

## A B S T R A C T S

*V.V. VOL'KHIN, A.L. ZHARNYL'SKAYA, D.A. KAZAKOV, G.V. LEONT'EVA*  
**SYNTHESIS AND STABILIZATION OF NANOSIZED TETRAGONAL MODIFICATION  
OF ZIRCONIUM DIOXIDE IN ALUMINA OXIDE MATRIX**

Synthesis conditions of zirconium oxyhydroxide at  $ZrOCl_2$  hydrolysis which capable to crystallize at heating ( $\geq 400$  °C) with the t- $ZrO_2$  phase formation were determined. The alumina-oxide gel with a homogeneous distribution of  $ZrO_2$  nano particles was synthesized by means of sol-gel process on the base of  $\gamma$ - $AlOOH$  and  $ZrO_2$  sols. A possibility of nano particles stabilization of pure (non-doped) phase of t- $ZrO_2$  in the alumina matrix in all investigated range of calcination temperatures of composite samples was confirmed up to 1350 °C.

**Key words:** nano particles, zirconium dioxide, tetragonal modification, stabilization, alumina-oxide matrix, sol-gel process, products of thermal treatment

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**ACTIVATION OF BASIC BLAST-FURNACE SLAG BY PRODUCTS OF NATURAL GYPSUM  
THERMAL TREATMENT**

Using modern methods of researches the catalytic properties of products of natural gypsum thermal treatment have been studied in the activation process of blast-furnace slag hardening. The activating ability of sulfate calcium has been shown to depend on its activity. The best activators of blast-furnace slag hardening are the products of gypsum thermal treatment at temperature of 182 °C. Compositions of binding materials for dry mixtures on the base of blast-furnace slag activated with the products of gypsum treatment have been proposed.

**Key words:** granulated basic blast-furnace slag, natural gypsum, blast-furnace slag activation, thermo treatment,  $\beta$ - $CaSO_4 \cdot 0,5H_2O$ , water polarization, hydration, hydrolysis, gypsum-slag compositions

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**SYNTHESIS OF COMBINATORIAL LIBRARIES OF AMIDES, SULFAMIDES AND UREAS  
FROM 2-ACYLBENZO [d] THIAZOLE-2,5-DIAMINES**

The effective method of synthesis of 2-acylbenzo[d]thiazole-2,5-diamines by hydrogen reduction of N-(5-nitrobenzo[d]thiazol-2-yl)amides on the Pd catalyst in DMF was proposed. The series of amides, sulfamides and carbdiimides derivatives of benzo[d]thiazole-2,5-diamines for highly productive bio-screening were obtained by the solution-phase parallel synthesis.

**Key words:** synthesis, hydrogen, palladium catalysts, benzo[d]thiazole-2,5-diamine, amides, sulfamides, ureas

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**ASYMMETRIC OXIDATION OF 2-BENZYLTHIO-1H-BENZOIMIDAZOLE WITH APPLICATION  
OF TITANIUM (IV) AND VANADIUM (IV) CHIRAL COMPLEXES**

The asymmetric oxidation of 2-benzylthio-1H-benzoimidazole by the tert-butyl hydroperoxide, hydrogen peroxide and chlorine dioxide with application of vanadium (IV) and titanium (IV) complexes with the Schiff's chiral bases and diethyl tartrate has been carried out. It has been shown, that appropriate sulfoxide with enantiomeric excess up to 81% is formed, and application of chlorine dioxide leads to opposite enantiomer.

**Key words:** asymmetric sulfoxidation, chlorine dioxide, nitrogen-containing heterocyclic sulfoxides

*E.A. SAMOIYLOV*  
**INTERACTION OF COMPLEX FERROCYANIDE ANIONS WITH PINACYANOLE CATION  
IN AQUEOUS SOLUTIONS AND IN SURFACTANT CONTAINING SOLUTIONS**

By spectrophotometric method and quantum simulations the formation possibility of compounds between the ferrocyanide complexes  $[Fe(CN)_6]^{3-}$  or  $[Fe(CN)_6]^{4-}$  ( $An^i$ ) anions and cationic dye pinacyanole ( $Ct^+$ )

has been established in aqueous solutions. Additions of anionic surfactant (sodium dodecylsulfate) have been shown to result in the destruction of associates  $Ct^+$  with  $An^{i-}$ .

**Key words:** inter-ion association, dyes, surfactants

*P.A. TRUBAEV, E.A. ZAIYITSEV*

#### **CALCULATION OF HEAT EFFECTS OF CHEMICAL TRANSFORMATIONS ON BASE OF DIFFERENT BASE LEVELS**

It is proposed to determine the heat effect of chemical transformations on the specific mass enthalpy of chemical compounds formation from the oxides. It is suggested to apply the Kirkgof' rule not to chemical reactions but to a heat formation of chemical elements from the oxides. The proposed method may serve as a foundation in the methods of thermal and thermodynamic analysis of industrial heat-engineering processes of construction materials obtaining from the natural and anthropogenic raw materials.

**Key words:** heat effect of chemical reactions, formation enthalpy of chemical compounds, cement clinker

*O.N. SHCHERBININA, S.S. POPOVA*

#### **ELECTROCHEMICAL BEHAVIOR OF COPPER, LEAD AND COPPER-LEAD ELECTRODE IN SOLUTIONS OF BISMUTH, CALCIUM, THALLIUM AND BARIUM SALTS**

The thin films electrodes Bi – Cu – O, Ca – Cu – O, Bi- Pb, Ca- Pb, Bi- Pb-Cu- O, Tl-Cu-O, Ba – Cu have been obtained by the method of electrochemical cathode intrusion. The diffusion-kinetic parameters of electrodes have been calculated and the phase composition has been determined with X-raying. The penetration depth of intruding metals into the carrier metal has been established with the laser micro-spectral analysis. The stability of compounds forming in process of compounds cathode polarization has been determined with the no-current chronopotentiogram method. The influence of preliminary treatment of bismuth salt solution in magnetostatic field on the kinetics of intrusion process has been considered.

**Key words:** electrochemical cathode intrusion method, diffusion, magnet treatment, surface modification

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#### **ELECTROCHEMICAL AND ELECTROCATALYTIC PROPERTIES A NUMBER OF DERIVATIVES OF TETRAPORPHYRAZINE AND II TETRA-2,3-HYNOXOLINOPORPHYRAZINE IN ANKALINE SOLUTION**

The investigation the redox conversion of some derivatives of tetrapyrazinoporphyrazine and tetra-2,3-hynoxolinoporphyrazine in alkaline solution has been carried out using the cyclic voltammetry method. The estimation of electro catalytic activity of compounds in the reaction of molecular oxygen electro reduction has been given.

**Key words:** tetrapyrazinoporphyrazine, tetra-2,3-hynoxolinoporphyrazine, electro reduction, oxygen, catalytic activity

*A.M. KLIMOV, S.P. RUDOBASHTA, Yu.A. TEPLYAKOV, V.M. NECHAEV, G.M. MIKHAIYLOV*

#### **DIFFUSION EQUILIBRIUM OF MASS EXCHANGE PROCESSES IN THE SYSTEM "SOLID BODY – LIQUID"**

The results of research of diffusion equilibrium of mass exchange processes in the system "solid body – liquid" for solid materials with different structure are presented.

**Key words:** mass exchange, diffusion equilibrium, system solid body-liquid

*G.I. MALTSEV, S.V. VERSHININ*

#### **RESEARCH OF PHYSICAL AND CHEMICAL PROPERTIES AND USE PROSPECTS MIXED IRON-ALUMINUM CONTAINING COAGULANT**

The mixed iron-aluminum containing coagulant being used at purification of waste water of industrial enterprises has been obtained from wastes of high purity aluminum production.

**Key words:** the anode rests, mixed iron-aluminum coagulant, purification, waste water

*E.A. VYALYKH, S.A. ILARIONOV*

**OBTAINING COMPOUNDS SIMILAR TO HUMIC ACIDS FROM LEAF LITTER**

The possibility of humic acids obtaining from the plant residues is considered. The thermal treatment of the last catalyzes the process of acids formation. The products obtained have been identified by elemental analysis, IR-spectroscopy and electrophoresis in polyacrylamide gel.

**Key words:** humic acids, plant residues, thermal treatment

*A.Yu. BUSHUEVA, G.G. ABASHEV, E.V. SHKLYAEVA*

**SYNTHESIS AND ELECTROCHEMICAL BEHAVIOR OF NOVEL CONJUGATED MONOMERS CONTAINING PYRIMIDINE FRAGMENTS**

Synthesis of new conjugated monomers containing both  $\pi$ -electron-scarce pyrimidine core and  $\pi$ -electron- excess heterocycles (such as pyrrole, thiophene, 3,4-ethylenedioxythiophene) has been described. The cyclic voltammetry (CV) has been applied to characterize an electrochemical behavior of these systems.

**Key words:** pyrimidine derivatives, 3,4-ethylenedioxythiophene, thiophene, pyrrole, cyclic voltammetry

*V.G. STOKOZENKO, Yu.V. TITOVA, M.V. KONYCHEVA, A.I. MAXIMOV*

**INVESTIGATION OF INFLUENCE OF LIGNIN CHEMICAL COMPOSITION ON ITS SOLUBILITY IN PROCESSES OF CHEMICAL AND PLASMA-CHEMICAL TREATMENTS**

The chemical composition of three types of bast fiber lignin (flax, hemp and jute) was under study by methods of IR spectroscopy. The destruction degree and solubility of lignin of fibers under study in the processes of chemical and plasma-solution treatments were shown to be in the dependence on the amount of methoxylated phenylpropane groups in lignin macromolecule stable towards the reactions of hydrolytic destruction.

**Key words:** lignin, bast fibers, delignification, plasma-solution treatment

*N.A. MAMEDOVA, F.M. SADYGOV, B.Z. RZAEV, I.I. ALIEV*  
**THIOSTANNATES OBTAINING FROM WATER SOLUTIONS OF Me (Cu<sup>+</sup>, Co<sup>2+</sup>, Cd<sup>2+</sup>) – SnS<sub>2</sub> – H<sub>2</sub>O SYSTEMS**

Thiostannates of copper (I), cobalt (II) and cadmium of Cu<sub>2</sub>SnS<sub>3</sub>, CoSnS<sub>3</sub> и CdSnS<sub>3</sub> compositions have been obtained by means of precipitation from water solutions of Me (Cu<sup>+</sup>, Co<sup>2+</sup>, Cd<sup>2+</sup>) – SnS<sub>2</sub> – H<sub>2</sub>O systems. The obtaining of these compounds at optimal conditions has been established to proceed in the medium of buffer solution of ammonium acetate. Some physical-chemical and crystal-chemical properties of compounds obtained have been studied. It has been discovered that the CuSnS<sub>3</sub> crystallizes in cubic system, CoSnS<sub>3</sub> – in rhombic one and CdSnS<sub>3</sub> – in tetragonal one.

**Key words:** thiostannates, copper (I), cobalt (II), cadmium, obtaining

*A.V. EREMEIYSHVILI, M.V. STEPANOVA*

**SOME PECULIARITYIES OF ZINC, LEAD AND CADMIUM CONTENT IN SNOW COVER OF UGLICH TOWN**

The content of micro elements in the snow of Uglich town of Yaroslavl region (67 samples, 268 quantitative measurements) has been determined by the method of inversion voltammetry. The pollution of atmospheric air of Uglich micro-districts with heavy metals and connection of that parameter with ecological conditions of neighbouring territories has been shown.

**Key words:** micro elements, zinc, lead, cadmium, snow cover, inversion voltammetry

*E.S. KLIMOV, E.N. KALYUKOVA, M.V. BUZAEVA*

**SULPHATE IONS ADSORPTION ON NATURAL MINERALS SILICA CLAY, DOLOMITE AND SCHUNGITE**

The adsorption of sulphate ions on natural sorbents silica clay, dolomite and schungite has been studied. Quantitative adsorption characteristics have been determined. The comparative analysis of sorption ability has been carried out.

**Key words:** adsorption, natural sorbents, sulphate ion, isotherm

*N.Ch. MOVSUM-ZADE*

#### **STRUCTURE OF SUBSTITUTED ACETO- AND PROPIONENITRILES**

Results of quantum-chemical calculations of aceto and propionenitrile are presented. On the base of quantum-chemical data the nitriles activity with respect to nucleophilic reactions has been studied.

**Key words:** quantum chemistry, nucleophile, acetonitrile, propionenitrile

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E.F. ZHARIKOVA, S.V. SAVILOV, J.V. DOBROHOTOVA, V.M. NOVOTORTZEV, I.L. EREMENKO*  
**NEW HETEROMETALIC BINUCLEAR CARBOXYLATE COMPLEX WITH MAGNESIUM  
AND COBALT ATOMS – MOLECULAR PRECURSOR FOR OBTAINING CATALYST  
OF CARBON NANO TUBES SYNTHESIS**

It has been shown that the interaction of  $Ni_9(OH)_6(Piv)_{12}(Piv)_4$  cluster, potassium pyvalate, magnesium nitrate of hexahydrate  $Mg(NO_3)_2 \cdot 6H_2O$  and 2,2'-bipyridyle in TGF-MeCN solution at 50 °C (1 hour) results in formation of hetero nuclear complex  $Ni_2Mg(piv)_6(bpy)_2 \cdot 3,5MeCN$  (1·3,5MeCN, piv is anion of pyvaline (three methyl acetic) acid, bpy is 2,2'-bipyridyle), the structure of which has been established with X-ray. The thermolysis of 1·3,5MeCN (up to 500 °C) has been shown to result in formation of solid product containing from oxide mixture of MgO and NiO. The 1·3,5MeCN has been established can use as molecular precursor for catalyst obtaining the process of obtaining the multi-layer nano tubes.

**Key words:** hetero-nuclear complexes, magnesium, nickel, thermolysis, catalyse, carbon nano-tubes

*N.M. LADAEV*

#### **DESTRUCTION OF MATERIALS BY BLOW**

The article gives experimental results of research of destruction process of single particles at blow against a stationary surface. The influence of blow velocity and velocity of destruction start on destruction probability has been considered. Dependencies for the determination of velocity of destruction start as well as the velocity of 50% probability of destruction have been found as a function of material mechanical properties and its initial size.

**Key words:** blow, milling, milling probability, destruction start velocity, 50% destruction velocity, blow velocity

*O.A. ABONOSIMOV, S.I. LAZAREV, D.O. ABONOSIMOV*

#### **QUESTIONS OF SOLUTION FLOW HYDRODYNAMIC IN BAROMEMBRANE DEVICES OF ROLL TYPE**

The factor of longitudinal mixing in industrial baromembrane roll devices for two kinds of dividing elements has been studied depending on the movement velocity and flow pressure. Dependences of factors of longitudinal mixing on hydrodynamic characteristics of baromembrane devices have been analyzed and explained.

**Key words:** mixing, baromembrane device, hydrodynamic parameters

*S.A. IVNEV, D.O. BYTEV, L.V. KOROLEV*

#### **GRINDING PROCESSES MODELING IN SYSTEMS WITH INTRINSIC TIME**

For the describing the milling process the model of intrinsic time of physical systems has been proposed. In the frame of that model the local dependencies of kinetic equation coefficients of milling on the particle sizes have been determined. The obtained stationary distribution of milling products on the sizes is appropriate to results arising from other models.

**Key words:** milling, intrinsic time model, kinetic equation

*E.Yu. KULIKOVA, V.V. KULIKOV*

#### **CALCULATION OF SOLUBILITY FACTORS AND SOME THERMODYNAMIC PROPERTIES IN SYSTEM OF RADON AND BINARY SOLVENT ON BASE OF SCALE PARTICAL THEORY**

The article deals with the finding the solubility factor and calculation of free energy, enthalpy and en-

tropy of cavity formation on the base of scale particle theory in the system of radon and binary solvent. The solubility factor of radon in different binary solvents has been shown to be very small.

**Key words:** solubility factor, scale particle theory, thermodynamic properties, radon

***O.V. ZAKHAROV, M.V. ULITIN, A.A. KOMAROV***  
**HYDROGENATION REACTION KINETICS OF 4-NITROTOLUENE ON SKELETON NICKEL  
IN 2-PROPANOL AQUEOUS SOLUTIONS. I. EXPERIMENTAL DETERMINATION  
OF REACTION KINETIC ORDER**

The study of hydrogenation reaction kinetics of 4-nitrotoluene on the skeleton nickel catalyst has been carried out for binary solvents 2-propanol-water at atmospheric and increased pressure of hydrogen. It has been established that the reaction proceeds on the hydrogenation mechanism without formation of by-products and intermediate products with the integral selectivity on the 4-aminotoluene close to quantitative. Apparent kinetic parameters of reaction have been determined in the range of high and low concentrations of compound being hydrated. Velocity changes and hydrogenation rate constants depending on solvent composition and hydrogen pressure have been shown to cause by peculiarities of adsorption steps of hydrogen, 4-nitrotoluene and reaction product on the catalyst surface.

**Key words:** hydrogenation, 4-nitrotoluene, skeleton nickel, organic solvents, hydrogen pressure

***R.I. KUZMINA, A.A. KABKOV, I.V. KOZHEMYAKIN, V.T. LIVENTSEV, T.K. VETROVA***  
**CONVERSION OF N-HEXANE ON HIGH SILICEOUS CEOLITE CATALYSTS MODIFIED  
WITH COPPER**

The conversion of n-hexane on copper modified high siliceous ceolite catalysts was investigated. The catalysate with high octane number was obtained. The catalysate contained the compounds of iso- structure and aromatic hydrocarbons. The catalysate fulfils requirements both to engine fuel and ecological standards.

**Key words:** n-hexane, ceolite, catalyst, octane number, engine fuel

***G.A. ZUEVA, G.N. KOKURINA, V.A. PADOKHIN, N.A. ZUEV***  
**STUDY OF HEAT-MASS EXCHANGE IN PROCESS OF CONVECTION DRYING  
OF FIBROUS MATERIALS**

The experimental studies of some fibrous materials drying have been carried out for the purpose of adequacy check of mathematical description of various periods of drying process of fibrous materials. The experimental set up has been developed. Experimental curves of fibers drying and heating have been obtained. The fibers porosity and density have been determined. Dependencies of critical moisture content on the drying agent temperature are given.

**Key words:** drying, fibrous materials, heating and drying curves, critical moisture content

***E.P. GRISHINA, N.O. KUDRYAKOVA, A.M. PIMENOVA***  
**ELECTRO CHEMICAL DEPOSITION OF COPPER ONTO TITANIUM AND TANTALUM  
FROM LOW TEMPERATURE ION MELT OF 1-BUTYL-3-METHYLIMIDAZOLE  
BROMIDE-COPPER (II) BROMIDE**

The process of electrochemical deposition of copper covers onto titanium and tantalum with application of binary ion liquid 1-butyl-3-methylimidazole bromide-copper (II) bromide has been studied. It has been shown that at optimal condition of process performing it is possibly the obtaining the light semi-bright copper layers with good adhesion to carrier without the special surface preparation.

**Key words:** ion liquid, 1-butyl-3-methylimidazole bromide, copper cover, electro chemical deposition, titanium, tantalum

***E.V. MOMOTOV, S.B. NOSACHEV, A.G. TYRKOV, T.R. DOBRYANSKAYA***  
**ALKYLATION REACTIONS OF 5-CARBONITRILE-4-PHENYL-1H-PYRAZOLES**

The alkylation reaction of 5-carbonitrile-4-phenyl-1H-pyrazoles with chloromethoxyrane and opening direction of oxyrane ring by the action of tert-butylamine or morpholine has been studied.

**Key words:** alkylation, 5-carbonitrile-4-phenyl-1H-pyrazole, chloromethoxyrane

*A.I. OREKHOVA, R.P. LELEKOVA*  
**THERMODYNAMIC ANALYSIS OF DENYDRATION REACTIONS AT DEWATERING  
OF CARNALLITES OF VARIOUS COMPOSITIONS**

The thermodynamic analysis of dehydration processes of carnallite of various phase compositions, its hydrolysis and thermal decay of hydrolyzed compounds with the use of standard formation enthalpies of compounds  $0,5\text{NaCl}\cdot\text{MgCl}_2$  and  $\text{KCl}\cdot\text{MgCl}_2$ , and also its crystalline hydrate  $0,5\text{NaCl}\cdot\text{MgCl}_2\cdot n\text{H}_2\text{O}$  ( $n = 6; 4$ );  $\text{KCl}\cdot\text{MgCl}_2\cdot 6\text{H}_2\text{O}$  and  $\text{KCl}\cdot\text{MgCl}_2\cdot 2\text{H}_2\text{O}$  which were calculated on experimentally determined integral enthalpies of dissolution and also on values of thermal capacity of specified compound which were obtained by the method of high-temperature calorimetry is presented.

**Key words:** dehydration, carnallite, thermodynamic analysis

*A.N. DAVYDOV, S.V. PLOKHOV*  
**REDUCTION OF Cd (II) FROM SCOURAGE OF CHLORIDEAMMONIUM CADMIUM PLATING  
BY ION- EXCHANGE METHOD AND ELECTROLYSIS**

The manufacturing scheme for reduction of Cd (II) from scourage of chlorideammonium cadmium plating based on a combination of filtration, adsorption, ion exchange and electrolysis has been proposed. The basic kinetic laws and optimal parameters of electrodeposition and ion exchange extraction of cadmium has been determined

**Key words:** Ion exchange, electrolysis, washings, cleaning, cadmium