

Summaries

UDC 544.022.347

Shimanskii A.F.
INFLUENCE OF DEVIATION FROM STOICHIOMETRY
ON SINTERING KINETICS OF ION SOLID BODIES

It has been shown that deviation from stoichiometry of ionic crystal composition defines mass transfer velocity at the initial stage of solid-phase sintering and process motive force at liquid phase. The model describing interaction of nonstoichiometry and sinterability of ionic solid bodies was proposed.

UDC 666.762.2

Antipina S.A., Vereschagin V.I.
HEAT-RESISTANT MATERIAL FOR ALUMINUM CASTING

New heat-resistant material on basis of calcic-siliceous binder and wollastonite for lining runners, casting molds, buckets for taking liquid aluminum has been proposed. The results of studying the structure and properties of heat-resistant wollastonite with high thermal and chemical resistance conditioned by composition and properties of silicate bond and filler characterized by close values of thermal coefficients of linear expansion are given. It is shown that asbestos-thermal silicates on basis of anthophyllite asbestos exceed the developed heat resistant material in several time in a number of tests at heat resistance test.

UDC 691.3

Mitina N.A., Vereschagin V.I.
BUILDING MATERIALS ON BASIS
OF ACTIVATED SILICA SAND

The possibility of obtaining building materials with high strengthening indices on basis of high-silica raw material of Siberian region has been shown. It is achieved by fine grinding of siliceous raw material and application of chemical activators and, in this case, products made of the studied compositions have maximal resistance mark M300. Products with filler in the ration bonder: filler =50:50 has the mark M100-150. Not ground natural silica sand is used as a filler.

UDC 666.597

Kulinich E.A., Khabas T.A., Nikolaeva O.O.
INFLUENCE OF A TYPE AND METHOD OF INTRODUCING
ADMIXTURES OF OXIDES OF RARE-EARTH ELEMENTS ON
COLOR OF DENTAL PORCELAIN

Glass-ceramic material which may be used in stomatology for making dental layer of multiple coating of pivot tooth has been obtained. To color the material the admixtures of compounds Tb and Ce as well as complex admixture representing a mixture of oxides Ce, Nd and La are used. It is shown that addition of Tb oxide color material only together with Ce oxide. It is ascertained that at growth of content of oxide admixtures of rare-earth elements in sample composition the increase of coloring power of sintered material is observed. Wave length of reflected light of the studied samples is in the range of 600..650 nm that corresponds to yellow-orange and orange-red spectral region.

UDC 536.46:544.452.2

Sakovich G.V., Arkhipov V.A., Vorozhtsov A.B., Korotkikh A.G.
SOLID PROPELLANTS ON BASIS OF DOUBLE
OXIDIZER CONTAINING ALUMINUM ULTRA-FINE POWDER

The results of experimental investigation of the processes of thermal decomposition and ignition of new class of solid propellants containing aluminum ultra-fine powder and double oxidizer on basis of perchlorate

and ammonium nitrate have been given. The combustion products of the studied mix solid propellants were analyzed. It was found out that partial change of ammonium perchlorate by ammonium nitrate decreases thermal decomposition temperature, content of condense particles and chlorinated components in combustion products of solid propellants.

UDC 539.23:539.25

Dubrova N.A., Lider A.M., Chernov I.P.
TEMPLATE SYNTHESIS OF SILVER NANOSTRUCTURES

Using chemical synthesis technique based on metal ion reduction from solution on inner walls of pores of polycarbonate track membranes, silver nanotubes and nanobundles have been obtained. Optimal conditions of metallization of polycarbonate track membranes for obtaining homogeneous and regular nanotubes were determined.

UDC 546.261:620.193+541.183

Kurzina I.A., Chukhlomina L.N., Blokhina A.S., Vodyankina O.V.
INFLUENCE OF SOLVENT NATURE ON FORMATION PROCESS
OF SILVER NANOPARTICLES

Physicochemical and catalytic properties of silver catalysts spread on silicon nitride from water and organic medium at partial oxidation of ethylene glycol into glyoxal have been studied. The studied systems differ in structure and physicochemical properties of phase active in catalysis that influences the forms of agent adsorption, catalytic properties and surface reaction mechanism. It was ascertained that argentiferous systems spread on granulated silicon nitride using organic medium are perspective catalysts for the process of selective oxidation of ethylene glycol into glyoxal.

UDC 621.762

Ilyin A.P., Nazarenko O.B., Tikhonov D.V., Tolbanova L.O.
OBTAINING MOLYBDENUM NANOPOWDERS
AT CONDUCTOR ELECTRIC EXPLOSION

Disperse and phase composition of nanopowders obtained by electric explosion of molybdenum conductors has been studied. Influence of energy of discharge arc stage and gas environment composition on nanopowder characteristics was ascertained. Thermal activity of the obtained molybdenum powders at heating in the air was studied.

UDC 546.16:182

Ilyin A.P., Korshunov A.V., Tolbanova L.O.
STRUCTURE, PROPERTIES AND PROBLEMS
OF METAL NANOPOWDER CERTIFICATION

Principle characteristics of metal nanopowders: shape, particle size, content of metal component, chemical activity parameters, electrochemical characteristics, thermodynamic state of nanoparticles and nanopowders have been examined. Experimental results of applying standard methods of analysis and features of their use when determining nanopowder characteristics were given. It was shown that to certify nanopowders as metastable systems the complex of methods and techniques of analysis taking into account their metastable structure-energy state should be developed.

UDC 544.526.5

Voronova G.A.
PERSPECTIVES OF APPLYING ELECTROEXPLODING NANO-
POWDER OF TITANIUM DIOXIDE IN PHOTOCATALYSIS

Structural features, physicochemical properties of electro-explooding powder TiO₂ using methods of roentgenophase and X-ray diffraction analysis, transmission electron microscopy, thermal analy-

sis, optical spectroscopy and its photocatalytic properties have been studied. It was ascertained that photocatalytic activity of electroexploding powder TiO₂ is higher in comparison with activity of commercial samples of TiO₂ of the mark Degussa P25. It was supposed that structural peculiarities and crystal structure of electroexploding powder TiO₂ influences photocatalytic properties.

UDC 544.54:628.16

Shakhova N.B., Saveliev G.G., Yavorovskii N.A., Yurmazova T.A.
HYDROLYSIS AND EXCHANGE REACTIONS
AT ACTION OF PULSE ELECTRIC DISCHARGES
ON INTERFACE METAL – SALT SOLUTION

Products of chemical reactions occurring at action of pulse electric discharges on interface iron – salt solutions containing Ni²⁺ and HSiO₃⁻ ions have been determined. It was shown that hydrolysis and exchange reactions locally initiated by heating and occurring without change of solute oxidation degree take part in product formation.

UDC 544.72:546:72

Yurmazova T.A., Galanov A.I., Saveliev G.G.,
Yavorovskii N.A., Lobanov G.L., Mitkina V.A.
MAGNETIC CARRIER FOR DOXORUBICINE AND ITS CHEMI-
CAL TRANSFORMATION IN MODEL BIOLOGICAL FLUIDS

Samples of magnetic carriers of medicine for oncology (doxorubicine) have been obtained by the method of pulse electrolytic erosion of iron in liquid media (water, solutions of phosphoric acid and ethyl alcohol, hexane). It was shown that the sample obtained in hexane possesses the highest adsorptive doxorubicine capacity with its chemical transformation at desorption. It was ascertained that chemical transformation is observed for the sample obtained in hexane. This sample is well-dissolved in human blood plasma. Maximal dissolution time and possible iron removal from organism does not exceed 10 days.

UDC 66.067.1

Serikov L.V., Shiyon L.N., Tropina E.A., Khryapov P.A.
CHROMATICITY OF GROUND WATER IN WEST-SIBERIAN
REGION

Experimental results in determining chromaticity of ground water in West-Siberian region taken from the depth of 80...200 m have been given. Problems occurring when using of techniques for determining chromaticity recommended by SS P 52769-2007 are shown. This SS is planned to be introduced from 01.01.2009. These problems are connected with peculiarities of ground water chemical composition and they are conditioned by formation of stable colloidal particles consisting of Fe(OH)₃ and dissolved organic substances of humic origin. It is ascertained that ground water chromaticity is generally determined by the presence of these particles and characterized as «apparent» water chromaticity.

UDC 543.3:543.25

Slepchenko G.B., Pikula N.P., Dubova N.M.,
Schukina T.I., Zharkova O.S.
ELECTROCHEMICAL CONTROL OF WATER QUALITY (REVIEW)

The review of works on use of electrochemical techniques in analysis of natural, mineral, process, waste water on content of inorganic elements and organic substances published from 2003 to 2007 has been given. Information on possibilities and conditions of determining microquantities of elements and substances in different waters is generalized in tables. The certified and standardized measuring techniques of element and substance content in water by electrochemical methods are noted.

UDC 543.552.054.1

Glyzina T.S., Kolpakova N.A.
DETERMINING BISMUTH IN MINERALS BY THE METHOD OF
INVERSE VOLTAMPEROMETRY

The conditions of Bi (III) electric concentration on the surface of mercury and carbon-bearing electrodes have been investigated. Influence of Cu (II), Au (III), Pt (IV) on bismuth anode peak was studied. It was shown that at Au (III) or Pt (IV) in sediment when using carbon-bearing electrodes on anode current-voltage curves the additional pe-

aks preventing bismuth determining occur. Influence of electric concentration potential on possibility of inversion-voltamperometry determining Bi (III) with mercury film electrode in solutions containing Cu (II) was considered. To determine Bi (III) at Cu (II) the potential of electric concentration -0,2 V was recommended. The obtained data were used when developing the technique of determining bismuth in minerals after extraction of Bi (III) dithizonate with chloroform by the method of inverse voltamperometry.

UDC 541.138.2

Kolpakov G.N., Kolpakova N.A., Kuzov V.A., Khvostov V.I.
PURIFICATION OF STAINLESS STEEL SCRAP FROM RADIO-
ACTIVE CONTAMINATION BY ELECTROLYTIC METHOD

Possibility of purification of stainless steel scrap from radioactive contamination by electrolytic method has been shown. It was ascertained that for tubes «cold leg» of reactor cooling system purification occurs in one cycle of electrolysis at cathodic processing of the purified item in solution of 40 g/dm³ sodium chloride in 20...30 min at current density 100...130 mA/cm². Tube samples are purified from 4000 to 20...10 β-particles/cm²·min.

UDC 621.9.047/.048

Stavyschenko A.S.
IMPROVING SURFACE OF STAINLESS STEEL
ARTICLES BY ELECTROCHEMICAL POLISHING
IN THE MODE OF NONSTATIONARY ELECTROLYSIS

Problems of traditional methods of electrochemical processing the surface of ductile material article have been noted. A new progressive method of electrochemical polishing the stainless steel articles in the mode of nonstationary electrolysis is proposed. The data of experimental investigations in processing samples of 12X18H10T steel applying this polishing technique are given. It is ascertained that quality indices of processing test sample surface by the proposed method is higher than the indices of the samples obtained after traditional processing techniques. Fields of practical application of processing metals and alloys by the given method are indicated.

UDC 665.633

Kravtsov A.V., Ivanchina E.D., Smyshlyaeva Yu.A.
MATHEMATICAL MODELING OF COMPOUNDING
COMMERCIAL GASOLINE SUBJECT
TO MIXTURE COMPONENT REACTIVITY

New approach to calculation of producing commercial gasoline using computer modeling system has been stated. Influence of intermolecular interaction of mixture components on non-additivity of their properties subject to peculiarities of commercial technologies and composition of the processed raw material was analyzed.

UDC 66.011

Frantsina E.V., Afanasjeva Yu.I., Funk A.A.,
Ivashkina E.N., Kravtsov A.V.
FORMALIZATION OF TRANSFORMATION SCHEME OF HY-
DROCARBONS AT DEHYDROGENATION OF HIGHER ALKAN-
ES C₉-C₁₄ ON THE SURFACE OF PLATINUM CATALYST

Thermodynamic probability of chemical reactions at dehydrogenation of higher alkanes C₉-C₁₄ has been shown on the basis of quantum-chemical calculation; the level of formalization of transformation mechanism on platinum catalyst has been proposed. The formed transformation scheme became the base of kinetic model of higher alkanes C₉-C₁₄ dehydrogenation on platinum catalyst allowing taking into account the influence of raw material chemical composition on efficiency of its operation.

UDC 66.011

Shnidorova I.O., Fetisova V.A., Ivashkina E.N.,
Ivanchina E.D., Funk A.A.
DEVELOPMENT OF KINETIC MODEL
OF BENZENE ALKYLATION WITH OLEFINS

Using quantum-chemical methods of calculating thermodynamic functions the thermodynamic possibility of occurring target and side

reactions at liquid-phase catalytic alkylation of benzene with higher olefins has been estimated. The formalized scheme of hydrocarbon transformations made on the basis of the results of calculations is taken as a principle of the process kinetic model.

UDC 547.551

Bochkarev V.V., Soroka L.S.
STUDYING A CATALYST ROLE IN REACTION OF ANILINE CONDENSATION TO DIPHENYLAMINE

General principle of acid catalyst action in reaction of aniline condensation to diphenylamine has been ascertained. A new method of diphenylamine synthesis in heterophase conditions using heterogeneous catalysts on the basis of aluminum oxide modified with phosphoric and boric acids suitable for commercial application was developed. It was ascertained that this process allows increasing the end product yield in comparison with known commercial processes, excluding catalyst overcarbonization. A new method of obtaining diphenylamine by aniline condensation at phthalic anhydride was proposed. In contrast to known methods the problem of ammonia utilization is solved by means of this reaction: phthalimide - the valued product of organic synthesis is formed.

UDC 678.761.002.2

Bondaletov V.G., Tolmacheva V.Ya., Fiterer E.P., Troyan A.A., Manankova A.A., Petrenko T.V.
STUDYING METAL-COMPLEX CATALYST DEACTIVATION BY EPOXY RESINS IN SYNTHESIS OF PETROLEUM POLYMER RESINS

For development and improve of technology of synthesizing petroleum polymer resins the method of deactivation of catalyst system $TiCl_4 - Al(C_2H_5)_2Cl$ by epoxy-dians resins has been proposed. The obtained petroleum polymer resins possess the properties allowing recommending them as film-forming components for paintwork materials.

UDC 541.64:547.759.32

Ionova E.I., Lyapkov A.A., Bondaletov V.G., Shipilova N.S.
LAWS OF STEROL CATIONIC POLYMERIZATION UNDER THE INFLUENCE OF TITANIUM TETRACHLORIDE

The laws of sterol cationic polymerization under the influence of $TiCl_4$ in toluene solution have been studied. It was supposed that solvate separated ion pairs are the most probable type of growing particles. Active centers are formed by $TiCl_4$ direct attachment by monomer vinyl bond. The effective value of chain growth rate constant was calculated. It was shown that heat generation at sterol polymerization is determined by contribution of at least two components: polymerization thermal effect directly and heat of $TiCl_4$ solvation the contribution of which may be rather great.

UDC 541.64:547.759.32

Lyapkov A.A., Ionova E.I., Bondaletov V.G., Romanova A.A.
POLYMERIZATION OF DICYCLOPENTADIENE UNDER THE INFLUENCE OF TITANIUM TETRACHLORIDE

Laws of cationic polymerization of dicyclopentadiene under the influence of $TiCl_4$ in toluene solution have been studied. It was shown that competition between solvent and monomer in solvation of $TiCl_4$ molecule influences greatly the reaction behavior. The most probable polymerization mechanism in the studied system is chain growth at contact or solvate-separated ion pairs. The effective values of rate constant of catalyst solvation and chain growth were calculated. It was ascertained that heat generation at polymerization of dicyclopentadiene is determined by polymerization thermal effect and heat of $TiCl_4$ solvation. It was found that forming microstructures in polymer chain are conditioned by attachment of monomer new molecule by one of double bonds. Using catalytic system $TiCl_4 - diethyl-aluminum-chloride$ a part of microstructures formed by metathesis reaction increases.

UDC 543.646:550.443:551.312.4

Cheshkov T.V., Sagachenko T.A., Bushnev D.A., Burdelnaya N.S.
HETERORGANIC COMPOUNDS IN LAKE SEDIMENT LIPIDS

Distribution and composition of nitrogen-, sulfur-, and oxygen-containing components in lipids of modern sediments of continental

type have been studied. It was shown that they are represented by a complex mixture of saturated compounds which contain great amount of ethers, acids and alcohols. Amines, amides of fatty acids, tetrapyrrole pigments are ascertained among nitrogenous compound. Sulfur in modern sediment lipids is in macromolecular formations the main structural constituents of which are normal and isoprenoid hydrocarbons, high molecular $\alpha\alpha\alpha$ -steran and $\beta\beta$ -hopan.

UDC 547.+552.578

Kovalenko E.Yu., Sagachenko T.A., Yanovskaya S.S.
NITROGENOUS COMPOUNDS OF ORGANIC SUBSTANCE OF NAPHTHYDE-SATURATED SANDSTONE (EAST SIBERIA)

Distribution and structural-group composition of nitrogen-organic compounds of Изучено naphthide-saturated sandstone of Buur-Olenekskaya area of East-Siberian platform have been studied. It was shown that nitrogenous compounds of sandstone битумоида are approximate to oils by a set of compounds, composition and structural features. It indicates the fact that sandstone organic substance has been deeply transformed at stages of diagenesis and catagenesis.

UDC 541.182+665.6

Antipenko V.R., Ershova O.A.
THERMAL TREATMENT INFLUENCE ON REACTIVITY OF COMPONENTS OF RESIDUUM IN OILS OF VARIOUS TYPES

Using the approach, suggested by the authors, providing comparison of the results of petroleum residues interaction at 20 and 197 °C with chloric iron solution in ethylene glycol the comparative data on thermal treatment influence on reactivity of components of black oils and tars of various types oils have been obtained. Its direct connection with the ratio of content of resins and pyrobitumens in oil residues was determined. For black oils having close value of the ratio resins/pyrobitumens the effect of thermal treatment is higher in bituminous oil residue with higher content of heteroatoms, resins, free stable radicals and chelates of quadrivalent vanadium. In case of tars with end point higher than 410 and 480 °C it is higher, on the contrary, for residuum of medium density oils in spite of lower content of the enumerated components in them.

UDC 622.276.7

Gerasimova N.N., Kovalenko E.Yu., Yanovskaya S.S., Sergun V.P., Sagachenko T.A., Min R.S.
SULFUR AND NITROGENOUS COMPOUNDS OF HEAVY HIGHLY RESINOUS OILS OF USINSKOE DEPOSIT

Distribution and composition of sulfur- and nitrogen-organic compounds in heavy highly resinous oils of Usinskoe deposit (Komi Republic) have been studied. It was shown that the investigated oils refer to high-sulfur and characterized by nitrogen high content. Low-molecular sulfur compounds are essentially represented by sulphides and thiophene at dominance of the latter. Among heterocyclic aromatic sulfur compounds the C_2-C_4 dibenzothiophene dominate. The feature of usinskoe oils is high content of low-molecular nitrogen-containing bases among which nitrogen-oxygen-containing components form a considerable part. Relative content of polycyclic aromatic structures is high in composition of low-molecular nitrogen bases.

UDC 550.4: 665.61

Yanovskaya S.S., Sagachenko T.A.
WEAKLY BASIC NITROGEN COMPOUNDS IN OILS AND ORGANIC SUBSTANCE OF VERKHNEYURSKOE DEPOSITS OF WEST SIBERIA

Weakly basic nitrogen-containing compounds of oils and organic substance of rocks of upper Jura in west Siberia have been studied. It was ascertained that aromatic heterocyclic amides of pyridone type, their hydrogenated analogs - lactams, quinolin-, benzo- and dibenzozquinolin-carboxylic acids, tiaperedone and thiaquinolones are in their composition. C_1-C_5 -alkyl homologs of quinolone, benzquinolone and its homologs C_1 and C_2 were identified in composition of aromatic heterocyclic amides by the method of chromat-mass-spectrometry.