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CHEMICAL TECHNOLOGY

(inorganic and organic substances.
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А Б С Т Р А К Т С

A.M. BORISOV, S.M. KUZMIN, V.G. VOSTRIKOV, N.V. TKACHENKO, V.I. PARFENYUK
ARC DISCHARGE SYNTHESIS OF BORON CARBONITRIDE AND ITS OXIDATION
AT LOW TEMPERATURE

The results of study of superfine boron carbonitride synthesized by the arc discharge method are presented. It was shown that in the process of synthesis the doping of carbon structures by hetero atoms occurs. As a result the ratio of the elements is B:C:N:O is 24:66:6:2, respectively. Low-temperature oxidation of obtained carbonitrides proceeds in two steps: the first one is the accumulation of phase of cubic boron nitride, the second one is the accumulation of boron oxide.

Key words: superfine boron carbonitride; arc discharge method; low-temperature oxidation

S.P. MAKAROVA, E.V. RUMYANTSEV, E.V. ANTINA
COMPLEXATION OF ALKYLATED BILATRIENES WITH Zn(II), Cd(II), Co(II), Ni(II), Cu(II),
Mn(II) AND Pb(II) IN DIMETHYLFORMAMIDE

Processes of complexation of 7,8,12,13-tetraethylbilatriene-a,b,c and 7,13-dimethyl-8,12-dibutylbilatriene-a,b,c with acetates of Zn(II), Cd(II), Co(II), Ni(II), Cu(II), Mn(II) and Pb(II) in dimethylformamide under 298.15 K were investigated by the methods of UV-vis spectroscopy. For all systems the formation of metal-complex systems was shown to occur. It allows to identify their compositions and to suppose the structure and to determine the constants of complexation processes. The coordination of bilatrienes with d-metals ions was revealed to accompany with the formation of mono nuclear complexes whereas coordination with the Pb²⁺ ion results in the biligand complexes formation. Regularities of d-metals cation influence on the thermodynamic stability of mononuclear biladienes chelates were established.

Key words: complexation, bilatrienes, d-metals, lead (II), mononuclear complex, biligand complex, absorption electron spectra, stability

A.M. MAGERRAMOV, G.SH. DURUSKARI, KH. A. GARAZADE, A.G. LUTFALIEV, I.A. ALIEV,
M.N. MAGERRAMOV

SYNTHESIS OF SOME NITROGEN CONTAINING STYRENE DERIVATIVES

The dehydrochlorination of substitution products of chlormethyl group with the chlorine atoms in compounds of chlormethylation of 1-phenyl-1-chloropropane leads to a formation of nitrogen containing derivatives of styrene with the yield up to 70%.

Key words: styrene, ethylbenzene, chlormethylation, piperidine, chlorination

V.G. AMELIN, I.V. PODKOLZIN, A.V. TRET'YAKOV

APPLICATION OF MASS-SPECTROMETRY WITH INDUCTIVE-COUPLED PLASMA FOR ORIGIN IDENTIFICATION AND REVEAL OF FALSIFICATION OF NATURAL MINERAL WATERS

The principal possibility of mass-spectral method with inductive-coupled plasma for reveal of geographic region of origin and establishment of falsification of natural mineral water was shown using the results of elemental analysis and Li/U, Mn/Ge, Li/Mo, Li/Sr, B/Ba, Rb/Th concentration ratio.

Key words: mass spectrometry with inductive-coupled plasma, natural mineral water, microelement composition

T.E. NIKIFOROVA, V.A. KOZLOV, S.V. NATAREEV, E.A. SOLOVYOVA
SORPTION OF COPPER (II) IONS FROM WATER SOLUTIONS BY CELLULOSE
CONTAINING SORBENT

The sorption of Cu²⁺ ions with a polysaccharide biosorbent from water solution of CuSO₄ was studied. Experimental data on sorption of copper (II) ions were treated within the frame of theory of volume filling of micro pores. The sorption of metal ions was established to proceed on anionic sorbent sites on the mechanism of ionic exchange.

Key words: ionic exchange, copper ions, cellulose containing sorbent

T.V. ALYKOVA, N.M. ALYKOV, D.R. ASANOVA
**ADSORPTION STUDY ON SORBENT SV-1 OF ENZYMES-ANTIOXIDANTS OBTAINED
FROM POTATO TUBERS**

The adsorption on sorbent SV-1 of the enzymes-antioxidants obtained from tubers of potato was studied. The sorbent SV -1 was obtained by non- chemical processing of molding boxes of the Astrakhan region. Possibility of practical application of product of sorption concentrating enzymes-antioxidants for providing the live safety was shown.

Key words: enterosorbent, enzymes-antioxidants, molding boxes

E.V. SELIVANOVA, E.A. PRUTENSKAYA, M.G. SULMAN, E.M. SULMAN
OPTIMIZATION OF ULTRASONIC EXTRACTION OF HYDROCARBONS FROM OIL-SLIME

The process of extraction of petroleum hydrocarbons from oil sludge was studied. The optimal parameters of extraction of petroleum hydrocarbons were found. The ultrasonic treatment was shown to allow reducing extraction time and increasing the degree of extraction of petroleum hydrocarbons from the samples.

Key words: ultrasound, hydrocarbon, oil, oil-slime, extraction

V.V. PANTELEEVA, A.B. SHEIN
IMPEDANCE OF CoSi-ELECTRODE IN SULPHURIC ACID SOLUTION

The results of investigation of anodic behaviour of CoSi in sulphuric acid solution at the potentials from corrosion potential up to oxygen evolution potential by polarization and impedance measurements are presented. Impedance spectra were described with the help of equivalent electric circuit taking into consideration the presence of oxide film on electrode surface. The dependences of the electric circuit parameters as well as of time constants on the electrode potential were analyzed. The conclusion was done that the high anodic resistance of cobalt mono silicide in sulphuric acid solutions is due to barrier properties of the oxide film.

Key words: cobalt, silicide, anodic dissolution, passivation, impedance

A.I. MAXIMOV, A.V. KHLUSTOVA, A.K. GROSHEVA
ACTION OF LOW-VOLTAGE UNDERWATER DISCHARGES ON DYES SOLUTION MIXTURES

Data on kinetic decolorization of mixtures of the organic dyes solutions at underwater electrical discharges action are presented. The rate of decolorization was shown to depend on dyes content ratio and does not depend on initial temperature of solution

Key words: underwater discharges, decolorization, barbotage

O.A. SEMENOVA, A.M. EFREMOV, V.I. SVETTSOV
KINETIC AND TRANSPORT CHARACTERISTICS OF ELECTRON IMPACT PROCESS IN METHANE

A set of cross sections for electron impact for the methane molecule was obtained. The electron energy distribution function as well as the integral characteristics of electron gas (average energy, drift rate, diffusion coefficient and mobility) and the rate constants for electron impact processes were calculated using the numerical solution of steady-state kinetic Boltzmann equation in one component approximation.

Key words: methane, EEFD, rate constant, ionization, dissociation

E.M. KUVSHINOVA, A.S. SEMEIYKIN, S.A. SYRBU, O.A. GOLUBCHIKOV
**KINETICS OF COORDINATION OF NITRODERIVATIVES OF 5,15-BIS-PHENYL-
TETRAMETHYLTETRAETHYLPORPHYN BY COBALT ACETATE IN ORGANIC SOLVENTS**

The kinetics of cobalt complexation with nitro-derivatives of 5,15-bis-phenyltetramethyltetraethylporphyrin: 5,15-bis(4-nitrophenyl)tetramethyltetraethylporphyrin; 5,15- diphenyl-10-nitro tetramethyltetraethylporphyrin; 5,15- diphenyl-10,20-dinitrotetramethyl-tetraethylporphyrin; 5(4-nitrophenyl)15- phenyl-10,20- dinitrotetra-methyltetraethylporphyrin; 5,15- bis(4- nitrophenyl)-10,20-dinitrotetramethyl-tetraethylporphyrin in pyridine and acetic acid –benzene(7:3) was studied. The kinetic parameters of the process depend on a degree of the tetrapyrrole macrocycle deformation, the solvation effect and electron effects of NO₂-groups.

Key words: nitro derivatives, porphyrine, complexation, organic solvent

O.A. FEDYAEVA
**STUDYING KINETICS OF HYDROGENATION REACTIONS OF CARBON OXIDES
ON CATALYSTS CdTe AND CdHgTe**

Reactions kinetics of hydrogenation of CO and CO₂ on semi-conductor catalysts CdTe, CdHgTe was studied. Kinetic characteristics of reactions of hydrogenation of carbon oxides were determined. Participation in hydrogenation reactions of superficial anion-radicals CO₂⁻ was confirmed. The analogy in the empirical equ-

ations of hydrogenation of CO on CdTe and on metal catalysts was established. Extreme reduction of reaction rate with temperature growth was pointed out.

Key words: kinetic parameters, active sites, catalytic hydrogenation

R.N. RUMYANTSEV, A.A. ILYIN, A.P. ILYIN, A.B. ZHUKOV

SYNTHESIS AND CATALYTIC PROPERTIES OF POTASSIUM MOLYBDATE IN REACTION OF PARTIAL OXIDATION OF METHANOL TO FORMALDEHYDE

With the methods of X-ray phase and X-ray structural diffraction, simultaneous thermal analysis and infrared spectroscopy the process of joint mechanical activation of K_2CO_3 and MoO_3 was studied in order to obtain the potassium molybdate. Physico-chemical and catalytic properties of synthesized molybdate were investigated in the reaction of partial oxidation of methanol to formaldehyde.

Key words: mechanical activation, potassium molybdate, methanol oxidation, formaldehyde, polymorphic transformations

P.V. SINGIN, I.P. TRIFONOVA, YU.N. ERSHOVA, V.A. BURMISTROV, O.I. KOIFMAN

PECULARITIES OF SORPTION AND PERMEABILITY OF MEMBRANES BASED ON MIXTURE OF CELLULOSE DIACETATE AND POLYVINYL FORMAL MODIFIED BY TETRAPHENYLPORPHINE

Extreme dependence of the swelling degree of polymeric membranes formed from cellulose diacetate and polyvinyl formal mixtures on the composition of the polymer matrix was discovered. The diffusion of zinc acetate aqueous solutions through these membranes was studied. The monotonic increase of permeability coefficient with the increase in polyvinyl formal content in polymer blends was shown.

Key words: sorption, permeability, cellulose diacetate, polyvinyl formal, tetraphenylporphin

M.Zh. BURKEEV, A.K. MAGZUMOVA, G.K. BURKEEVA, E.M. TAZHBAEV, A.V. OMASHEVA,

Zh.B. ISKAKOVA

SYNTHESIS AND INVESTIGATION OF COPOLYMERS OF UNSATURATED POLYESTER RESIN WITH VINYL MONOMERS

The radical copolymerization of unsaturated polyester resin and acrylic acid and acrylamide was investigated. Compositions of copolymers and copolymerization constants for studied systems were determined. The influence of external factors on the behavior of hydrogels under consideration was studied. Susceptibility of studied hydrogels to the change in medium pH, solvent nature and concentration of low molecular salt was determined experimentally.

Key words: polymers, hydrogels, unsaturated polyester resin, acrylic acid, acrylamide

R.M. KUMYKOV, A.A. BEEV, A.K. MIKITAEV, A.L. RUSANOV

NEW SOLUBLE POLYNAPHTHYLIMIDES BASED ON DERIVATIVES OF CHLORAL

Not previously described soluble polynaphthtylimides was obtained by the reaction of 3,3'-diamino-4,4'-dihlorarilenes with aroylen bis (naphthalic anhydrides) containing dichlorethylene, simple ether and carbonyl groups. The effect of the introduction of chlorine atoms in aromatic rings, dihllorethylene, carbonyl and methylene groups between the phenyl nuclei of the central fragments of the original diamines on thermal and mechanical properties of the synthesized polymers was studied.

Key words: polynaphthtylimide, polycyclocondensity, fire-resistance, solubility, catalyst

D.F. GRISHIN, N.B. VALETOVA, I.S. IL'ICHEV

INFLUENCE OF STRUCTURE OF HALOGEN-CONTAINING INITIATORS ON POLYMERIZATION OF METHYL METHACRYLATE CATALYSED BY ZEROVALENCY NICKEL COMPOUNDS FORMING IN SITU

The features of methyl methacrylate polymerization proceeding in the presence of bis(triphenylphosphine)nickel dibromide, zinc dust and various arylhalide initiators were studied. The introduction of strong electron-accepting groups into the para-position of the arylbromide was established to result in the considerable growth of polymer yield.

Key words: aryl bromides, bis(threephenylphosphine) nickel dibromide, zinc dust, catalysis, polymerization, methylmethacrylate

A.E. ZAVADSKIY

PECULIARITIES OF SUPRAMOLECULAR STRUCTURE OF WOOL FIBERS

X-ray diffraction research of oriented wool fibers has shown strongly pronounced anisotropy of crystallite regions and lack of orientation of an amorphous phase of biopolymer. It was offered to estimate the change in the content of an amorphous phase in wool fibers at various actions by a comparison method on the normalized intensity of coherent component of diffuse halo.

Key words: wool fibers, X-ray diffraction analysis, anisotropy, crystallites, diffuse scattering

*A.A. RZHEVSKIY, E.M. ALOV, N.P. GERASIMOVA, E.V. ZHIKHAREV, E.A. ZAIYCHIKOVA,
G.A. PLOTNIKOV*

SYNTHESIS OF NEW S- AND N- DERIVATIVES OF 5-(4-METHYLPHENYL)-2,4-DIHYDRO-3H-1,2,4-TRIAZOLE-3-THIONE

The interaction between 5-(4-methylphenyl)-2,4-dihydro-3H-1,2,4-triazole-3-thione and different monoelectrophyles was studied. The best reaction conditions were chosen. New derivatives of 1,2,4-triazole-thiones were synthesized on the base of available reagents.

Key words: 1,2,4-triazole-3-thione, S-alkylation, N-acetylation, Mannich reaction

S.V. BAYIKOV, E.R. KOFANOV, V.V. SOSNINA, M.V. KARUNNAYA, G.G. KRASOVSKAYA, A.S. DANILOVA
OXIDATION OF 3-ARYL-5-METHYL-1,2,4-OXADIAZOLES

The oxidation of 3-aryl-5-methyl-1,2,4-oxadiazoles was considered. The reaction products were aromatic carboxylic acids and 3-aryl-1,2,4-oxadiazole-5-(4H)-ones. The methyl group in the 5-position of 1,2,4-oxadiazole ring is stable to oxidizing agents of different nature.

Key words: 1,2,4-oxadiazole-5-carboxylic acid, 5-methyl-1,2,4-oxadiazole, oxidation

V.I. MALOVA, V.B. LYSKOV, ZH.V. CHIRKOVA, I.G. ABRAMOV
REDUCTION OF NITROPHALONITRILES

The reaction of reduction of nitrogroup in nitroptalonitrile proceeding under the action of various reductive systems was investigated. On the base of the received results the way of synthesis aminophtalonitriles was improved, and the yield of target products in this case exceeds 90 %

Key words: nitroptalonitrile, aminophtalonitrile, reduction, tin chloride (II)

D.V. KORABELNIKOV, M.A. LENSKIY, A.V. OZHOGIN

INCREASE IN HEAT AND WEAR RESISTANCE OF FRICTION POLYMER COMPOSITIONS BY ADDITION OF POLYMETHYLENE-P-THREEPHENYL ESTER OF BORIC ACID

The possibility of conyting the physical and mechanical characteristics and wear resistance of friction polymeric materials based on rubber polymethylene-p-threephenyl ester of boric acid was shown. A considerable increase in heat resistance of the modified non-asbestos composition was established.

Key words: polymer frictional composition, brake pads, polymethylene-p-threephenyl ester of boric acid, strength, wear resistance, heat resistance

*S.F. URMANCHEEV, V.Z. MINGALEEV, Yu.V. MOROZOV, I.SH. NASYROV, V.P. ZAKHAROV,
Yu.B. MONAKOV*

OPTIMIZATION OF DIFFUSER-CONFUSER SECTIONS NUMBER IN TURBULENT REACTOR FOR POLYMERS SYNTHESIS

On the base of the $k-\varepsilon$ turbulence model the simulation the vortex flows in the reactor of diffuser-confuser type was carried out for different viscosities of mixture. The tubular turbulent apparatus of diffuser-confuser construction from four sections was shown to provide a high level of mixing in beginning of the conversion growth of molecular masses of stereoregular polydiene during their synthesis.

Key words: turbulent reactors, $k-\varepsilon$ turbulence model, mass transfer, synthetic rubber production

*A.L. SMIRNOV, S.YU. SKRIPCHENKO, V.N. RYCHKOV, M.G. SHTUTSA, E.S. KOPARULINA,
A.M. PASTUKHOV*

STUDY OF URANIUM TETRAFLUORIDE GRANULATION PROCESS

The possibility of producing a granulated uranium tetrafluoride on the plate granulator is considered. The effect of amount of added binder, time of granulation process, temperature and time of drying on characteristics of the granules produced was studied. The optimal conditions of uranium tetrafluoride granulation process were determined.

Key words: uranium tetrafluoride, granulation, roll briquetting method

D.V. KUDELIN, T.N. NESIOLOVSKAYA, A.B. VETOSHKIN
**EVALUATION OF STRENGTH PROPERTIES OF THIN-WALLED RUBBER PRODUCTS
AT CONDITIONS OF COMPLEX-DEFORMED STATE**

Estimation methods of strain-strength properties of rubbers at conditions of complex-deformed state were developed. These methods allow determining the deformative and limiting parameters of materials for the same sample. The statistical treatment of data confirming the accuracy the proposed methods was carried out. This allows to use these methods as fast methods for forecast of membranes behavior during operation.

Key words: complex-deformed state, strength, tears resistance, rubber diaphragm, spherical indenter

V.G. GOLUBEV, V.K. BISHIMBAEV, A.A. VOLNENKO, T.S. BAZHIROV
**DETERMINING NUMBER OF NUCLEATION CENTERS AT HETEROGENEOUS
CONDENSATION OF VAPORS**

In the given work the calculated dependence for determining the number of heterogeneous centers during the condensation processes from dusty gas-vapor mixtures is offered. The initial parameters allowing implement calculations on the given expression were determined. The accomplished verifying calculations have shown their adequacy to the real data. We consider that the offered calculation procedure and the obtained results will be useful at analyzing the condensation efficiency and slugging processes.

Key words: condensation, sludge formation, condensation centers, gas-vapor mixture, dust, condensers

A.ZH. SUIYGENBAEVA, R.R. YAKUBOVA, D.S. SABYRKHANOV, S.A. SAKIBAEVA
DETERMINATION OF STATISTICAL CHARACTERISTICS AT MIXING PROCESS

Mathematical description of the feature of disperse mixing the ingredients of polymer mixture was offered. That description takes into account the change in statistical characteristics for the mixing process – the effective dynamic diffusion coefficient and fractal dimension of medium.

Key words: rubber mixtures, dispersing mixing, statistical characteristics, dynamical diffusion coefficient, medium fractal dimension

S.P. BOBKOV, S.S. SMIRNOV
**VERIFICATION OF ADEQUACY OF DISCRETE DYNAMICAL MODEL OF DEFORMATION
PROCESS OF SOLID**

The article is devoted to study of adequacy of the discrete model describing the process of elastic deformation of the one-dimensional solid. The impulses propagation in the solid and its reflection from interface of two media was considered. The check of energy conservation law was done.

Key words: discrete models, cellular automata, elastic waves

A.M. BESSARABOV, A.L. KOCHETYGOV, A.V. KVASYUK, G.E. ZAIKOV
**SYSTEM ANALYSIS AND CONTROL WITH INNOVATIVE RESOURCES OF INDUSTRY
COMPLEXES OF CHEMICAL AND PETROCHEMICAL INDUSTRY**

For effective innovative politics accomplishing by state administration the meso economical analysis of innovative resources of chemical industry of Russian Federation was carried out. On the base of proposed methodology of system analysis and modern economical-mathematic models the basic tendencies of innovative development were revealed for 165 leading enterprises of chemical and petrochemical industry. The forecasting and integrated criterial estimation of innovative resources was done. For Industry Ministry the control system was developed. This system informative core is statistic forms for 1995-2008 years.

Key words: system analysis, innovation controlling, innovative resources, information technologies, chemical and petrochemical industry

A.M. ALIEV, E.M. MAMEDOV, G.S. ALIEV, U.A. ABASOVA, I.G. MELIKOVA
**MATHEMATICAL DESCRIPTION AND CALCULATION OF REACTOR FOR PROCESS
OF VAPOR-PHASE OXIDATION OF METHYL ALCOHOL TO FORMIC ACID**

On base of experimental data, kinetic model and theoretical optimization the mathematical description of process of vapor-phase oxidation of methyl alcohol to formic acid was carried out on modified zeolite catalyst Pd-modernite. The temperature distribution, reactive media pressure, and change in formic acid moles along reactor length as well as reactor overall dimensions were determined.

Key words: mathematical modeling, methyl alcohol oxidation, formic acid, zeolite, reactor calculation