

CONTENTS

CHEMISTRY

(inorganic, organic, analytical, physical, colloid
and high-molecular compounds)

Novikova N.S., Kilimenchik E.D., Kondratyeva R.V., Meshkova S.B., Topilova Z.M., Yarkova M.Yu. New liquid-crystal compounds – esters of 2 - metoxybenzoic acid	3
Ledenkov S.F. Thermochemical study of solvation of D,L-epinephrine in aqueous-ethanol solvents	7
Gridchin S.N., Nikolskiy V.M., Tolkacheva L.N. Thermodynamic parameters for protolytic equilibria of ethylenediamine-N,N'-diglutamic acid.....	11
Gruzdev M.S., Manin N.G., Frolova T.V., Chervonova U.V. Synthesis and thermal behavior of bromide salts of 1,3-dialkylbenzimidazole derivatives.....	13
Novikov G.K., Smirnov A.I., Fedchishin V.V. Recombination and mobility of charge in polymers and mica electrets.....	18
Yakovleva A.A., Chyong S.N., Le M.L. Influence of temperature on sodium oleate adsorption onto talc of Onotsk deposit	22

CHEMICAL TECHNOLOGY

(inorganic and organic substances.
Theoretical fundamentals)

Grinevich A.V., Petropavlovskiy I.A., Kiselev A.A., Kuznetsov E.M., Ryashko A.I. Research of recrystallization process of calcium sulphate dihydrate into hemihydrate under conditions of receiving extraction phosphoric acid from Koks'u's phosphorite.....	27
Gorbovskiy K.G., Kolpakov V.M., Norov A.M., Malyavin A.S., Pagareshkin D.A., Mikhaylichenko A.I. Study of properties and phase composition of nitrate-containing fertilizers obtained with different degree of ammoniation of phosphoric acid	31
Kirovskaya I.A., Mironova E.V. Neutralization of nitrogen (IV) and carbon (II) oxides on system of InSb – CdTe catalysts	35
Golota A.F., Seleznev S.A. Effects of liquids on crystal surface of phosphors based on sulfides of strontium and calcium	38
Shekhanov R.F. Influence of ammonium oxalate on electrodeposition of nickel-iron alloys	42
Lotov V.A., Khabibulin Sh.A. Mechanism of solidification of modified liquid glass binder and composite materials on its basis	46
Solopchenko A.V., Babkin A.V., Kepman A.V., Serdan A.A. Influence of spray adhesives on mechanical strength of infused carbon fiber reinforced plastics.....	51
Begieva M.B., Ligidov M.Kh., Pakhomov S.I. Influence of Na ⁺ montmorillonite modified by N,N-diallylaminoisogexane acid on structure and pro- perties of polypropylene	55
Vorotyntsev V.M., Malyshev V.M., Vorotyntsev I.V., Battalov S.V., Shablykin D.N. Separation and high purification of gases by hybrid membrane - gas hydrate method.....	59
Petrova N.P., Abrukov V.S., Tarasov N.A., Koltsov N.I. Investigation of regularities of combustion rubber process on basis of butadiene-nitrile rubber using artificial neuronal networks	64
Natareev O.S., Kokina N.R., Natareev S.V. Heat transfer in convective drying of wet material	67

ECOLOGICAL PROBLEMS
OF CHEMISTRY AND CHEMICAL TECHNOLOGY

Shutov D.A., Bogdanov P.V., Ivanov A.N.

Novel technique of organic pollutants destruction in water solutions under low-temperature plasma jet treatment73

Dunaev A.M., Rumyantsev I.V., Grinevich V.I.

Heavy metals as a risk factor for urban systems: application to Ivanovo city.....77

SHORT COMMUNICATIONS

Osadchaya T.Yu., Ilyin A.A., Afineevskiy A.V., Prozorov D.A., Rumyantsev R.N., Lukin M.V.

On possibility of using X-ray diffraction analysis for study of pyrophoric systems using skeletal nickel as example82

Prozorov D.A., Smirnov N.N., Afineevskiy A.V.

Values of hydrogen sorption by skeletal nickel catalyst in water.....83

A B S T R A C T S

*N.S. NOVIKOVA, E.D. KILIMENCHYK, R.V. KONDRATYEVA, S.B. MESHKOVA,
Z.M. TOPILOVA, M.Yu. YARKOVA*

NEW LIQUID-CRYSTAL COMPOUNDS – ESTERS OF 2 - МЕТОXYBENZOIC ACID

New liquid-crystal compounds - 4-(4-alkoxybenzoyloxy)phenyl esters of 2- methoxybenzoic acids forming a nematic phase and forming in a solution with Tb (III) ions luminescing complexes were synthesized.

Key words: synthesis, 2[4-(4-alkoxybenzoyloxy)phenoxy]metoxybenzenes, mesomorphism, terbium complexes, luminescence

S.F. LEDENKOV

**THERMOCHEMICAL STUDY OF SOLVATION OF D,L-EPINEPHRINE
IN AQUEOUS-ETHANOL SOLVENTS**

The enthalpies of dissolution of epinephrine (Adr) in water and water-ethanol solvents at pH<4 and temperature of 298.15K were measured by means of a calorimetric method. The process of dissolution is exothermic in all binary solvents. Standard enthalpies of transfer of a stoichiometric mixture of ions ($\text{AdrH}^+ + \text{ClO}_4^-$) for aqueous-ethanol solvents with the content of alcohol up to 72.5 mol.% were calculated. Values of these quantities were also estimated for individual ions by use of extrathermodynamic assumptions. The solvation of cation AdrH^+ was found to increase in a content of ethanol in the beginning strengthen, and then is apparently weakens. The comparison of enthalpy parameters of cations solvation of epinephrine and dopamine in binary solvents was carried out.

Key words: epinephrine, adrenaline, dopamine, dissolution, solvation, enthalpy, solvents, aqueous ethanol

S.N. GRIDCHIN, V.M. NIKOLSKIY, L.N. TOLKACHEVA

**THERMODYNAMIC PARAMETERS FOR PROTOLYTIC EQUILIBRIA
OF ETHYLENEDIAMINE-N,N'-DIGLUTARIC ACID**

The stepwise dissociation constants of ethylenediamine-N,N'-diglutamic acid (H_4L) were determined potentiometrically at 298.15K and at an ionic strength of 0.1 (KNO_3). The heat effects for neutralization of the "betaine" groups of this complexone were measured calorimetrically under the same experimental conditions. The thermodynamic parameters of protolytic equilibria of H_4L were calculated via combined use of the results obtained from the thermochemical and potentiometric procedures.

Key words: complexones, aminopolycarbonic acids, thermodynamics, potentiometry, calorimetry

M.S. GRUZDEV, N.G. MANIN, T.V. FROLOVA, U.V. CHERVONOVA

**SYNTHESIS AND THERMAL BEHAVIOR OF BROMIDE SALTS OF 1,3-DIALKYL-
BENZIMIDAZOLE DERIVATIVES**

Bromide salts of symmetric 1,3-dialkylbenzimidazole derivatives (1,3-diethylbenzimidazolium bromide, 1,3-dipropylbenzimidazolium bromide, and 1,3-dibutylbenzimidazolium bromide) were obtained. The products were characterized by their melting temperature, the elemental analysis data, chromatography-mass spectrometry, ^1H , ^{13}C NMR and FT-IR spectroscopy. The substances were found to be hydrophobic ionic liquids. The main temperature characteristics were established which allow to take into account phase behavior of the substances obtained under their applications.

Key words: ionic liquids, benzimidazole, bromide salts, phase transitions, thermal stability

G.K. NOVIKOV, A.I. SMIRNOV, V.V. FEDCHISHIN

RECOMBINATION AND MOBILITY OF CHARGE IN POLYMERS AND MICA ELECTRETS

Ionizing radiation of electric gas corona (EGKD) and electric gas barrier discharges (EGBD) creates in a polymer and mica electrets on their depth the radiation gradient of concentration of recombination centers. Experimental measurements of the stability of electrets potential difference $U_0 = f(t)$, the TSD current spectra

and X-ray half-value depth $\delta_{1/2EGKG, EGBD}$ were used to determine the mobility of charge carriers in polymers and mica electrets.

Key words: mobility, recombination centers, traps, gas discharge X-ray, radiation, polymers, micas, thermally stimulated currents, electrets, radiation thickness gradient of concentration of recombination centers

A.A. YAKOVLEVA., S.N. CHYONG, M.L. LE

INFLUENCE OF TEMPERATURE ON SODIUM OLEATE ADSORPTION ONTO TALC OF ONOTSK DEPOSIT

It was showed that the temperature increase results in a growth of maximum adsorption of sodium oleate onto talc MM-20 of Onotsk deposit (Irkutsk region). The experimental data were confirmed by the analysis of changes in a process mechanism.

Key words: absorption, absorbing capacity, talc, surfactant, sodium oleate, micelle formation

A.V. GRINEVICH, I.A. PETROPAVLOVSKIY, A.A. KISELEV, E.M. KUZNETSOV, A.I. RYASHKO
RESEARCH OF RECRYSTALLIZATION PROCESS OF CALCIUM SULPHATE DIHYDRATE INTO HEMIHYDRATE UNDER CONDITIONS OF RECEIVING EXTRACTION PHOSPHORIC ACID FROM KOKSU'S PHOSPHORITE

Phase transition kinetic of calcium sulphate dihydrate into hemihydrate was investigated at temperatures of 86-94°C and concentrations of P₂O₅ 24-31% and SO₃ 7-9% as applied to conditions of extraction phosphoric acid production by dehydrate-hemihydrate method from phosphorite of Koksus. Calcium sulphate hemihydrate crystal habit and impurity composition were determined.

Key words: extraction phosphoric acid, phosphorite of Koksus, calcium sulphate dihydrate, calcium sulphate hemihydrate, recrystallization

K.G. GORBOVSKIY, V.M. KOLPAKOV, A.M. NOROV, A.S. MALYAVIN, D.A. PAGALESKIN, A.I. MIKHAIYLICHENKO

STUDY OF PROPERTIES AND PHASE COMPOSITION OF NITRATE-CONTAINING FERTILIZERS OBTAINED WITH DIFFERENT DEGREE OF AMMONIATION OF PHOSPHORIC ACID

The paper presents results of the study of properties of complex nitrate-containing fertilizers obtained with different degree of ammoniation of phosphoric acid. The phase composition of fertilizers was studied by X-ray and thermal analysis.

Key words: complex fertilizers, ammonium nitrate, hygroscopicity, blocking property, static strength

I.A. KIROVSKAYA, E.V. MIRONOVA

NEUTRALIZATION OF NITROGEN (IV) AND CARBON (II) OXIDES ON SYSTEM OF InSb – CdTe CATALYSTS

In the temperature range of 290-473K the catalytic properties of binary semiconductors and solid solutions of InSb – CdTe system were studied in relation to reaction of reduction of oxide of nitrogen (IV) by oxide carbon (II). At a preliminary estimate of conditions of more noticeable course of reaction and further clarification of its mechanism results of earlier executed researches of individual and collateral adsorption of participants of reaction were used. The high extent of catalytic transformation of NO₂ (especially on CdTe) is noted at ambient temperature. The mechanism of catalytic transformation is offered. The carried-out parallel analysis of results of direct catalytic and IR-spectroscopic researches indicated the expediency of use of the IR-method for an operational assessment of the relative activity of catalysts and possibility of ecological protection. The studied catalysts were recommended as the low-temperature, rather inexpensive catalysts of neutralization NO₂ and CO (carbon monoxide).

Key words: diamond-like semiconductors, solid solutions, catalysts, transformation degree, IR-spectroscopic researches, reaction mechanism

A.F. GOLOTA, S.A. SELEZNEV

EFFECTS OF LIQUIDS ON CRYSTAL SURFACE OF PHOSPHORS BASED ON SULFIDES OF STRONTIUM AND CALCIUM

The hydrolytic stability of phosphors with a matrix based on sulfides of calcium and strontium activated with europium and samarium was studied. Spectra of diffusion reflection of initial and hydrolyzed sam-

ples of Sr(Ca)S:Eu, Sm were considered. The degree of action of water medium and organic solvents on the lighting characteristics of structures under study was established.

Key words: alkaline earth sulfides, hydrolysis, diffuse reflectance spectrum, the flash of photostimulated luminescence (PSL)

R.F. SHEKHANOV

INFLUENCE OF AMMONIUM OXALATE ON ELECTRODEPOSITION OF NICKEL-IRON ALLOYS

The processes of electrolytic deposition of alloys of nickel and iron from sulphate and oxalate electrolytes were studied. The influence of current density and temperature of electrolytes on the composition of deposited alloys was analyzed. The internal stresses of precipitations obtained from oxalate comprehensive electrolyte were shown to be approximately two times less than at electrodeposition from sulfate solutions.

Key words: alloys electrodeposition, complexation, soft magnetic coatings

V.A. LOTOV, Sh.A. KHABIBULIN

MECHANISM OF SOLIDIFICATION OF MODIFIED LIQUID GLASS BINDER AND COMPOSITE MATERIALS ON ITS BASIS

A binder on the basis of the liquid glass possessing the high water resistance, good adhesion in relation to various surfaces, and also ability to volume curing was proposed. The system "portlandcement-ethylsilicate-liquid glass" was studied by physical and chemical methods of the analysis. The scheme describing the mechanism of curing and strength acquisition in this system was offered. On the basis of proposed modified liquid-glass binding the set of composite materials was obtained.,

Key words: liquid glass, portland-cement, ethylsilicate

A.V. SOLOPCHENKO, A.V. BABKIN, A.V. KEPMAN, A.A. SERDAN

INFLUENCE OF SPRAY ADHESIVES ON MECHANICAL STRENGTH OF INFUSED CARBON FIBER REINFORCED PLASTICS

The influence of spray adhesives used in carbon fiber reinforced composite lay up process on mechanical properties and microstructure of hardened composite were investigated. It was established that residual glue in a volume of composite material results in the increase in a strength parameters at the bend of short beam from 20% and up to 10% at compression.

Key words: polymeric composite material, air-zol glues, micro structure, compressive strength, inter layer shear

M.B. BEGIEVA, M.Kh. LIGIDOV, S.I. PAKHOMOV

INFLUENCE OF Na⁺ MONTMORILLONITE MODIFIED BY N, N-DIALLYLAMINOISOGEXANE ACID ON STRUCTURE AND PROPERTIES OF POLYPROPYLENE

Composites based on polypropylene modified montmorillonite were prepared by mixing in a twin screw melt extruder of the company "JiangsuXindaScience & Technology". The structure of the composites was investigated using X-ray diffraction and scanning electron microscopy. It was shown that against the unfilled polypropylene, modulus, toughness, melt flow index of composites is increased, and the time of combustion and the flame propagation velocity is decreased.

Key words: N,N- diallylaminoisohexane acid, composite, polypropylene, modified Na⁺ - montmorillonite

V.M. VOROTYNTSEV, V.M. MALYSHEV, I.V. VOROTYNTSEV, S.V. BATTALOV, D.N. SHABLYKIN

SEPARATION AND HIGH PURIFICATION OF GASES BY HYBRID MEMBRANE - GAS HYDRATE METHOD

The new hybrid method for separation and high purification of gases was proposed. This method combines membrane gas separation and gas-hydrate crystallization. The mathematic modeling the separation and high purification process was carried out. It was found that separation factor of hybrid method depends on the method of sampling through the membrane and on sampling by gas hydrate.

Key words: membrane, gaseous hydrate, separation, hybrid method, mathematical modeling

N.P. PETROVA, V.S. ABRUKOV, N.A. TARASOV, N.I. KOLTSOV
**INVESTIGATION OF REGULARITIES OF COMBUSTION RUBBER PROCESS ON BASIS
OF BUTADIENE-NITRILE RUBBER USING ARTIFICIAL NEURONAL NETWORKS**

The influence of temperature and combinations of flame retardants on the process of burning rubber on the basis of BNKS-40AMN rubber using the artificial neural networks was investigated.

Key words: rubber, butadiene-nitrile rubber, burning, combinations of fire retardants, artificial neuronal networks

O.S. NATAREEV, N.R. KOKINA, S.V. NATAREEV
HEAT TRANSFER IN CONVECTIVE DRYING OF WET MATERIAL

Mathematical model of heat transfer in convective drying of wet material is given. The model was verified using clay drying as example.

Key words: drying, chamber dryer, mathematic model

D.A. SHUTOV, P.V. BOGDANOV, A.N. IVANOV
**NOVEL TECHNIQUE OF ORGANIC POLLUTANTS DESTRUCTION IN WATER SOLUTIONS
UNDER LOW-TEMPERATURE PLASMA JET TREATMENT**

The novel process of the destruction of the organic pollutants (by the example of phenol red) in water solutions under the action of low-temperature plasma jet was proposed. The plasma jet was formed using the new type plasmatron constructed by authors.

Key words: plasma generator, plasma jet, plasma chemical destruction, plasma-solution processes

A.M. DUNAEV, I.V. RUMYANTSEV, V.I. GRINEVICH
HEAVY METALS AS A RISK FACTOR FOR URBAN SYSTEMS: APPLICATION TO IVANOVO CITY

In given study the aspects of environment pollution with the heavy metals on urbanized territory were considered. Calculations and analysis of basic parameters of risk level for a population health and environment of Ivanovo city territory were carried out. Calculated values give evidence on essential level of risk of development of general toxical unfavourable effects and essential economic demand. The tendency to worsening of ecological situation on the Ivanovo city territory is pointed out.

Key words: ecological monitoring, heavy metals, risk level, life expectancy, economic loss

*T.Yu. OSADCHAYA, A.A. ILYIN, A.V. AFINEEVSKIY, D.A. PROZOROV,
R.N. RUMYANTSEV, M.V. LUKIN*
**ON POSSIBILITY OF USING X-RAY DIFFRACTION ANALYSIS FOR STUDY OF PYROPHORIC
SYSTEMS USING SKELETAL NICKEL AS EXAMPLE**

The applicability of the tableting method for getting X-ray diffraction patterns of pyrophoric nickel catalyst in water was considered. X-ray diffraction patterns of samples of skeletal nickel catalyst were obtained and the activities of these samples were measured. The effect of oxidation on the catalyst samples prepared for getting X-ray diffraction patterns was evaluated.

Key words: skeletal nickel, x-ray analysis, pyrophoric properties

D.A. PROZOROV, N.N. SMIRNOV, A.V. AFINEEVSKIY
VALUES OF HYDROGEN SORPTION BY SKELETAL NICKEL CATALYST IN WATER

The total quantity of sorbed hydrogen on skeletal nickel in water was obtained by simultaneous thermal analysis and mass spectrometry. The direct experimental method was shown the presence of at least three types of surface complexes of "metal-hydrogen" with different energies on skeletal nickel.

Key words: skeletal nickel, mass spectrometry, hydrogen adsorption