

CONTENTS

REVIEWS

Kholodkova N.V., Kholodkov I.V.
Heterogeneous recombination of atoms on solid surface.....3

CHEMISTRY

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

Konnik O.V., Bekirova Z.Z., Shul'gin V.F., Minin V.V., Alexandrov G.G., Eremenko I.L.
Gadolinium complexes with bisacylbishydrozones of 3-methyl-1-phenyl-4-formylpyrazole-5-one 10

Kiselev A.E., Kudin L.S., Ilyin A.P.
High temperature processes in mechano-activated system of $K_2O \cdot nFe_2O_3$ oxides 15

Kyarov A.A., Khochuev I.I., El'mesova R.M., Mirzoev R.S., Ligidov M.Kh.
Solubility and properties of saturated solutions in $C_8H_8MoO_4 - C_2H_5OH - H_2O$ system at 25°C.....20

Lazov M.A., Alov N.V., Ischenko A.A.
Determination of stoichiometry and thickness of ion-synthesized tungsten oxide nanostructures with XPS.....25

Vorokhobin I.S., Vyaznova I.A., Taranushich V.A.
Interaction of ammonium nitrate with potassium chloride in water-ethanol medium 30

Mirasov V.Sh., Zherebtsov D.A., Kleschyov D.G., Mikhaylov G.G.
Hydrothermal method of synthesis of nano disperse "iron mica" 33

Khelevina O.G., Malyasova A.S., Ishutkina M.V.
Structuring of liquid polymethylsiloxanediols with esters of *ortho*- titanium and *ortho*- silicic acids..... 38

Kuznetsov V.A., Kodess M.I., Pestov A.V.
Polymerization of lactide in presence of tin (II) chloride complexes 44

Ibrayeva S.S., Praliev K.D., Iskakova T.K., Seiykhanov T.M.
Synthesis of 1-(3-ethoxypropyl)-4-hexyl-4-hydroxypiperidine 48

Velichko E.V., Golishenko A.A., Shtemenko A.V.
Interaction of *trans*-tetrachloro-di- μ -carboxylate of dirhenium (III) and 3-derivatives of 1-adamantane
carboxylic acid 51

Nguyen Thi Thu Ha, Merkin A.A., Latypova A.R., Lefedova O.V.
Influence of skeletal nickel catalyst amount on hydrogenation rates of intermediate products
of nitrobenzene reduction..... 55

Fedorova A.A., Sharonov N.Yu., Ulitin M.V.
Peculiarities of adsorbed layers formation on solid and liquid surfaces in electrolyte solutions 58

Fedotov V.Kh., Koltsov N.I.
Evaluation of nonlinear times of relaxation of catalytic reactions 63

Makhmudov F.T.
Sorption dynamics of phenol and sulfonol on solid sorbents..... 67

Bobkova E.S., Sungurova A.V., Shishkina A.I., Rybkin V.V.
Degradation kinetics of phenol and formation of products of its destruction in solution under action
of DC discharge..... 70

CHEMICAL TECHNOLOGY

(inorganic and organic substances.
Theoretical fundamentals)

Panteleeva V.V., Shein A.B.
Anodic behaviour of FeSi -electrode in alkaline solution..... 75

Smirnova D.N., Ilyin A.P., Smirnov N.N.
Mechanochemical synthesis of silicon oxycarbon adsorbents for purification of extraction phosphoric acid 81

Chulovskaya S.A., Vavilova S.Yu., Garas'ko E.V., Parfenyuk V.I. Polypropylene thermo- fasten linen with fungicidal properties	87
Shurdumov G.K. Synthesis of molybdates and tungstates of lead in melts of $[KNO_3-NaNO_3-Pb(NO_3)_2]_{\text{ext.}}$ - $Na_2Mo(W)O_4$ (K,Na,Pb// NO_3 , $Mo(W)O_4$) systems	91
Jailoev J.Kh., Ganiev I.N., Amonov I.T., Azimov Kh.Kh. Potentiodynamic studies of Al +2.18% Fe alloy doped with barium	97
Kolesnikov A.A., Mesnik M.O. Calculation of performance of technological equipment for manufacturing elastic leathers using electron accelerators.....	99
Natareev S.V., Dubkova E.A., Nikiforova T.E., Kharchenko I.S. Ion-exchange extraction of copper from solutions in device with sectionalized fluid-bed.....	101
Kostarev V.V., Mizonov V.E., Zaitsev V.A., Leznova N.R. Mathematical model of moisture distribution in roll under fabric winding	105
Volynsky V.Yu., Storozhenko Ya.S. Mathematical modeling of process of thermal treatment sheet materials in tenter drier	108

SHORT COMMUNICATIONS

Allambergenova Z.B., Aliev N.U., Ermaganbetov M.E. Synthesis and post growth-regulating properties of N- phenylthiocarbamate of 3 - (3-ethyl piperidyl)- propynyl-1-cyclohexyl alcohol.....	112
--	-----

А Б С Т Р А К Т С

N.V. KHOLODKOVA, I.V. KHOLODKOV
HETEROGENEOUS RECOMBINATION OF ATOMS ON SOLID SURFACE

The analysis of the literature data on the probability of a heterogeneous recombination of atoms of oxygen, nitrogen and hydrogen on the surfaces of various natures are given. It may be useful for numerical simulation of the processes at the conditions of non-equilibrium plasma of low pressure.

Key words: heterogeneous recombination, atom, oxygen, nitrogen, hydrogen

O.V. KONNIK, Z.Z. BEKIROVA, V.F. SHUL'GIN, V.V. MININ, G.G. ALEXANDROV, I.L. EREMENKO
GADOLINIUM COMPLEXES WITH BISACYLBISHYDROZONES OF 3-METHYL-1-PHENYL-4-FORMYLPYRAZOLE-5-ONE

The gadolinium coordination compounds with saturated dicarboxylic acids and imino-, oxo- and thiodiacetic acids and 3-methyl-1-phenyl-4-formylpyrazole-5-one bisacylbishydrazones are described. On X-ray analysis data binuclear complexes have a binuclear structure and consist of the gadolinium cations that are connected with three bridging ligands. Magneto chemistry data show the presence of a weak antiferromagnetic interaction between paramagnetic centers. The ESR spectra show intense symmetrical singlet with $g \approx 2.0$ and weak signal of forbidden transition with $g \approx 4.0$.

Key words: gadolinium, bisacylbishydrazone, 4-formylpyrazole-5-ones, crystal structure, ESR, magnetochemistry

A.E. KISELEV, L.S. KUDIN, A.P. ILYIN
HIGH TEMPERATURE PROCESSES IN MECHANO-ACTIVATED SYSTEM OF $K_2O \cdot nFe_2O_3$ OXIDES

The processes proceeding at vacuum annealing of the mechano-activated mixture of $K_2CO_3 - Fe_2O_3$ were characterized. The change in the vapor composition at the reduction process of $K_2O - Fe_2O_3$ double oxide was revealed and the hypothesis on the structural rearrangement of the crystal lattice of catalyst controlled by the potassium oxide was formulated.

Key words: mechanical activation, $K_2CO_3 - Fe_2O_3$ catalytic system, mass spectrum, vapor composition, high temperature mass spectrometry

A.A. KYAROV, I.I. KHOCHUEV, R.M. EL'MESOVA, R.S. MIRZOEV, M.Kh. LIGIDOV
SOLUBILITY AND PROPERTIES OF SATURATED SOLUTIONS IN $Cs_2MoO_4 - C_2H_5OH - H_2O$ SYSTEM AT 25°C

The solubility in $Cs_2MoO_4 - C_2H_5OH - H_2O$ system was studied at 25°C. It was shown that in a given system new compounds are not formed but the appearance of ethyl alcohol leads to sharp decreasing in a solubility of cesium molybdate in a water and in a solution delaminating on two phases in a wide concentration range. There is the critic point (K) on bimodal curve where compositions of two conjugated liquid phases (L1 and L2) become the same on structure and physical – chemical properties. So at this point there is one liquid phase (weight %): 15.42 of Cs_2MoO_4 ; 25.30 of C_2H_5OH ; 59.28 of H_2O . Conjugated saturated liquid phases which are in non-variant equilibrium with solid phase Cs_2MoO_4 and vapor of composition (weight %) : – 79.72 of Cs_2MoO_4 ; 1.61 of C_2H_5OH ; 19.21 of H_2O ; – 0.0215 of Cs_2MoO_4 ; 96.43 of C_2H_5OH ; 3.56 of H_2O . Density, refractive index, dynamic viscosity was determined. Isotherms of mole volume, kinematic viscosity, and ionic force of solution and mole volume of total amount of non-water components were calculated.

Key words: solubility, cesium molybdate, ethanol, solubility diagram, physical-chemical properties of saturated solutions

M.A. LAZOV, N.V. ALOV, A.A. ISCHENKO
**DETERMINATION OF STOICHIOMETRY AND THICKNESS OF ION-SYNTHESIZED
TUNGSTEN OXIDE NANOSTRUCTURES WITH XPS**

At the oxidation of tungsten surface by O_2^+ ions, X-ray photoelectron spectrum analysis showed the presence of the W(IV), W(V) and W(VI) oxide forms, which were given as homogeneous layers. To improve the approximation quality for complex W 4f line, deconvolution of series of tungsten oxidation spectra was carried out taking into account of W 5p_{3/2} line of low intensity. Dependence of tungsten oxides concentrations on the ion implantation dose was determined. Thicknesses of oxide layers, the average degree of oxidation of tungsten and the stoichiometry of the oxidized layer and the entire thickness of the sample analyzed were calculated. Amount of oxides and the thickness of the respective layers were monotonically increased from zero with the increasing doses of irradiation by O_2^+ with the energy of 3 keV.

Key words: X-ray photoelectron spectroscopy, tungsten oxide nanostructures, thin films, ion-beam surface treatment

I.S. VOROKHOBIN, I.A. VYAZENOVA, V.A. TARANUSHICH
**INTERACTION OF AMMONIUM NITRATE WITH POTASSIUM CHLORIDE
IN WATER-ETHANOL MEDIUM**

In the work the results of study of physical and chemical properties are presented for solid phases being forming of ammonium nitrate - potassium chloride - water at partial replacing solvent by ethanol. The introduction of an organic phase was shown to result in a change in a structure and regularities of formation of precipitate crystal structure.

Key words: gas-generating condense systems, oxidizer, ammonium nitrate, potassium chloride, potassium nitrate, co-crystallization, modifying agent, polymorphic transformation, organic solvent

V.Sh. MIRASOV, D.A. ZHEREBTSOV, D.G. KLESCHYOV, G.G. MIKHAIYLOV
HYDROTHERMAL METHOD OF SYNTHESIS OF NANO DISPERSE "IRON MICA"

Phase transformations of iron oxyhydroxide (III) forming at interaction of hydrogen peroxide with $FeSO_4$ solutions and (or) with $Fe(OH)_2$ suspensions were studied at hydrothermal treatment in $0 \leq C_{KOH} \leq 5$ mol/l KOH solutions at 150 - 220 °C. Dependences of phase composition forming products as well as the size and morphology of $\alpha-Fe_2O_3$ crystals on hydrothermal treatment parameters were generalized. Conditions for obtaining synthetic "iron mica" were specified.

Key words: oxidation; iron oxyhydroxides; hydrothermal treatment, phase transformations, "iron mica"

O.G. KHELEVINA, A.S. MALYASOVA, M.V. ISHUTKINA
**STRUCTURING OF LIQUID POLYMETHYLSILOXANEDIOLS WITH ESTERS
OF ORTHO- TITANIUM AND ORTHO- SILICIC ACIDS**

Structuring liquid polymethylsiloxanediols with esters of ortho- titanium and ortho- silicic acids was studied. The reaction describes by kinetic equation of the first order for irreversible reactions. The effective rate constants of structuring were calculated at temperatures of 130, 140, 150 and 160⁰ C as well as the values of activation energies. Catalyst introducing, tin phthalocyanine, results in the essential increase in structuring rate. Considerations were expressed on action mechanism of tin phthalocyanines. Materials with vulcanized covers on the basis of liquid polymethylsiloxanediols possess high physical-mechanical properties and fire resistance.

Key words: polymethylsiloxanediols, structuring, ortho- titanium and ortho- silicic acids esters, catalust

V.A. KUZNETSOV, M.I. KODESS, A.V. PESTOV
POLYMERIZATION OF LACTIDE IN PRESENCE OF TIN (II) CHLORIDE COMPLEXES

A comparison of tin (II) complexes, tin (IV) complexes and tin (II) 2-ethylhexanoate (octanoate) activity as initiators of lactide bulk polymerization was carried out. Among investigated compounds synthesized for the first time tin (II) chloride complexes with ethers showed the highest activity. The complex with 1,4-dioxane provides the highest monomer conversion and molecular mass of the polymer at temperature of 200°C, complex with 1,2-dimethoxyetane - at temperature of 155°C. Offered complexes can be used as cheap and efficient initiators for lactide polymerization.

Key words: lactide, ring opening polymerization, initiators

S.S. IBRAYEVA, K.D. PRALIEV, T.K. ISKAKOVA, T.M. SEIYLKHAVOV
SYNTHESIS OF 1-(3-ETHOXYPROPYL)-4-HEXYL-4-HYDROXYPIPERIDINE

Corresponding 4-hexynylpiperidol was obtained by the reaction of 1-(3-ethoxypropyl)piperidone with hexyne the catalytic hydrogenation of which on Raney nickel catalyst led to 1-(3-ethoxypropyl)-4-hexylpiperidol. To study the biological activity of tertiary alcohols their acylation was carried out.

Key words: piperidines, alkynylpiperidols, alkynylation, catalytic reduction, acylation

E.V. VELICHKO, A.A. GOLISHENKO, A.V. SHTEMENKO
INTERACTION OF TRANS-TETRACHLORO-DI-CARBOXYLATE OF DIRHENIUM (III)
AND 3-DERIVATIVES OF 1-ADAMANTANE CARBOXYLIC ACID

Methods of synthesis of mixed-ligands complex compounds of dirhenium (III) with 3-derivatives of 1-adamantane carboxylic acid. Composition and structure of obtained complexes were determined with the elemental analysis, electron absorption and IR spectroscopy.

Key words: rhenium, clusters, adamantane carboxylic acids, quadruple bond

NGUYEN THI THU HA, A.A. MERKIN, A.R. LATYPOVA, O.V. LEFEDOVA
INFLUENCE OF SKELETAL NICKEL CATALYST AMOUNT ON HYDROGENATION RATES
OF INTERMEDIATE PRODUCTS OF NITROBENZENE REDUCTION

The influence of skeletal nickel catalyst amount on the reaction rates of azoxybenzene and azobenzene hydrogenation in an aqueous 2-propanol with acetic acid and sodium hydroxide addition was studied. It was established that the specific reaction rate of azoxy- and azobenzene hydrogenation was not constant in case of small amounts of catalyst. The catalyst possible deactivation assessment was discussed.

Key words: azobenzene, azoxybenzene, hydrogenation, skeletal nickel, deactivation

A.A. FEDOROVA, N.Yu. SHARONOV, M.V. ULITIN
PECULIARITIES OF ADSORBED LAYERS FORMATION ON SOLID AND LIQUID SURFACES
IN ELECTROLYTE SOLUTIONS

The isotherms and heats of sodium maleate adsorption on skeletal nickel in reactions of liquid phase catalytic hydrogenation, isotherms and isosteric heats of adsorption of inorganic I, I-electrolytes and sodium maleate from water and aqueous sodium hydroxide solutions were experimentally measured. It was shown that the surface layers structure at the liquid/gas interface and adsorption solutions compositions in a pores of solid change is changed under the influence of solvent. The received data are discussed from the point of view of solvation influence on the adsorbate state in surface layers.

Key words: adsorption, isotherms, liquid and solid surfaces, thermodynamics, heats, entropy, solvation

V.Kh. FEDOTOV, N.I. KOLTSOV
EVALUATION OF NONLINEAR TIMES OF RELAXATION OF CATALYTIC REACTIONS

Estimation of non-linear relaxation times and examples of their application to catalytic reactions proceeding on different stage schemes are presented.

Key words: non-linear relaxation times, catalytic reactions, stage schemes

F.T. MAKHMUDOV
SORPTION DYNAMICS OF PHENOL AND SULFONOL ON SOLID SORBENTS

Calculated theoretical output curves of sorption of phenol and sulfonol from solutions on activated coal KAD-iodine and anionite AB-17-OH describe satisfactorily the experimental ones. It confirms the stationarity of process of dynamic sorption in given experiments.

Key words: dynamics, sorption, phenol, sulfonol, sorbent

E.S. BOBKOVA, A.V. SUNGUROVA, A.I. SHISHKINA, V.V. RYBKIN
DEGRADATION KINETICS OF PHENOL AND FORMATION OF PRODUCTS OF ITS DESTRUCTION
IN SOLUTION UNDER ACTION OF DC DISCHARGE

The process of phenol decomposition in an aqueous solution under the action of a DC discharge of atmospheric pressure in air was studied. The decomposition efficiency was found to be 0.017 molecules per 100 eV. The oxyphenols, carboxylic acids, aldehydes and nitro phenols were the main decomposition products. The

treatment process accompanies by the hydrogen peroxide formation, pH decrease and the nitric acid formation. Some other parameters of discharge were determined as well.

Key words: kinetics, phenol, decomposition, destruction products, direct current discharge

V.V. PANTELEEVA, A.B. SHEIN

ANODIC BEHAVIOUR OF FeSi-ELECTRODE IN ALKALINE SOLUTION

Anodic behaviour of FeSi-electrode in (0.5 – 5.0) M NaOH solution at anodic potentials from -0.95 up to 0.97 V was studied using potentiostatic and cyclic voltammetry method as well as impedance spectroscopy one. On basis of impedance data the conclusion was made on the formation of the two-layer passivating film of the insoluble products of the anodic oxidation of metal component of alloy oxide. Equivalent electrical circuit describing the passive state of FeSi was offered.

Key words: iron silicide, passivation, alkaline electrolyte, impedance

D.N SMIRNOVA, A.P ILYIN, N.N SMIRNOV

MECHANOCHEMICAL SYNTHESIS OF SILICON OXYCARBON ADSORBENTS FOR PURIFICATION OF EXTRACTION PHOSPHORIC ACID

Extraction phosphoric acid is a multicomponent product. Nowadays it is actual the usage of adsorbents for acid cleaning. Mechanochemical method of preparation of carbon adsorbent with the usage of silica with different activity was considered. Under mechanochemical activation compounds of silicon carbide and oxycarbide are formed. At phosphoric acid cleaning on the obtained silicon-carbon adsorbents was shown to increase in a defluorination degree.

Key words: phosphoric acid, carbon adsorbent, silica, mechanical activation, carbide, silicon oxycarbide

S.A. CHULOVSKAYA, S.Yu. VAVILOVA, E.V. GARAS'KO, V.I. PARFENYUK

POLYPROPYLENE THERMO-FASTEN LINEN WITH FUNGICIDAL PROPERTIES

The method of obtaining polypropylene non-woven thermo-fasten linen filled with nano-size copper-containing powder and possessing fungicidal properties was developed. The surface properties of new material were studied by methods of IR-spectroscopy and AFM. The influence of nature and concentration of copper-containing filler on obtaining the non-woven material and its fungicidal properties was estimated.

Key words: non-woven linen, nano-size powders, fungicidal activity

G.K. SHURDUMOV

SYNTHESIS OF MOLYBDATES AND TUNGSTATES OF LEAD IN MELTS OF [KNO₃-NaNO₃-Pb(NO₃)₂]_{EVТ.}-Na₂MoO₄ (K, Na, Pb // NO₃, Mo(W)O₄) SYSTEMS

The rational method for molybdate and tungstate of lead in melts of systems [KNO₃-NaNO₃-Pb(NO₃)₂]_{levt.}-Na₂Mo(W)O₄ (K, Na, Pb // NO₃, Mo(W)O₄) was developed. This method is one of the possible versions of solution of the problem on the basis of melt technology. Synthesis and identification of compounds mentioned above was carried.

Key words: melt, synthesis, molybdate (tungstate) of lead, thermal analysis, identification

J.Kh. JAILOEV, I.N. GANIEV, I.T. AMONOV, Kh.Kh. AZIMOV

POTENTIODYNAMIC STUDIES OF Al +2.18% Fe ALLOY DOPED WITH BARIUM

The research results of the anodic behavior of the Al +2.18% Fe alloy doped with barium from 0.005 up to 0.5 wt.% were presented for NaCl electrolyte.

Key words: aluminum alloy with iron, barium, potentiostatic method, corrosion, anodic behavior, pitting, NaCl medium

A.A. KOLESNIKOV, M.O. MESNIK

CALCULATION OF PERFORMANCE OF TECHNOLOGICAL EQUIPMENT FOR MANUFACTURING ELASTIC LEATHERS USING ELECTRON ACCELERATORS

The paper presents calculations of the technological equipment of elastic leathers production using electron accelerators. On the basis of calculations carried out the electron accelerators can be chosen with the necessary parameters of the electron energy and power.

Key words: electron accelerators, electron irradiation dose, equipment performance

S.V. NATAREEV, E.A. DUBKOVA, T.E. NIKIFOROVA, I.S. KHARCHENKO
ION-EXCHANGE EXTRACTION OF COPPER FROM SOLUTIONS IN DEVICE WITH SECTION-ALIZED FLUID-BED

The design of the device with segmented fluid-bed ionite layer was offered. On this device the studies of the ion-exchange sorption process of copper ions from water solutions were carried out. The influence of sections quantity of the device on the solution purification degree was established.

Key words: ion exchange, fluid-bed device

V.V. KOSTAREV, V.E. MIZONOV, V.A. ZAITSEV, N.R. LEZNOVA
MATHEMATICAL MODEL OF MOISTURE DISTRIBUTION IN ROLL UNDER FABRIC WINDING

A cell mathematical model to describe evolution of moisture content distribution in a geotextile roll during spooling of fabric on it was proposed. The model takes into account variation of the roll during spooling and moisture evacuation from its periphery. Two variants of the process are examined: at constant angular speed of the roll, and at constant speed of fabric. Some examples of calculation of evolution of moisture content distribution are presented.

Key words: forced moisture conduction, rotating geotextile roll, cell model, state vector, transition matrix, moisture content distribution

V.Yu. VOLYNSKY, Ya.S. STOROZHENKO
MATHEMATICAL MODELING OF PROCESS OF THERMAL TREATMENT SHEET MATERIALS IN TENTER DRIER

In the article the new approach based on the theory of fuzzy neural networks for modelling the drying process of sheet materials, for example cotton fabrics, was proposed. The hybrid network was developed which allows to determine of material output humidity at the withdrawal from tenter drier.

Key words: drying, modeling, cotton cloth, neural network

Z.B. ALLAMBERGENOVA, N.U. ALIEV, M.E. ERMAGANBETOV
SYNTHESIS AND POST GROWTH-REGULATING PROPERTIES OF N-PHENYL-THIOCARBAMATE OF 3 - (3-ETHYL PIPERIDYL)-PROPYNYL-1-CYCLOHEXYL ALCOHOL

The corresponding n- phenylthiocarbamate was synthesized by interaction of phenyl isothiocyanate with 3 - (3-ethylpiperidil)-propynyl-1 cyclohexyl alcohol in dehydrated benzene and by heating. It is found that this compound regulates growth of watermelons well.

Key words: acetylene amino alcohol, phenylthiocarbamate, plant growth stimulator