrocarbon structures. In hard bitumens the n-alkanes dominate or occur in approximate concentration with steranes and terpanes, in heavy bitumen the sterane and terpane structures are the main ones. The main features of the composition of saturated hydrocarbons in the bitumens examined are conditioned by different composition of the original organic substance, thermal action and biodegradation processes leveling it or determinative in the case of heavy bitumen.

UDC 665.61:553.985:547.91

**Serebrennikova O.V., Vu Van Hai, Akhmedova A.R.**  
**COMPOSITION OF AROMATIC HYDROCARBONS  
IN BITUMENS OF NORTHERN KHAKASSIA**

The authors have studied the composition of aromatic hydrocarbons of heavy and hard natural bitumens underlying in basalt strata in the north of Khakassia. Bi-, tri- and tetracyclic condensed aromatic structures are identified in all bitumens. In hard bitumens the pentacyclic, polyphenyls (up to five phenyl rings) and phenyl substituted naphthalenes, phenanthrenes and pyrenes are identified as well. Mono-arenes in hard bitumens are represented mainly by methyl-alkyl-benzenes in heavy bitumens they are represented by aryl-iso-prenoids. The processes of pyrolysis at contact with molten magma have influenced greatly the composition of aromatic hydrocarbons of hard bitumens. The specific conditions of accumulating the original organic substance has affected considerably on composition of aromatic hydrocarbons of heavy bitumens.

UDC 665.613

**Chuykina D.I., Serebrennikova O.V., Russkikh I.V.,  
Gulaya E.V., Stakhina L.D., Kadychagov P.B.**  
**THE INFLUENCE OF OIL-DISPLACING COMPOSITIONS  
ON HYDROCARBON DISTRIBUTION IN THE SYSTEM  
OIL – WATER PHASE IN LABORATORY TESTS**

The authors have studied the influence of surface-active substances of oil-displacing compositions on hydrocarbon composition and their distribution in heavy-paraffin crude oil and water phase as a result of thermostat control of the system oil – water (oil – composition) in laboratory tests modeling stratal. It is shown that the occurrence of composition in reaction mixture results in increase of relative content of alkanes C<sub>10</sub>–C<sub>15</sub> both in oil and in water phase.

UDC 542.343+547.27+547.21

**Aliev N.U., Sakhatova G.S.**  
**PARAFFIN-BASE OILS OF KENKIYAK  
AND KARAGANDA DEPOSITS AND INDIVIDUAL  
COMPOSITION OF THEIR GASOLINES**

The authors have studied the oils of Kenkiyak and Karaganda deposits (Kazakhstan) and analyzed the individual hydrocarbon compositions of their gasolines. Based on this analysis the gasolines of the given oils are recommended as raw materials for reforming.

UDC 542.343+547.27+547.21

**Aliev N.U., Sakhatova G.S.**  
**OXIDATION OF LIQUID PARAFFINS OBTAINED FROM OIL  
MIXTURE OF ZHETIBY AND UZEN DEPOSITS (KAZAKHSTAN)**

Optimal parameters of finished liquid paraffin oxidation to the hydroxyl acids extracted from oils of Uzen and Zhetiby deposits were determined by the method of factorial design of experiments.

UDC 547.37.632.954

**Aliev N.U., Allamberganova Z.B.**  
**SYNTHESIS OF PHENOXYACETIC ETHERS  
OF SOME ACETYLENIC AMINOALCOHOLS**

Based on acetylenic aminoalcohols and phenoxyacetic, mono- and dichlorophenoxyacetic acids the ester derivatives have been synthesized and their individuality and physicochemical characteristics have been determined using the elemental analysis, TLC, IR- and PMR-spectroscopy. The microbiological tests showed that chlorine-containing ester derivatives possess higher antimicrobial activity in comparison with the phenoxyacetic acid derivatives.

UDC 556.555:550.4

**Golushkova E.B., Sagachenko T.A.**  
**TRANSFORMATION OF LIPID NITROGEN BASES IN LAKE  
SEDIMENT UNDER CONDITIONS MODELING THE DIAGENESIS  
AND KATAGENESIS PROCESSES**

The article introduces the results of the laboratory tests on the action of all-round compression and thermolysis on modern lake sediment. The stages of sedimentation mass formation in conditions of later diagenesis and katagenesis is characterized by all-round compression and thermolysis. It is shown that oil nitrogen bases are not formed at the stage of later diagenesis. The composition of these compounds is formed at thermal transformation of organic substance of young sediments.

UDC 547.62

**Nguyen Hai Min, Portnaya V.V., Chaikovskiy V.K.,  
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**SYNTHESIS OF DERIVATIVES OF THE CONDENSED AROMATIC  
HYDROCARBONS USING MICROWAVE RADIATION**

The authors propose to use the microwave reactor for synthesizing iodine-, phenylethynil- and styryl derivatives of the condensed polycyclic hydrocarbons. It is shown that microwave radiation accelerates ten-fold the processes in comparison with the known techniques.