

# Summaries

UDC 544.723;661.183

**Khandorin G.P., Dubov G.I., Mazin V.I., Makotchenko V.G., Nazarov A.S., Fedorov V.E., Khasanov O.L., Ryazantseva N.V., Shteinle A.V., Steinle L.A., Chechina O.E., Ratkin A.V.**  
**SYNTHESIS AND APPLICATION OF NANO-STRUCTURED GRAPHITE**

The experimental-industrial technology of synthesizing nano-structured graphite by graphite fluorination by iodine heptafluoride and thermal decomposition of fluorinated graphite intercalated compounds has been developed. The experimental process installation was developed, the test batches of nano-structured graphite with high area of specific surface and adsorption capacity were produced; they were tested as a sorbing agent in bandaging medical materials.

UDC 541.1;541.182

**Tolbanova L.O., Ilyin A.P.**  
**WATER RESISTANCE OF NITRIDE CONTAINING CERAMIC MATERIALS SYNTHESIZED BY BURNING IN THE AIR**

Water action on intermediate combustion products in the air of aluminum nanopowder mixtures with catalytic admixtures of metals of the VI group of Periodic system was studied. It was ascertained that the studied samples are resistant to water action but at increase of pH the rate of interaction with water grows. Aluminum alpha-oxide and oxynitride are the most stable phases. The conclusion was drawn on possibility of aluminum nitride stabilization in the air due to aluminum oxynitride layer formed on the surface.

UDC 546.62:544.778.4:543.573:546.171.1

**Korshunov A.V.**  
**PRINCIPLES OF INTERACTION OF ALUMINUM POWDERS WITH NITROGEN**

The principles of interaction process of coarse-grained powders and explosive aluminum nanopowder with nitrogen at heating in conditions of linearly increasing temperature and in isothermal mode were studied. Process stages are determined, the dependence of reaction kinetic parameters and sample transformation degree at different stages on their dispersity and thermogravimetry conditions were shown. Sample chemical activity at heating in nitrogen and in air atmosphere are compared; the explanation of difference in these processes kinetic parameters accounting the influence of dimensional factor and state of oxide-hydroxide layer of powder particles on their reactivity, is proposed.

UDC 544.774.2

**Petrovskaya T.S., Kozik V.V., Borilo L.P.**  
**THIN FILM FORMATION IN SILICOPHOSPHATE SYSTEM**

Thin films in the system  $\text{SiO}_2\text{-P}_2\text{O}_5$  were synthesized by sol-gel method. Physicochemical processes in solutions as well as at film thermal treatment were studied. The conditions of obtaining films of different thickness were determined. The kinetic parameters were calculated and the comparative analysis of the processes of  $\text{SiO}_2$  synthesis in thin film and dispersed phase was carried out.

UDC 543.311;57.014

**Serikov L.V., Shiyun L.N., Tropina E.A., Khryapov P.A., Saveliev G.G., Metrevely G., Delay M.**  
**COLLOID-CHEMICAL PROPERTIES OF IRON COMPOUNDS IN NATURAL WATERS**

The results of experimental modeling the structure of colloid systems occurring in natural ground waters have been introduced. It was ascertained that iron hydroxide is the main component of natural colloid system. It was shown that silicon compounds and dissolved organ-

ic substances act as surface active substances and prevent sol coagulation. The results of electrolyte  $\text{CaCl}_2$  influence on coagulating stability of synthesized model colloid solutions were introduced.

UDC 546.23

**Kovaleva S.V., Aksinenko O.S.**  
**STANDARD POTENTIALS OF SYSTEMS CONTAINING MONO- AND POLYSELENIDE-IONS**

Literature data on standard potentials of generation of mono- and polyselenide-ions have been generalized. The equations expressing the dependence of standard potentials of the systems  $\text{Se}/\text{Se}_m^{2-}$  on the number of selenium atoms in anion chain were proposed. Standard potentials of the systems  $\text{Se}_m^{2-}/\text{Se}_m^{2-}$  were calculated.

UDC 542.9:546.791(21)

**Sofronov V.L., Buynovskiy A.S., Sidorov E.V., Matveev A.A., Rudnikov A.I., Rusakov I.Yu., Knyazev A.S., Novikov D.V.**  
**STUDYING THE KINETICS OF  $\text{U}_3\text{O}_8$  REDUCTION BY HYDROGEN IN NON-ISOTHERMAL CONDITIONS**

The ability of preliminary reduction of  $\text{U}_3\text{O}_8$  by hydrogen before its fluorination has been considered. The kinetics of reduction process in non-isothermal conditions was studied and kinetic parameters of hydrogen interaction with  $\text{U}_3\text{O}_8$  were calculated.

UDC 546.791

**Terovskiy V.S., Balakhonov V.G., Burov Yu.V., Matyukha V.A.**  
**INFLUENCE OF THE METHOD OF PREPARING PLATINUM CATALYSTS AT ION CARRIERS ON THE EFFICIENCY OF URANIUM (VI) REDUCTION BY HYDRAZINE IN NITRATE SOLUTIONS**

The technology of preparing platinum catalysts on the basis of ionites VP-Iap and A-100 for uranium (VI) reduction to uranium (IV) by hydrazine in nitrate solutions has been developed. Kinetic equations for describing uranium (IV) yield at variation of initial reagent concentration were proposed.

UDC 621.039.7

**Ryabov A.S., Terentiev S.G., Sedelnikov V.P., Krivopustov S.I., Savushkina M.K., Kosareva I.M.**  
**SUBSTANTIATION OF THE ABILITY OF UNDERGROUND DISPOSAL OF NITRATE FLUORIDE-CONTAINING WASTES**

The investigations on determining permissible concentrations of fluoride-ions in composition of nitrate liquid radioactive wastes for their underground disposal into Layer-collector bypassing open surface storage have been carried out using real samples of deep storage rock. The permissible concentrations of fluoride-ions for these wastes with optimal molar ratio  $[\text{Fe}^{3+}]:[\text{F}^-]$  as applied to the new operating wells were determined. Maximum permissible fluoride concentrations at which their negative action on materials of deep storage may be neglected were determined.

UDC 550.4:552.57:662.73

**Maslov S.G., Trofimov A.B., Arbuzov S.I.**  
**THE RESEARCH OF MINERAL IMPURITY DISTRIBUTION IN OXIDIZED BROWN COALS OF ITATSKOE DEPOSIT**

Composite stratified samples of oxidized coal of Itatskoe deposit located in north-east of Kemerovo region have been studied by the methods of technical, group and neutron-activation analysis. High content of element-impurities in oxidation zone of coal bed is shown. Their high concentration in bitumens and fulvic acids is mentioned. The layer-by-layer development of a deposit is recommended to be carried out.

UDC 669.181.42

**Arkhipov V.S., Korsun V.R.  
REDUCTION OF PEAT MINE MATERIALS  
FROM RICH BAKCHAR ORE**

Iron ore concentrate of Bakchar deposit of Tomsk region with the content of total iron 52 % has been obtained at magnetic roller separator. Peat ore materials with peat content 33...36 % are made of base ore and concentrate. The dynamics of peat ore material reduction at linear heating at rate of 5 °C/min to the temperatures 500...1100 °C are studied. It is ascertained that at temperatures to 700 °C vapor gases of peat decomposition are the reducing agents. Metallization stage occurs at temperature 800...1100 °C.

UDC 661.715.001.5

**Fan Fu, Chekantsev N.V., Ivanchina E.D., Kravtsov A.V.  
SIMULATION AND DESIGN TECHNIQUES OF PHYSICAL  
AND CHEMICAL PROPERTIES OF HYDROCARBON SYSTEM**

The simulation system of oil physical and chemical properties has been developed on the basis of the analysis of various design techniques of physical and chemical properties of oil fraction hydrocarbons. Mathematical models involved into simulation system describe sufficiently functional dependences of boiling temperature, density and molar weight of fraction on operating conditions.

UDC 66.011

**Litvak E.I., Kravtsov A.V., Ivanchina E.D., Chekantsev N.V.  
STUDYING THE INFLUENCE OF CHEMICAL-ENGINEERING  
SYSTEM STRUCTURE ON THE EFFICIENCY  
OF PENTANE-HEXANE FRACTION ISOMERIZATION USING  
THE PROCESS MATHEMATICAL MODEL**

The influence of chemical-engineering system structure on the efficiency of the process of pentane-hexane fraction isomerization has been studied using the computer modeling system «Izomer». It is shown that the use of recirculation of normal and slightly-branched paraffins as well as iso-pentane extraction off raw materials result in considerable increase of product octane number. Comparing different charts of isomerization process it was stated that the chart with raw material de-iso-pentanisation and recirculation of H-C<sub>5</sub> and H-C<sub>6</sub> is optimal by the accepted criterion.

UDC 66.084:547.912

**Saveliev V.V., Golovko A.K.  
ASPHALTENE MECHANODESTRUCTION IN THE MEDIUM  
OF VARIOUS GASES AND WITH SOLID ADDITIONS**

The experiments on mechanodestruction of asphaltene released from asphaltites in the medium of air, argon and butane-propane gas as well as with solid additions – polycrystalline quartz and hematite, have been carried out. The degree of asphaltene mechanodestruction, material and group compositions of the formed products at mechanical processing were determined. It was shown that the highest degree of asphaltene mechanodestruction more than 90 wt. % is observed in argon medium with polycrystalline quartz. More resins are formed with quartz and more asphaltene substances are formed with hematite. The oil portion obtained at asphaltene mechanical processing consists mainly of saturated and poly-aromatic hydrocarbons.

UDC 543.422.3

**Sukhanov A.V., Gavrilenko N.A.  
SOLID-PHASE SPECTROPHOTOMETRIC DETERMINATION  
OF ASCORBIC ACID USING 2,6-DICHLOROINDOPHENOL  
IMMOBILIZED INTO POLY- METHACRYLATE MATRIX**

Ascorbic acid interaction with 2,6-dichloroindopheno immobilized into poly-methacrylate matrix has been studied. A simple technique of ascorbic acid solid-phase spectrophotometric determination was developed. The technique was applied for analyzing plant raw material extracts.

UDC 541.64

**Bondaletov O.V., Bondaletova L.I., Ogorodnikov V.D.,  
Bondaletov V.G., Sutyagin V.M., Grichnevskaya L.A.  
USE OF CYCLOPENTADIENE OF LIQUID PYROLYSIS  
PRODUCTS IN SYNTHESIS OF MODIFIED PETROLEUM RESINS**

The possibility of synthesizing the modified petroleum resins with the advanced elasticity, adhesion and strength by copolymerization of just-distilled dicyclopentadiene of liquid pyrolysis products of hydrocarbon raw materials and acryl monomers under the action of titanium tetrachloride and catalyst system of titanium tetrachloride – diethylaluminum chloride has been shown. It was stated that copolymerization results in obtaining 27...53 % of resins during 20...30 min. the property package of synthesized resins allows using them in coating industry.

UDC 541.64:678.761.002.2

**Vasilieva E.V., Gaidukova O.S., Ionova E.I.,  
Lyapkov A.A., Bondaletov V.G.  
OLIGOMERIZATION OF FRACTION C<sub>9</sub> UNDER THE ACTION  
OF CATALYTIC COMPLEX TiCl<sub>4</sub>:Al(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>Cl**

The kinetics of oligomerization process of fraction C<sub>9</sub> under the action of catalytic system TiCl<sub>4</sub>:Al(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>Cl with different molar ratio of the components has been studied by the adiabatic temperature survey. The values of the observable constants of fraction C<sub>9</sub> oligomerization and heat release in the system at optimal relationship of catalytic system components were determined.

UDC 665.7.038

**Troyan A.A., Bondaletov V.G., Dmitrieva Z.T.  
MODIFIED POLYMERIC PETROLEUM RESINS IN FORMATION  
AND STABILIZATION OF WATER-IN-OIL EMULSIONS**

The dynamic viscosity, structural-mechanical properties and viscos-flow stability of water-in-oil emulsions on the basis of waste motor oils at slight additions of modified polymeric petroleum resins have been studied. Ozonized and maleinized aromatic and cycloaliphatic polymeric petroleum resins affect the emulsion interphase structure as buffers.

UDC 541.64:66.095.261.4

**Ionova E.I., Lyapkov A.A., Bondaletov V.G., Vasilieva E.V.,  
Gaidukova O.S., Izvekova N.V., Zaitseva A.P., Shipilova N.S.  
MODELING THE PROCESS OF OLYGOMERIZATION  
OF FRACTION C<sub>9</sub> OF PETROLEUM PYROLYSIS**

The processes of co- and terpolymerization of the main unsaturated components of fraction 130...200 °C of liquid pyrolysis products of straight-run gasoline in toluene have been considered as the models of oligomerization of fraction C<sub>9</sub> under the action of catalytic system TiCl<sub>4</sub> – Al(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>Cl. Relative reactivities of styrene, α-methyl styrene, indene, vinyl toluenes and bicyclopentadiene amounting to 80...85 % of total amount of polymers, were determined. The opportunity of obtaining poly(oligo)mere products corresponding mainly to industrial polymeric petroleum resins obtained from fraction C<sub>9</sub> was ascertained on the basis of the data of adiabatic temperature survey as well as IR- and <sup>1</sup>H NMR spectroscopy.

UDC 547.551+547.546

**Bochkarev V.V., Soroka L.S.  
CATALYSIS OF ANILINE CONDENSATION REACTION  
WITH NITROBENZENE BY HIGH-BASIC ANION RESINS**

It was ascertained that high-basic anion resins containing quaternary ammonium group –N(CH<sub>3</sub>)<sub>3</sub><sup>+</sup>, may serve as selective catalysts of nitrobenzene condensation process with aniline in alkaline medium forming 4-nitrozo- and 4- nitrodiphenylamine. Use of polymeric catalyst excludes the stage of its separation from the reaction mass, lifts strict temperature and concentration limitations at the next stages of the process of obtaining 4-aminodiphenylamine.

UDC 543.544.32

**Lebedeva M.A., Kolesnik V.D., Mashukov V.I., Egorov A.V.  
CHROMATOGRAPHIC INVESTIGATION  
OF HEAVY PYROLYSIS TARS CHEMICAL COMPOSITION**

The determination method of chemical composition of heavy pyrolysis tars has been introduced. Substances were identified chromatography-mass spectrometry and  $^{13}\text{C}$  NMR spectroscopy methods. Quantitative content of the mixture 13 components was identified chromatographically using direct sample injection. This direct analysis method allows monitoring plant waste composition.

The chromatographic analysis of heavy pyrolysis tars fractions allows determining more than 30 tar components including those with concentration less than 1 wt. %.

UDC 543.42

**Mashukov V.I., Mastushkina I.V., Maksimov D.A.,  
Kazakov Yu.M., Egorov A.V.  
ANALYZING THE MICROSTRUCTURE  
OF BUTADIENE-NITRILE RUBBERS BY THE METHODS  
OF  $^1\text{H}$  AND  $^{13}\text{C}$  NMR-SPECTROSCOPY**

The microstructure of butadiene-nitrile rubbers with different content of acrylonitrile monomer 20...50 % has been analyzed in details by the method of NMR-spectroscopy. The content of [1,2]-, [1,4]-butadiene (B) and acrylonitrile links in polymer chain was determined by the  $^1\text{H}$  NMR-spectroscopy. The content of cis-[1.4]-B links in rubber was estimated by the  $^{13}\text{C}$  NMR-spectroscopy. The content of acrylonitrile was additionally confirmed by the elemental (C,H,N,S) analysis.