ИЗВЕСТИЯ ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЙ

Т 58 (3) ХИМИЯ И ХИМИЧЕСКАЯ ТЕХНОЛОГИЯ 2015

C O N T E N T S

R E V I E W S

C H E M I S T R Y
(inorganic, organic, analytical, physical, colloid and high-molecular compounds)

C H E M I C A L T E C H N O L O G Y
(inorganic and organic substances. Theoretical fundamentals)

ECOLOGICAL PROBLEMS OF CHEMISTRY AND CHEMICAL TECHNOLOGY

PERSONALS

A B S T R A C T S

K.T. SHAKHMURZOVA, Zh.I. KURDANOVA, S.Yu. KHASHIROVA, A.A. BEEV, M.Kh. LIGIDOV, S.I. PAKHOMOV, A.K. MIKITAEV

POLYESTERKETONES. OBTAINING, PROPERTIES AND APPLICATION

The data on the synthesis of polyesterketones, including carded, comb-shaped and block polyetherketones were considered and generalized. It was revealed that the polyesterketones are a promising class of polymers, which are widely used in almost all fields of technic, which is associated with a unique combination of a broad set of valuable performance properties. The requirements for polymeric materials grow continuously. An important quality indicator of the growth is the appearance of the new and improved materials. The materials of the future, in particular, the high-performance polyetherketones open up new opportunities for innovative technical products.

Key words: synthesis, polymers, polyesterketones

A.N. PEREVOSHCHIKOVA, M.Yu. GILEV, Yu.S. ROZHKOVA, Yu.V. SHKLYAEV

SIMPLE SYNTHESIS OF 1-SUBSTITUTED 3,3,4,4-TETRAMETHYL-3,4-DIHYDROISOQUINOLINES

Reaction of 3,3-dimethyl-2-phenyl-butan-2-ol with a nitrile in concentrated sulfuric acid on the Ritter reaction leads to the formation of 1-substituted 3,3,4,4-tetramethyl-3,4-dihydroisoquinolines due to sequentially occurring Wagner -Meerwein rearrangement and Ritter reaction.

Key words: 3,3-dimethyl-2-phenylbutan-2-ol, Wagner-Meerwein rearrangement, 1-substituted 3,3,4,4-tetramethyl-3,4-dihydroisoquinolines

N.O. VASIL'KOVA, N.V. ZARAEVA, V.V. SOROKIN, A.P. KRIVEN'KO

AMINOAZOLES IN SYNTHESIS OF FUNCTIONAL-SUBSTITUTED AZOLOQUINAZOLINES

Functional- substituted azoloquinazolines were synthesized on basis of hydroxooxocyclohexanedicarboxylate, aldehydes, ethylacetoacetate and aminoazoles (3-amino-1,2,4-triazole, 2-amino-1,3-thiazole)using the method of two- and three-component cyclocondensation. The structure of obtained substancies was established with spectral methods.

Key words: triazoloquinazolines, thiazoloquinazolines, triazolopyrimidines, hydroxyoxocyclohexanedicarboxylates, 3-amino-1,2,4-triazole, 2-amino-1,3-thiazole

M.A. LAZOV, N.V. ALOV, A.M. IONOV, A.A. PEROV, S.G. DOROFEEV, N.N. KONONOV, S.G. PROTASOVA, R.N. MOZHCHIL, V.N. BAGRATASHVILI, A.A. ISHCHENKO

DETERMINATION OF NANOSILICON CHEMICAL COMPOSITION BY X-RAY PHOTOELECTRON SPECTROSCOPY

By the X-ray photoelectron spectroscopy the determination of the qualitative and quantitative composition of the "core-shell" silicon nanoparticles was carried out.The samples of nanocrystalline silicon were studied. These samples were obtained by annealing of the silicon monoxide followed by surface functionalization of the silicon core by hydroxyl groups, and octadecyl groups as well as under the decomposition of monosilane at the action of the laser irradiation followed by natural surface oxidation in the atmosphere. In the synthesized nanoparticles the average stoichiometry was determined, and revealed the dependence of photoluminescence properties of the particles on its composition. The composition of all samples can be expressed by the formula $Si/SiOx/SiO_2$, where Si - the core of the nanoparticles, SiOx - interface intermediate oxides corresponding to valence states of silicon Si^{1+}, Si^{2+} and Si^{3+}, and SiO_2 - outer shell of the nanoparticles. The data on the quantitative composition of the samples are presented. The interrelation between the composition of the samples and their photoluminescent properties are discussed.

Key words: nanosilicon, composition of the nanosilicon quantum dots, valence states of silicon, photoluminescence, X-ray photoelectron spectroscopy, quantum size effect

T.Yu. OSADCHAYA, A.V. AFINEEVSKIY, D.A. PROZOROV, M.V. LUKIN

CATALYTIC PROPERTIES OF MODIED SKELETAL NICKEL IN REACTION OF LIQUID-PHASE HYDROGENATION OF P-NITROTOLUENE

The kinetic parameters of p-nitrotoluene hydrogenation on a skeletal and modified skeletal nickel catalyst were determined. The concentration of the modifying agent was shown to act by various ways on the reaction kinet-

ics of hydrogenation and allows carrying out fine adjustment of the activity and the stability of the catalyst operation in a chosen process.

Key words: kinetic parameters, liquid phase hydrogenation, 4-nitrotoluene, 4-aminotoluene, modifying agents, Raney nickel, adsorption

A.I. KRASNOV, A.A. MERKIN, N.Yu. SHARONOV, A.R. LATYPOVA, M.P. NEMTSEVA, O.V. LEFEDOVA

EFFECTS OF TEMPERATURE AND SOLVENT ON HYDROGENATION RATE OF 2-CHLORO-4-NITROANILINE

The study of the kinetics of liquid phase hydrogenation of 2-chloro-4-nitroaniline in aqueous solutions of 2-propanol at various temperatures and the number of uptaked nitro compound was carried out. It was established that the by-process decreasing the reaction selectivity with respect to 2-chloro-1,4-phenylenediamin is dehalogenation. It was noted that the degree of dehalogenation increases with the mole fraction of water in a solvent and temperature and decreases with the increasing the initial quantity of nitro compound.

Key words: skeletal nickel, supported palladium catalysts, hydrogenation, 2-chloro-4-nitroaniline, 2-propanol-water, dehalogenation, acetic acid

Yu.M. ARTEMKINA, L.V. KOVALENKO, E.N. KOROTKOVA, A.G. POLIVANOVA, V.V. SHCHERBAKOV

PECULIARITIES OF ABSORPTION OF MICROWAVE ENERGY WITH SOME POLAR SOLVENTS AT FREQUENCY OF 2455 MHZ

The analysis of high-frequency (HF) electric conductivity (EC) of acetone, water, dimethyl sulfoxide (DMSO), methanol, ethanol and propanol-1 was carried out at the temperature of 298.15 K. The limit HF EC of acetone and water is maximum one and is minimum one for alcohols. HF EP at a frequency of 2455 MHz is a maximum one for methanol and is minimum one for acetone. The rate of absorption of microwave energy by polar solvents was determined. The rate of HF heating was shown to increase directly proportional to the HF EC of polar solvent.

Key words: high-frequency conductivity, microwave energy, high-frequency heating, acetone, water, dimethylsulfoxide, methanol, ethanol and propanol-1

E.Yu. MOSHCHENSKAYA, V.V. SLEPUSHKIN, Yu.V. RUBLINETSKAYA, B.I. KASHKAROV

MODELING METHOD OF STATE DIAGRAMS OF BINARY EUTECTIC SYSTEMS OF ALLOYS

The method of constructing phase diagrams "composition-temperature" of binary eutectic systems on an example of heterogeneous alloys of Cr-Lu and Al-Ge was considered. The equations to describe the liquidus curves of binary eutectic systems, finding the composition and temperature of eutectic were proposed. The aim of this study is modeling the state diagrams of binary eutectic alloy systems by means of theoretical calculations.

Key words: phase diagrams, two-component eutectic metal system of alloy, methods for calculating liquidus curve

S.A. MAZUNIN, V.L. CHECHULIN

ON FLATNESS OF STRUCTURES OF NON-VARIANT AND INVARIANT SOLUTIONS, THEIR REFRACTIVE INDEX IN MULTICOMPONENT WATER-SALT SYSTEMS

The property of flatness of non-variant compositions and non-variant solutions in multicomponent aqueous salt systems was described. The additional parameter – the index of refraction of saturated solutions -was considered. It was established that adding additional physical parameters – refractive index of the liquid phase – the property of flatness is maintained. This is proof predominantphysical nature of the interaction of particles of the solute in repeatedly saturated solutions.

Key words: non-variant equilibrium lines flatness, collegiate property, solution refractive index, multicomponent water-salt system, physical nature of the interaction in multiply saturated solutions

I.B. SOBECHKO, Yu.I. GORAK, Yu.Ya. VAN-CHIN-SYAN, V.V. KOCHUBEIY, M.Ya. PUNYAK, N.D. OBUSHAK

TERMODYNAMICS OF SOLUBILITY OF ISOMERIC 5-(NITROPHENYL)-FURAN-2-CARBOXALDEHYDES IN ORGANIC SOLVENTS

On the temperature dependence of the solubility of isomeric 5 - (nitrophenyl) -furan -2 -carbaldehydes the thermodynamic characteristics of their dissolving in benzene , acetonitrile , ethyl acetate, dimethylketone , and 2 -propanol were calculated. With thermogravimetric method the melting enthalpies investigated aldehydes were determined. Those values were recalculated to 298 K. The enthalpies of aldehydes mixing with the solvents mentioned above were calculated. Linear dependence of the solubility of isomeric 5 - (nitrophenyl) -furan -2 –carbaldehydes was noted in various solvents.

Key words: 5-(nitrophenyl)-furane-2-carbaldehydes, solubility; dissolution enthalpy

R.Sh. VALIEV, L.N. OLSHANSKAYA

BIOELECTROGENESIS OF MINUTE DUCKWEED *LEMNA PERPUSILLA* TORR. IN PROCESS OF PHYTOREMEDIATION OF WATERS FROM COPPER SALTS

The article describes the mechanisms of generation of bioelectrical potentials in plants, its functions in plant life. Dynamics of the surface potential of minute duckweed in copper solutions is studied. It was shown, that the potentials of the plant in sulphate, nitrate, chloride and acetic solutions of copper with concentration of the metal of 10 mg/l are practically identical. It was found, that there was a smooth increase of the potential within 1.5-2 h up to ~350 mV in acetic solution with concentration of metal of 0.1 mg/l. After that the potential was constant. There was a different situation for more concentrated solutions (1 and 10 mg/l). At first, the increase in potential occurred up to ~315 mV within 30-40 minutes followed by the decrease up to ~240 mV within one hour. After that the potential was increased up to ~380 mV after 6 hours of the experiment.

Key words: bioelectrogenesis, surface potential, minute duckweed, copper solutions

A.F. GOLOTA, S.A. SELEZNEV

LUMINESCENCE AND SPECTRAL CHARACTERISTICS OF PHOSPHORS BASED ON SULFIDES OF STRONTIUM-CALCIUM

Spectra of stationary and stimulated luminescence of SrS: Eu, Sm and CaS: Eu, Sm were studied. The differences in spectral characteristics of the studied compounds were established. It was determined that in an excitation spectrum of the calcium sulfide phosphors, unlike strontium sulfide the band with wavelength of $\lambda = 350$ nm is presented. Due to this band the increase in a level of steady luminescence takes place at UV excitation of this phosphor in a range of $\lambda max = 365$ nm.

Key words: phosphor, photostimulated luminescence, excitation spectrum, stimulation, thermally stimulated luminescence

M.S. SOLODOV, A.S. SOLODOV, A.V. BALMASOV

INVESTIGATION OF COMPOSITE MATERIAL FROM CONDUCTIVE POLYANILINE AND CARBON BLACK FOR ELECTRODES OF SUPER CAPACITORS

An electrochemical synthesis of polyaniline composite / carbon black was carried out. The capacitive characteristics and stability of the resulting composite material and polyaniline were studied by cyclic voltammetry. The capacity of the composite material is determined by the capacity of the electrical double layer and pseudo capacity of electrically conductive polymer. The optimum content of carbon black in the composite material is in the range from 10% to 40% by weight.

Key words: super capacitor, composite, electrically conductive polyaniline, carbon black, morphology

E.A. MEZINA, N.V. LOSEV, I.M. LIPATOVA

PRODUCTION OF COMPOSITE MATERIALS ON BASE OF CHITOSAN AND MECHANO-ACOUSTICALLY ACTIVATED MICROCRYSTALLINE CELLULOSE

The influence of the mechano-acoustic action realized in rotor--pulse devices on aqueous suspensions of microcrystalline cellulose (MCC) was studied. The mechanical activation was established to cause the increase in their sedimentation stability, the change in ζ-potential and the growth in MCC water retention and sorption ability. This is due to the disintegration of particles and their surface amorphization. Preliminary mechanical MCC activation before their addition to chitosan aqueous solutions was shown to allow the increase in several times the composite chitosan-cellulose films (1:1) strength.

Key words: chitosan, microcrystalline cellulose, rotor-pulsed device, mechano-acoustic action

I.A. KIRSH, T.I. CHALYKH

ULTRASONIC TREATMENT OF POLYMER MELTS OF DIFFERENT CHEMICAL NATURE

The results of investigations of effect of ultrasonic treatment on the joint processing of polymer mixtures simulating waste polymers at recycling are presented. The effect of processing cycles on the change in viscosity, molecular weight, chemical and physical properties as the original polymers, and their mixtures was determined.

Key words: polymers, ultrasound, viscosity, molecular weight, physical and mechanical properties

O.I. KRIVONOS, E.N. TEREKHOVA, V.D. GALDINA, G.V. PLAKSIN

INVESTIGATION OF MINERAL COMPONENTS OF OIL-SHALES AND THEIR CARBONMINERAL RESIDUES AT THERMOLYSIS

Composition and physico-chemical properties of the mineral components of the oil-shales of Kotsebin and Kashpir deposits were studied with various instrumental methods. A study of the thermolysis of kerogen of oil-shale was carried out in the temperature range of 400-500°C. The textural characteristics of the solid carbon-mineral prod-

ucts were estimated. The possibility of obtaining organic-mineral mixtures, applicable in road construction, based on dispersed oil-shale was investigated.

Key words: oil-shale, kerogen thermolysis, oil-shale chemical composition, solid carbon-mineral products, asphalt concrete

A.N. BELYAKOV

APPLICATION OF DISCRETE MODELS OF BOLTZMANN EQUATION TO DESCRIBE COMBINED PROCESSES IN GRINDING TECHNOLOGY

A mathematical description of combined mechanical processes in milling circuits of arbitrary structure based on the discrete models of the Boltzmann equation was proposed. Some results of numerical experiments are presented.

Key words: granular material, mechanical processes, grinding, classification, motion, combined processes, fluidized bed jet mill, closed cycle

I.I. SHEPELEV, N.N. BOCHKOV, A.Yu. SAKHACHEV

TECHNOLOGY OF RECEPTION OF COMPLEX INORGANIC INDUSTRIAL BINDING MATERIAL ON BASIS OF WASTES OF INDUSTRIAL PRODUCTION

Researches on selection of composition of complex binding material on the basis of industrial wastes were carried out.The strength characteristics of compositions of binding components were studied. The most optimal and effective compositions of road mixtures providing high strenght of samples at pressing were determined. The technology of preparing the complex inorganic binding material for road was tested and developed. This material was made from nepheline slime, gipsum-containig component and local inert materials.

Key words: nepheline slime, gypsum-anhidrite, gypsum-containing wastes, road clothes, complex binding material, industrial tests of technologies

D.A. VOIYNO, L.N. SHIYAN, K.I. MACHEKHINA

INTEGRATED APPROACH TO DRINKING WATER OBTAINING FROM UNDER GROUND SUPPLY SOURCES OF WESTERN SIBERIA

It was shown that underground water of Western Siberia can be divided into two types according to the monitoring. The first type of water is characterized by hydro- carbons iron. The second type is the water where iron presents in colloid form, which is caused by the presence of humic substances and dissolved silicon compounds. Colloid form of iron causes difficulties at choice of technology of water treatment and at carrying out the quantitative chemical analysis. It was recommended to use a comprehensive approach that includes analytical determination of impurities, the establishment of their form and the choice of water treatment technologies to solve the problem of groundwater treatment of the second type.

Key words: form of impurities, colloid substances, methods of analytical quality control, water treatment technologies

R.K. GIMRANOV, O.B. BUTUSOV, V.P. MESHALKIN, R.A. KANTUKOV, G.M. KAZANSKY, A.G. POPOV, F.M. MUSTAFIN, R.R. KANTYUKOV, V.K. MODIN

COMPUTER-AIDED ANALYSIS OF GAS PIPELINES ECOLOGICAL RISKS

The analysis of ecological risks in a region of gas pipelines was carried out. The equation for atmosphere transport modeling of accident clouds under incomplete information was proposed. The definition of ecological risk was formulated. Relations for calculations of ecological risk were presented.

Key words: atmosphere transport modeling, fuzzy equations, ecological risk