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C O N T E N T S

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

CHEMICAL TECHNOLOGY
(inorganic and organic substances. Theoretical fundamentals)

ECOLOGICAL PROBLEMS
OF CHEMISTRY AND CHEMICAL TECHNOLOGY

A B S T R A C T S

N.I. GIRICHEVA, A.A. ISCHENKO, V.I. YUSUPOV, V.N. BAGRATASHVILI, A.V. BARASHKOVA, G.V. GIRICHEV

RESTRUCTURING CYCLIC CLUSTER OF WATER $(H_2O)_5$ AT IONIZATION PROCESSES

Changes of geometrical and electronic structure depending on ionic states were analyzed for cluster $(H_2O)_5$, which is a fragment of different hydrate skeletons polymorphic forms of ice and gas hydrates. The comparison of the properties of cyclic cluster with the properties of H_3O^+ cations и $H_5O_2^+$ as well as with the properties of neutral species was carried out. It was shown that the $(H_2O)_5^-$ ion obtained by the addition of an electron to cyclic cluster possesses the shape of "envelope" while the $(H_2O)_5$+ ion obtained by removing an electron exists as a system containing O-H fragment, two molecules of H_2O and $[H_2O...H...H_2O]^+$ fragment which is characterized by super strong hydrogen bonds.

Key words: water cluster, hydrogen bond, ionic species, structure, ionization energy

N.V. LAKINA, V.Yu. DOLUDA, I.P. SHKILEVA, O.S. BURMATOVA, K.E. SALNIKOVA

STUDY OF BIOCATALYST OF TRANSESTERIFICATION IN ENVIRONMENT OF SUPERCRITICAL CARBON DIOXIDE

The article presents the results of a study of biocatalysts on the basis of lipase immobilized on the modified surface of magnetic nanoparticles. Analysis of experimental data obtained by IR spectroscopy of samples of biocatalysts showed that at the treatment of the surface of the magnetic nanoparticles with modifying and cross-linking agent the formation of strong covalent bonds between the respective functional groups takes place. Conducting the reaction of transesterification in supercritical conditions in the presence of biocatalysts has the highest efficiency compared to the transesterification reaction carried out at atmospheric pressure.

Key words: biocatalyst, lipase, FTIR spectroscopy, transesterification reaction, supercritical conditions

M.A. KURBANOVA, I.I. ISMAILOV

FIRE RETARDANT ON BASIS OF BORON-CONTAING SILICON ORGANIC COMPOUNDS

In given article a synthesis of oligomers boron-containing silicon organic compounds is considered. It is offered to apply these compounds as fire retardant for fire proof coverings on a basis of nitrogen-phosphorus and silicon-containing compounds. This appclication results in the increase of therто destruction and fire resistance. The comparison of bond energy of atoms of boron, silicon with bond energy of carbon atoms was carried out. The dependence of yield of boron-containing silicon organic compound on temperature and on reagents ratio was obtained. The introduction of sicicon-containing oligomer fire-retardant into covers was shown to improve their physical properties and to increase in a fire resistance.

Key words: fire retardants, coverings, oligomers, boron-containg silicon organic compounds, nitrogen, phosphorus, silicon, sodium methasilicate, thermo destruction, bond energy, modification, poly siloxane

Yu.V. BUTINA, E.A. DANILOVA, T.V. KUDAYAROVA

SYNTHESIS OF 5-AMINO-2-BENZOYL-3-IMINO-1,2,4-THIADIAZOLINE

5-Amino-2-benzoyl-3-imino-1,2,4-thiadiazoline acylated into the cyclic atom of nitrogen was obtained by interaction of 3,5-diamino-1,2,4-thiadiazole and benzoylchloride. Qualitative composition of reaction mass was determined using the method of high performance liquid chromatography at change of temperature and time of acylation.

Key words: 3,5-diamino-1,2,4-thiadiazole, acylation, 5-amino-2-benzoyl-3-imino-1,2,4-thiadiazoline, high performance liquid chromatography

A.E. ZAVADSKII

X-RAY METHOD OF EXPRESS ANALYSIS OF CHANGES IN SPECIFIC SURFACE AREA OF CELLULOSE FIBERS

We have developed the methodology of express estimation of changes in the specific internal surface area (SISA) of cellulose fibers by low-angle X-ray scattering (LAXS). It was shown that the main source of

LAXS for dry fibers is the interfacial surface area of a polymeric matrix with microvoids rather than the boundary of the amorphous regions and crystallites. Mercerization of cotton fibers reduces the SISA only 13.7%, due to the preservation of their fibrillar structure. For viscose and siblon fibers, upon synthesis of which the morphological structure of the natural material is completely broken down, the SISA is only 13.1 – 13.7% of the analogous parameters for cotton.

Key words: X-ray analysis, low--angle X-ray scattering, cellulose fibers, heterogeneous structure, internal surface

I.K. GARKUSNIN, A.V. KOLYADO, S.M. ALENOVA, F.K. SUKOCHEV

RESEARCH OF THREE-COMPONENT SYSTEM OF SEBACIC ACID – AZELAIC ACID – ADIPIC ACID

Phase equilibriums in three-component system of sebacic acid - azelaic acid - adipic acid were studied by differential thermal analysis (DTA). The eutectic composition containing (wt.%) adipic acid - 12.3% azelaic acid - 59% sebacic acid – 28.7% was revealed. The melting point of the alloy of eutectic composition in the ternary system was 87.7 °C, specific enthalpy of melting was 212±12 J/g. The fields of phases crystallization were delimited. The study of binary systems of dibasic organic acids is of interest for practical use as a heat accumulating material.

Key words: differential thermal analysis (DTA), sebacic acid, azelaic acid, adipic acid, melting enthalpy, eutectic

A.M. EFREMOV, S.V. BELYAEV, E.S. TITOVA

ON INFLUENCE OF GAS TEMPERATURE ON NEUTRAL SPECIES KINETICS IN HYDROGEN CHLORIDE GAS DISCHARGE PLASMA

The model-based investigation of the influence of gas temperature on the steady-state plasma composition and plasma chemical kinetics in hydrogen chloride was carried out. It was find that, under the conditions of both high (~ 10^5Pa) and low (~ 10 Па) pressures, the variation of gas temperature results in qualitatively similar changes in the densities of molecules, but shows the different impact on the densities of atomic species. The reason for the last effect is the different contributions of bulk and heterogeneous processes in the total decay rates for atoms.

Key words:hydrogen chloride, plasma, kinetics

A.G. CHEREDNICHENKO

METHOD OF PURIFICATION OF HETERO-LIGAND COORDINATION COMPOUNDS OF EUROPIUM ON BASIS OF 1,10-PHENANTHROLINE FOR OLED-TECHNOLOGY

The reaction of synthesis of coordination compounds of europium on basis of 1,10-phenanthroline for application in OLED-technology was studied. The method of purification of synthesized compounds by means of their thermal treatment in vacuum was proposed.

Keyword: europium complexes, organic compounds purification

N.F. KOSENKO, Yu.V. PIMKOV, N.V. FILATOVA

SYNTHESIS AND PHYSICOCHEMICAL STUDY OF MULLITE-FORMING SUSPENSION

The mullite-forming suspension giving mullite $3Al_2O_3 \cdot 2SiO_2$ at a thermal treatment was offered. The optimum pH range is 5.5-7.3. The negative role of sodium ions fixing aluminum and silicon oxides into alkaline aluminosilicates was established. It needs Na^+ ions separation. The mullite formation in the coprecipitation product is shifted to lower temperatures (up 250-280 °C) as compared with the mixture of $Al(OH)_3$ and H_2SiO_3.

Key words: mullite, mullite formation, coprecipitation, suspension, mechanical activation

V.L. KOTOV, N.Yu. KOVKOVA, A.K. KRIVTSOV

ELECTRODEPOSITION OF SOFT SOLDERS FROM ACIDIC ELECTROLYTES ON BASIS OF TIN CHLORIDE PENTAGIDRATE (IV). COMMUNICATION I. TIN- INDIUM ALLOY

Polarization character was determined by temperature-kinetic method at electro-deposition of Sn-In alloy from acid citrate electrolyte on basis of of Sn^{4+} salts. A mechanism of joint discharge of alloy-forming metal ions was offered.

Key words: tin, indium, alloy, electrodeposition

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

ANODIC BEHAVIOR OF Al+2.18%Fe ALLOY DOPED CALCIUM IN NaCl ELECTROLYTE

Results of studies of anodic behavior of the Al +2.18% Fe alloy doped with calcium (0.005-0.5 wt.%) in the medium of NaCl electrolyte are presented.

Key words: Al +2.18% Fe alloy, calcium, potentiostatic method, corrosion, anodic behavior, pitting, NaCl medium

E.P. GRISHINA, A.M. PIMENOVA, L.M. RAMENSKAYA

FREQUENCY DEPENDENCES OF CAPACITOR ALUMINUN FOILS IN IMIDAZOLIUM IONIC LIQUIDS

The effective capacitance frequency characteristics for capacitor models including high-capacity alumina foils and 1-n-butyl-3-methylimidazolium- bis(trifluoromethylsulfonyl)imide and -hexafluorophosphate ionic liquids as electrolytes were prepared and studied. The investigated ionic liquids were found experimentally to be useful for application as electrolytes for wet foil capacitors.

Key words: aluminum foil, wet foil capacitors, effective capacitance, frequency dependence, imidazolium ionic liquids

S.S. NIKULIN, Yu.E. SHULGINA, I.V. OSTANKOVA, T.N. POYARKOVA, N.S. NIKULINA

ACOUSTIC EFFECTS IN PRODUCING EMULSION RUBBERS

The effect of ultrasonic treatment on the efficiency of the coagulation process of styrene butadiene latex SCS 30 ARC in the presence of a cationic poly electrolyte poly-N, N-dimethyl-N, N-diallilammony chloride was established.

Key words: acoustic influence, styrene-butadiene latex, coagulation, cationic polyelectrolyte

V.O. KUDYSHKIN, R.Kh. MADIEV, E.K. IVANOVA, A.A. SARYMSAKOV, S.Sh. RASHIDOVA

TECHNOLOGY OF WASTE COMPONENTS SEPARATION OF LINEAR POLYETHYLENE PRODUCTION

The technology of the waste processing of linear polyethylene production was proposed. The technology includes the separation of low-molecular-weight polyethylene by centrifuging and subsequent supernatant distillation with the separation of low-boiling fraction with boiling points of 125-240 °C and bottoms. The paper presents the optimum technological modes of the processes necessary for the selection and design of equipment.

Key words: low-molecular-weight polyethylene, waste, centrifuging, distillation, low-boiling fraction, stillage bottom

A.A. GALIGUZOV, A.P. MALAKHO, V.V. AVDEEV, A.D. ROGOZIN

COMPARATIVE CHARACTERISTICS OF COAL TAR PITCHES: QUALITATIVE ANALYSIS, THERMAL AND STORAGE STABILITY

The article reports the results of a study of coal tar pitch characteristics influence on its thermal and storage stability. For current study three samples of coal tar pitches with different storage behavior were used. It was shown that one of the pitches exhibits a tendency to caking and clumping. It was found that the sample showed low thermal stability, which was confirmed by dramatic changes of its characteristics under thermal treatment due to high content of low-molecular weight hydrocarbons (naphthalene and its derivatives, anthracene and its derivatives) and high content of oxygen in initial coal tar pitch, as well as high content of fine fraction of parent pitch powder.

Key words: coal tar pitch, thermal analysis, viscosity, elemental analysis, thermal stability, stability at keeping

B.R. KISELEV, N.I. ZAMYATINA, R.E. ALLAKHVERDIEV, A.A. MELNIKOV, D.V. SMIRNOV

ENERGY ACTIVITY OF LUBRICANTS

Result of carried out researches showed that the most objective method of determination of energy activity of lubricants is a work of adhesion (wetting) on steel surface. The method was developed for determination of adhesion coefficient. Parameters of adhesion coefficients give the possibility of surfactants choice for design kinematically complex and hard load tribo-system.

Key words: lubricant, solid, surface energy, additive, surfactant, adsorption, adhesion, wetting

S.L. ZAKHAROV, V.N. BLINICHEV, A.V. EFREMOV, A.S. ZAKHAROV

EFFECT OF OPERATING PRESSURE ON SEPARATION PARAMETERS OF REVERSE OSMOSIS MEMBRANE FROM BOROSILICATE GLASS

The influence of the working pressure of the solution on the selectivity and performance of apparatus with membranes from borosilicate glass was studied. The main differences of nano-filtering and low-pressure reverse osmosis from the high-pressure reverse osmosis were considered.

Key words: reverse osmosis, nano-filtration, nano-porous membranes, porous structure, capillary-porous membranes

A.B. KAPRANOVA, I.I. VERLOKA, A.I. ZAITSEV

OPTIMIZATION OF PARAMETERS OF DEVICE FOR COMBINATION OF MIXING AND DEAERATION OF POWDERS

The example of multi-factor optimization in a case of calculation of centrifugal device with curvilinear blades for combination of mixing and deaeration of powders was considered. "Minimax principle" was used: maximality for performance - mixer and deaerator, the porosity of the mixture, pressure of gas in pores, and minimality for drive power, coefficient of heterogeneity, cross-sectional area of medium, and the thickness of layer.

Key words: optimization, parameters, process, target function, device, processes combination, mixing, deaeration, powder, mixture, productivity, power, porosity, gas permeability coefficient, heterogeneity coefficient

A.B. GOLOVANCHIKOV, A.A. SHAGAROVA

SIMULATION OF VISCOPLASTIC REACTION MASS FLOW IN SCREW REACTOR WITH LOW VISCOSITY WALL LAYER

The studies of flows structure were carried out for screw reactor with viscoplastic reaction medium. The comparative analysis of response curves of screw reactor with viscoplastic reaction medium and standard models of flows structure was done. The increase in the degree of conversion for screw reactor with a viscoplastic reaction mass was shown to achieve at feed to the wall layer the lubricant from low viscous liquid. At this the conversion degree increases by 7-8% at consumption of low-viscous liquid of 6% from consumption of reaction mass.

Key words: flow structure, screw reactor, viscoplastic reaction mass, conversion degree

B.A. BULGAKOV, D.I. KALUGIN, A.V. BABKIN, I.V. MAKARENKO, A.P. MALAKHO

SIMULATION OF CURING PROCESS OF COMPOSITE MATERIALS ON BASIS OF PROPARGYL MODIFIED PHENOL- FORMALDEHYDE RESINS

Non-isothermal kinetic simulation analysis was carried for carbon fiber reinforced composite material based on propargylatednovolac resins with various curing enthalpy. The simulation study was performed for composites with 40% mass resin content. The limited specific cure enthalpy that allows performing composite curing process without uncontrolled overheating and sample thermal destruction was shown to depend on the type of reinforced fiber. This value for carbon fiber based on composite was found to be 600J/g, whereas for glass fiber – 460J/g. This is due to the difference of thermal properties of these fibers.

Key words: propargylated phenolic resin, thermal resistance, simulation, curing

V.V. SAYAPOVA

POSSIBLE WAYS OF UTILIZATION OF DIMENSIONAL ELECTROCHEMICAL MACHINING SLIMES

The ecological problems of dimensional electrochemical machining (DECM) of various alloys were considered. Several methods for the slime utilization were studied. Currently the most acceptable solution for the problem of recycling slimes formed after DECM of titanium alloys is their use in the construction industry. Since the qualitative and quantitative composition of slimes after DECM of nickel chrome alloys is very complicated, then washed from salt and dried slime is better to direct to metallurgical works to extract individual elements or used as catalysts.

Key words: dimensional electrochemical machining, electrolyte, slime, recycle