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# ***JPRS Report***

# **Science & Technology**

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***USSR: Chemistry***

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# Science & Technology

## USSR: Chemistry

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907M0074A Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 6 Jun 88) pp 1559-1568

[Article by A. V. Kuznetsov, E. R. Martirosyan, A. Ye. Platonov, L. A. Gribov, and A. V. Davydov, Geochemistry and Analytical Chemistry Institute imeni V. I. Vernadskiy, Moscow]

[Abstract] Laser optoacoustic spectroscopy is a promising technique for the analysis of multicomponent gas mixtures. However, the component being analyzed must first be isolated from the mixture by some other means such as gas chromatography or distillation. If the isolation is incomplete or if some other unknown component is present, computer methods are needed to interpret the results. In the present work a design transformation technique based on the vector representation of spectra was developed for use in conjunction with optoacoustic absorption spectra on CO<sub>2</sub> laser lines. The method was used to analyze a gas mixture containing cyclohexane, dichloroethane, chloroprene, and hydrazine. This method makes it possible to determine the number of components in a gas mixture and verify the presence of a suspect substance. It is also possible to identify the spectra of components not present in the data bank. The effect of instrument noise was evaluated, but the limitations of the method require further study. Figures 5; references 14: 11 Russian, 3 Western.

UDC543.3:535.379

**Determination of Nanogram Quantities of Bromides by Chemiluminescence Combined With Dynamic Gas Extraction in Flow- Injection System**

907M0074B Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 14 Jun 88) pp 1585-1588

[Article by A. T. Pilipenko, A. V. Terletskaia, and O. V. Zuy, Colloidal Chemistry and Hydrochemistry Institute, Kiev]

[Abstract] Bromine is present in the environment as bromides, which have a significant effect on flora and fauna. The bromide content in water varies from tenths of a milligram to micrograms per liter river water and rain. The allowable limits in residential drinking water and fish farms is 0.2 mg per liter; research often requires a determination to much lower concentrations. Monitoring the bromide content in medicinals, effluents, ground water, and desalinated sea water used for drinking purposes is especially important. The various existing methods for determining bromides, such as photometry, electrochemistry, neutron-activation, and

gas chromatography, are either not sensitive enough or are time consuming (taking up to 12-16 hours). Recently, a chemiluminescent method was developed where the bromides are oxidized to bromine, extracted with benzene, and recorded as luminescence spectra after the benzene extract is combined with alkaline luminol in ethanol. Although the method is selective, it is laborious and still not sensitive enough. In the present work a technique was developed that uses dynamic gas extraction to directly leach out the bromine with a gas carrier stream as the bromine is oxidized. The halogen is then detected in the stream by reaction with luminol. The technique requires 1 minute for analysis and is sensitive to  $1.3 \times 10^{-3}$  mg per liter. Figures 2; references 12: 6 Russian, 6 Western.

UDC546.162:545.83:542.61:546.91

**Sample Digestion by Liquid-Phase Oxidative Fluorination With Bromine Trifluoride During Analysis for Noble Metals**

907M0074C Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 17 Jun 88) pp 1589-1593

[Article by B. N. Mitykin, A. A. Vasilyeva, T. M. Korda, S. V. Zenskov (deceased), V. G. Torgov, and A. N. Tatarchuk, Inorganic Chemistry Institute, Novosibirsk]

[Abstract] Digesting the sample is the most laborious and time-consuming stage during an analysis for noble metals. While high-temperature autoclave methods using chlorine trifluoride, xenon tetrafluoride, or bromine pentafluoride and mixtures of xenon difluoride and bromine pentafluoride have been recommended, it is more convenient to use bromine trifluoride where the digestion may be carried out under ordinary conditions in quartz or glass- carbon dishware. In the present work a study shows that liquid- phase oxidation with bromine trifluoride can be used to digest sulfide, silicate, and other samples containing noble metals. After decomposition, the metals were determined by extraction atomic absorption. References 11 (Russian).

UDC543.064:543.43

**Modification of Cation Exchanger KU-23 With 4-(2- Pyridylazo)resorsinol for Concentration and Photometric Determination of Heavy Metals**

907M0074D Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 1 Jun 88) pp 1594-1568

[Article by A. T. Pilipenko, V. G. Safronova, and L. V. Zakrevskaya, Colloidal Chemistry and Hydrochemistry Institute, Kiev]

[Abstract] Ion exchangers are widely used in analytical chemistry to concentrate metals from various media. For this purpose, the exchanger is usually modified with an organic reagent to increase its selectivity and facilitate

elution of the cations, which may then be determined by atomic emission, atomic absorption, or photometry. In the present work cationite KU-23 was modified with 4-(2-pyridylazo)resorsinol, a reagent that forms stable complexes with many metal cations. Conditions were determined for the concentration and elution of Fe, Cd, Co, Cu, Cr, Al, Ni, Pb, and Mn. The eluates were then analyzed photometrically. The detection limit was  $5 \times 10^{-6}$  percent by weight. Figures 3; references 12: 11 Russian, 1 Western.

UDC541.183:617.277.4:556

### Sorption Concentration Used To Raise Sensitivity of Nitrosamine Determination in Water

907M0074E Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 1 Jul 88) pp 1599-1602

[Article by T. S. Kulbich, L. A. Tiktin, and A. A. Glavin, General and Communal Hygiene SRI, Kiev; Problems of Oncology Institute, Kiev]

[Abstract] Most N-nitrosamines are carcinogenic, mutagenic, and teratogenic. They are present in industrial chemicals, cosmetics, perfumes, tobacco smoke, animal feeds, foods, water, air, and soil. The latter most frequently contain volatile nitrosamines. Due to the inconsistency of data on the effect of these substances on living organisms, allowable concentration limits have not yet been fixed, although  $0.06 \mu\text{m/l}$  is considered to be safe for N-nitrosodiethylamine. Most existing methods for determining nitrosamines, such as spectrophotometry, fluorescence, and chromatography, are not sufficiently selective and sensitive. However, the detection limitations of conventional instrumental techniques may be lowered by sorption concentration of these compounds. In the present work a relatively simple procedure is presented for concentrating nitrosamines and lowering their detection limitation by two orders of magnitude in aqueous solutions on natural oxidized BAU charcoals, which are resistant to organic eluents. For practical purposes, 5-6 grams of charcoal is used with a 10-l sample at a throughput rate of 500-1,000 ml/h. Figures 2; references 9: 5 Russian, 4 Western.

UDC543.422:546.77:541.14:542.941

### Spectrophotometric Determination of Molybdenum by Photochemical Reduction of Molybdenum-Tungsten Heteropolycomplex

907M0074F Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 1 Feb 88) pp 1611-1614

[Article by S. A. Morosanova and Ye. V. Bondareva, Moscow State University imeni M. V. Lomonosov]

[Abstract] Photochemical reduction of heteropoly compounds with UV-radiation has many practical applications: the study of photosynthesis processes in biochemistry, the determination of redox potentials of short-lived radicals in organic chemistry, the preparation of colored images in photography, and the determination of many elements in analytical chemistry. In analytical practice, reduction with UV-radiation has many advantages over tradition reducing agents, such as the possibility of controlling the UV-light dosage, high selectivity, and the absence of excess reducing agent after the termination of radiation. The formation of reduced forms of iso- and heteropoly compounds forms the basis of many methods for determining molybdenum, silicon, phosphorus, and arsenic, and therefore the problem of utilizing UV-radiation requires further study. In the present work a spectrophotometric method was developed for the determination of molybdenum as a heteropoly compound of tungsten by using photochemical reduction with UV-light. The method was tested on some simulated and working solutions. Figures 2; references 10: 9 Russian, 1 Western.

UDC615.252.349.015.2:541.854.6.07

### Use of 1,4-Benzoquinonechlorimine To Determine Pharmaceuticals

907M0074G Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 44 No 9, Sep 89 (manuscript received 11 Aug 88) pp 1684-1688

[Article by S. S. Artemchenko and V. V. Petrenko, Zaporozhye Medical Institute]

[Abstract] The determination of functional groups in pharmaceuticals broadens the range of reagents that can be used in photometric techniques. 2,6-Dichloro-1,4-benzoquinonechloroimine is used in the photometric analysis of pharmaceuticals, although its closest analogue, 1,4-benzoquinonechlorimine, is not yet used in functional analysis. Nor is there a single



concept of the reaction mechanism of these reagents. The purpose of the present work was to develop sensitive simple methods for the photometric determination of pharmaceuticals with the title compound. Conditions for reactions of 1,4-benzoquinonechlorimine with quinosol, enteroseptol, thymol, salsolin hydrochloride, mesatone, mercaptopurine, mercasolyl, cystein, protonamide, thiamine bromide, and primaquine were studied. Tinted reaction products were separated for reactions of 1,4-benzoquinonechlorimine with quinosol and enteroseptol. The reactions were used to develop spectrophotometric methods for the determination of pharmaceuticals. Figure 1; references 14: 8 Russian, 6 Western.

UDC 535.34+541.67

#### **Relationship Between Long Wave Absorption Band and Magnetic Susceptibility of Nickel Phthalocyanine and Its Degree of Oxidation**

907M0080A Kiev *TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA in Russian* Vol 25 No 5, Sep-Oct 89 (manuscript received 17 Jul 87) pp 534-539

[Article by A. G. Vinogradskiy]

[Abstract] Oxidized metal-phthalocyanines are a class of ion-radical salts having high darkfield quasiuniform conductivity. Identification of those features manifested during transition from the neutral, nonconducting state to the oxidized, conducting state is desirable. This transfer is, as a rule, associated with the oxidation of a ligand of the molecule in solid metal-phthalocyanines. Possible characteristics of the conducting state include the broad electron absorption band in the infrared range of the spectrum and the intensity of the EPR singlet signal, which determines paramagnetic susceptibility. A study of these properties in nickel and cobalt phthalocyanines oxidized at room temperature with halogen vapors shows that polarization of the long-wave electron band is associated with light absorption by conductivity electrons. Magnetic susceptibility of the oxidized samples is independent of the degree of oxidation. Figures 2; references 15: 5 Russian, 10 Western.

UDC 543:535.379:546.97

#### **Chemiluminescence of Chlorophyll With Periodate in Presence of Rhodium (III) Compounds**

18410238E Kiev *UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian* Vol 55 No 7, Jul 89 (Manuscript received 17 Feb 88) 724

[Article by A. T. Pilipenko, N. F. Kushchevskaya, Ye. P. Parkhomenko, and N. F. Falendysh, Institute of Colloid Chemistry and Water Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is presented of the chemiluminescent reaction of chlorophyll with periodate in the presence of various rhodium (III) complex compounds for use in chemical analysis. The catalytic activity of various forms of rhodium existing in chloride, sulfate, and perchlorate solutions was studied in the chemiluminescent reaction of chlorophyll with periodate. The method developed was used to determine the content of rhodium in carbon fibers activated with rhodium. The results of the determination show good reproducibility. Figure 1; References 11: Russian.

UDC 541.128.535.379

#### **Catalytic Oxidation of Luminol by Uniaxial Aliphatic Peroxy Acids**

18410238F Kiev *UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian* Vol 55 No 7, Jul 89 (Manuscript received 12 Dec 88) p 730

[Article by O. M. Zaverukha and Ya. P. Skorobogatyy, Lvov Commerce and Economics Institute]

[Abstract] Results are presented from a study of the catalytic oxidation of luminol (3-aminophthalic hydrazide) by hydrogen peroxide in the presence of nickel ions. The influence of reaction conditions as well as the addition of certain inhibitors on the intensity of luminol chemiluminescence and the rate of its oxidation is studied. The addition of  $\text{OsO}_4$  at  $1 \cdot 10^{-8}$  M prevents luminescence. The inhibitor primarily blocks the stage of formation of the light producer and does not alter oxidation. The inhibiting effect decreases with increasing pH and increases in the sequence of  $\text{C}_8$ - $\text{C}_{13}$  peroxy acids. The inhibitor reduces the ion radicals and then is rapidly regenerated in other reactions. Figure 1; References 7: Russian.

UDC665.658.2

**Separation of Vanadium from Spent Hydrocracking Catalysts***907M0053C Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 89 pp 12-13*

[Article by N. K. Nadirov and S. A. Petrashov, Oil and Gas SRI (A-U), Moscow]

[Abstract] During the hydrocracking process, organometallic compounds decompose, and the resulting metals (especially vanadium) deactivate the catalyst. When the vanadium concentration reaches 5,000 mg/kg, the deactivated catalyst is taken out of the process. Existing technology for regenerating spent hydrocracking catalysts requires calcining at temperatures above 600°C. In the present work a new process was developed wherein the spent catalyst is regenerated by superimposing an electrical current on the catalyst while leaching the vanadium with NaOH. Figures 2; references 4: 2 Russian, 2 Western.

UDC66.097.03.00.:338.51

**Price Setting in Catalyst Production***907M0053E Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 89 pp 29-30*

[Article by S. A. Ennel and A. F. Babikov, Angarsknefteorgsintez Production Association]

[Abstract] Up to 75 percent of all chemical processes in the United States are catalytic because of the relatively high cost of raw materials and energy as compared with the lower cost and efficiency of catalysts. Thus, the development of catalyst production should be stimulated with objective price setting. The experience of the catalyst factory of the Angarsknefteorgsintez Production Association is used as an example. The present method of price setting does not stimulate the producer to develop more efficient catalysts. Thus the costs of new and older catalysts are nearly the same, and under these conditions, it is more expedient for a producer to compensate for depreciating production due to inefficient catalysts by markups in production costs than to develop

newer catalysts. A method is proposed to stimulate producers to develop more efficient catalysts. According to the proposal, producers would be awarded a portion of the profits that a user derives from using a catalyst beyond its normative service life. References 4 (Russian).

UDC 541.126.13

**Effect of Oxygen on Catalytic Properties of Carried Palladium Catalysts During Hydrogenation of CO***907M0080B Kiev TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA in Russian Vol 25 No 5, Sep-Oct 89 (manuscript received 11 Nov 87) pp 557-563*

[Article by Yu. I. Pyatnitskiy, G. V. Filonenko, V. P. Stasevich, T. M. Shaprinskaya, V. I. Gritsenko, and G. G. Girushin, Physical Chemistry Institute imeni L. V. Piszhevskiy, Kiev]

[Abstract] The activity and selectivity of palladium catalysts during the preparation of methanol from carbon monoxide are functions of the chemical composition of the carrier and any promoters added during its preparation. One reason could be the effect of the chemical composition of the carrier and its additives on the electron state of the palladium, i.e., its degree of oxidation, which affects the rate and selectivity of the process. Methanol formation is specifically stimulated by the chlorine atoms remaining on the catalyst after preparation from palladium chloride. Oxygen-containing impurities could also play a similar role. The present work reports on a study showing that the addition of oxygen to carbon monoxide has a positive effect on the activity and selectivity of carried palladium catalysts in methanol synthesis. The degree of the oxygen effect is a function of the chemical nature of the carrier and the catalysis conditions. One possible cause of the oxygen effect could be the partial oxidation of palladium in the presence of oxygen, which affects its catalytic properties. Another reason could be the change in the methanol-to-hydrocarbon ratio, the oxygen changing the concentration of surface compounds that are precursors of methanol formation. Figures 3; references 20: 6 Russian, 14 Western.

UDC 621.315.592.3

**Nonradiative Capture of Main Carriers by Semiconductor Surface**

907M0028A Moscow *POVERKHNOST: FIZIKA, KHIMIYA, MEKHANIKA* in Russian No 9, Sep (manuscript received 15 Jun 88; after revision 29 Jun 88) 89 pp 5-11

[Article by R. A. Vardanyan, V. Ya. Kravchenko, L. B. Ovakimyan, Solid-State Physics Institute, USSR Academy of Sciences, Chernogolovka]

[Abstract] The problem of nonradiative capture of an electron in the surface zone condition during its autolocalization in a plane is examined. The specifics of the dimensionality of a system in the problem of condenser autolocalization are summarized. The quantum states of a system in an adiabatic approximation and the capture coefficient are both calculated by using numerous formulas. The capture of main carriers in the condenser state on a surface is considered by using the theory of multiphonon transitions. Selection of an electron-phonon interaction operator eliminated unlimited compression of the condenser and stabilized it at some distances. References 10: 9 Russian, 1 Western.

UDC 538.971

**Roughness and Delocalization of 3-D Quasicrystal Interface**

907M0028B Moscow *POVERKHNOST: FIZIKA, KHIMIYA, MEKHANIKA* in Russian No 9, Sep 89 (manuscript received 28 Mar 88; after revision 28 Sep 88) pp 12-14

[Article by L. V. Mikheyev, Crystallography Institute, USSR Academy of Sciences, Moscow]

[Abstract] The interface of a 3-D quasicrystal is studied in the context of density waves at high temperatures. The main conclusions are correct for all cases where  $T$  is greater than 0. The ideal quasicrystal was considered by assuming that phason fluctuations are final. In real quasicrystals, the diffraction peaks have final half-widths corresponding to the correlational length of the main harmonic. A real quasicrystal becomes rougher as the temperature increases. Figure 1, references 7 (Western).

UDC 543.42

**Effect of Physical and Chemical Treatment on Surface Composition of High-Temperature Superconducting Films and Ceramics of Y-Ba-Cu-O System by Using X-Ray Electron Spectroscopy Data**

907M0028C Moscow *POVERKHNOST: FIZIKA, KHIMIYA, MEKHANIKA* in Russian No 9, Sep 89 (manuscript received 29 Apr 88; after revision 2 Aug 88) pp 22-32

[Article by V. I. Nefedov, A. N. Sokolov, M. A. Tyzykhov, N. N. Oleynikov, and Ye. A. Yeremina,

General and Inorganic Chemistry Institute, USSR Academy of Sciences, Moscow, and Moscow State University imeni M. V. Lomonosov]

[Abstract] The surface layer of models of the high-temperature superconducting system Y-Ba-Cu-O was studied in detail by using x-ray electron spectroscopy. Quantitative analysis of surface layer conditions on layers up to 200 nm thick was conducted by studying the chemical composition of the atoms. A technique of layered quantitative analysis using x-ray electron spectroscopy was developed and used for studying compounds of yttrium, barium, and copper. More than 50 samples were analyzed and subjected to various forces. Experimental and theoretical methods of quantitative analysis of the surface are based on measurements of the intensity of x-ray electron lines of the corresponding elements, and it was shown that the experimental method was more accurate. Analysis at depths greater than 100 nm was conducted by scattering with an ion beam. The samples studied had high-temperature superconducting properties with a temperature of 85-95 K for ceramics and 30 to 85 K for films. The composition was measured at three points—on the surface, after 30 seconds of burning, and at 200 nm depth. The test samples were treated with water, steam, and an alkali, KOH. Substantial changes in the atomic ratios of Y, Ba, and Cu were noted in treatment with water and steam, but not with KOH. An infrared laser was used to make films several microns thick, but they were not stoichiometric due to a dramatic change in the composition of the surface layer that occurs during dispersion. Ion beams were used to calculate the relative coefficient of dispersing elements in a wide range of changes in the composition of the test samples. The chemical state of atoms in the surface layer was determined by using shifts of lines in x-ray electron spectra and results of measuring the half-widths of lines. Data on the energy in bonds also bears useful information about changes in the surface. The composition of the surface of ceramics and films differs from the stoichiometric composition. The degree of deviations and the thickness of the changing layer depend on the duration and conditions of storing the test sample. Carbon-containing compounds that interact with atmospheric  $\text{CO}_2$  were on the surfaces of all test samples. Water and steam treatment increase the amount of Ba and Y on the surface. Laser radiation decreases the content of Y in the surface layer. Figures 6, tables 6, references 17: 2 Russian, 15 Western.

UDC 541.15

**Nature of "Latent Sites" in Irradiated Proteins**

907M0088A Moscow *KHIMIYA VYSOKIKH ENERGIY* in Russian Vol 23 No 6, Nov-Dec 89 (manuscript received 19 Sep 87) pp 503-505

[Article by N. A. Vysotskaya and V. M. Russakovskiy, Physical Chemistry Institute imeni L. V. Pisarzhevskiy, Kiev]

[Abstract] While studying radiation chemical conversions of aromatic amino acid groups of phenylalanine and tyrosine from human serum albumin in the presence of air oxygen, the formation of "latent sites" was observed. They became apparent under ultraviolet light. Small doses of UV light on  $\gamma$ -irradiated albumin causes the formation of sites having intense absorption with a maximum at 237 nm. These sites disappear with further UV radiation. The effect is very sensitive to the strength of the  $\gamma$ -radiation and the temperature of the solution. A similar phenomenon was also observed during radiolysis of tyrosine solutions. It is hypothesized that the observed effect is related either to the formation of peroxide-type particles or to protein macromolecule coagulation facilitated by tyrosine amino acid groups. Figures 2; references 8 (Russian).

UDC 541.14

### Octabromofluorescein—Sensitizer of Hydrogen Evolution

907M0088B Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 23 No 6, Nov-Dec 89* (manuscript received 29 Apr 88) pp 519-521

[Article by V. S. Zakharenko, A. I. Yartsev, N. P. Smirnova, and A. V. Yeltsov, Catalysis Institute, Novosibirsk; Technological Institute imeni Lensovet, Leningrad]

[Abstract] It has been previously observed that halogen derivatives of fluorescein are efficient sensitizers of hydrogen formation during irradiation with visible light in the presence of an electron donor. It was further observed that the effect becomes more pronounced as the number of halogen atoms in the sensitizer molecule is increased. In the present work octabromofluorescein, a derivative containing the maximum possible bromine content, was studied. At energy quanta of 1.8-3.1 electron volts, the spectral relationship of the effective quantum yield of hydrogen from an aqueous solution of sensitizer, electron donor, and colloidal particles of platinum stabilized with polyvinylpyrrolidone was determined. The system reaches a stationary state as a result of debromination of the sensitizer into the stable form under the photoreaction conditions. Figures 2; references 7: 3 Russian, 4 Western.

UDC 621.373.8.038.82

### Energy Characteristics of D<sub>2</sub>-F<sub>2</sub>-CO<sub>2</sub> Laser

907M0088C Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 23 No 6, Nov-Dec 89* (manuscript received 12 Feb 88) pp 522-524

[Article by V. I. Igoshin and S. Yu. Pichugin, Kuybyshev Branch Physics Institute imeni P. N. Lebedev]

[Abstract] Finely dispersed aluminum particles preinjected into a pulsed chemical laser has been proposed as a means for creating a so-called photon-branched chain

reaction. The possibility has been demonstrated of initiating a D<sub>2</sub>-F<sub>2</sub>-CO<sub>2</sub> laser at 0.7-MPa pressure with an IR laser by vaporizing submicron aluminum particles with considerably less energy than that predicted to be generated by irradiation. However, a detailed analysis based on a complete kinetic model of a D<sub>2</sub>-F<sub>2</sub>-CO<sub>2</sub> laser is required to substantiate the possibility of creating a purely chemical laser amplifier of IR radiation not requiring energy from an electron beam, a discharge, or UV radiation. In the present work a study of the above pulsed laser, initiated with an IR laser during the vaporization of finely dispersed aluminum particles, demonstrates that it is possible to create a purely chemical amplifier for an IR laser based on a photon-branched chain reaction at 0.1-MPa pressure. The energy expended for IR laser radiation will be 6-8.5 times less than that generated. References 3: 2 Russian, 1 Western.

UDC 539.184:621:383

### Computing Molecular Distribution Function in Multicomponent Gas Medium Under Laser Irradiation

907M0088D Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 23 No 6, Nov-Dec 89* (manuscript received 25 Jan 88) pp 525-528

[Article by Yu. V. Petrushevich]

[Abstract] A study was made of the nonequilibrium excitation of molecules in a three-component gas mixture subjected to laser radiation, one of the components being resonant to the laser radiation. Numerical calculation of the molecular distribution functions indicated that the resonating gas molecules are distinct from those subject to maxwellian distribution. The effective temperature of this component is 10-20 percent higher than the temperature of the buffer gas. The molecular distribution functions of the other components of the gas mixture remain unchanged after the laser radiation. Figures 2; references 8: 7 Russian, 1 Western.

UDC 661.185:621.794.4:539.9

### Relationship of Rate of Fluorine Atom Etching of Silicon to Surface Adsorption Characteristics

907M0088F Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 23 No 6, Nov-Dec 89* (manuscript received 15 Jan 88) pp 534-538

[Article by Yu. Ye. Babanov, A. V. Prokashnikov, and V. B. Svetovoy, Microelectronics Institute]

[Abstract] Radical etching, an important trend in "dry" material treatment, is being applied in microcircuitry. It is based on the reaction of a neutral, chemically active particle with the surface of the substance being etched, such as fluorine atoms with silicon. To exclude other side effects on this reaction, experiments were conducted on etching silicon with fluorine plasma in an XeF<sub>2</sub> and

fluorine atmosphere prepared by dissociation of  $F_2$  molecules. In the present work a formula for the rate of silicon etching was derived from adsorption isotherms. The etching process is controlled by both the flow of fluorine atoms and the adsorption characteristics of the  $SiF_x$  layer. Surface contamination with silicon oxide has a marked effect on the rate of etching. Limiting values for the heat of adsorption of fluorine on pure and oxide-contaminated silicon surfaces were obtained. References 12: 3 Russian, 9 Western.

UDC 541.135.6

#### **Determining Equilibrium Potential of Electrode Reaction From Volt-Ampere Characteristics**

18410238A Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 23 Mar 88) p 708

[Article by A. V. Gorodyskiy and V. F. Grishchenko, Institute of General and Inorganic Chemistry, Ukrainian Academy of Sciences, Kiev; Kiev Polytechnical Institute]

[Abstract] Experimental determination of electrode potential as a function of current is performed relative to an independent comparison electrode or a certain rest potential. Volt-ampere measurements yield a function  $i=i(U)$ , where  $U$  is the voltage applied to the electrode shifted relative to the equilibrium potential by an unknown constant. The value of the constant is contained in the volt-ampere curve and can be determined by equations presented in this article. A table presents parameters of computed volt-ampere curves. References 2: Russian.

UDC 541.135

#### **Chronopotentiometric Study of Passivation of Polytrifluorochloroethylene Electrodes**

18410238B Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 13 Jul 88) p 711

[Article by E. A. Stezeryanskiy, K. I. Litovchenko, and V. S. Kublinovskiy, Institute of General and Inorganic Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] The purpose of this work was to derive the variance of transition time as a function of the quantity of electricity upon polarization of an electrode by a linear current pulse for electrode processes complicated by the formation of insoluble compounds inhibiting the electrochemical reaction. The applicability of the functions determined for a description of the experimental

results was evaluated on the example of the reduction of polytrifluorochloroethylene in aprotic electrolytes containing the lithium cation. Figures 3; References 4: 2 Russian, 2 Western.

UDC 543.253:546.31

#### **Polarographic Study of Kinetics of Complex Formation of Lead With Citric Acid in Aqueous and Aqueous-Organic Media**

18410238C Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 18 Jul 88) p 718

[Article by T. Ya. Vrubleevskaya, M. Ye. Bodnar, and O. M. Shuter, Lvov Institute]

[Abstract] Results are presented from a study of the complex formation and the kinetics of electric reduction of complexes of lead (II) with citric acid as well as the influence of the type of solvent on the structure and stability of the complexes. Measurements were performed on an oscillographic polarograph in a three-thermostatted cell at 298 K with a saturated calomel comparison electrode, a mercury drop indicator electrode, and a mercury supplementary electrode. It is found that the process of the reduction of Pb(II) from citrate solutions in the presence of a 25 percent organic additive is a diffusion process with a slight shift in potential in the positive direction. Figures 3; References 6: 5 Russian, 1 Western.

UDC 541.135.5+620.197.3

#### **Inhibition of Electrochemical Reactions on Heterogeneous Electrode Surface**

18410238D Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 11 Aug 88) p 720

[Article by K. T. Kuzovleva, Institute of Chemistry, Far Eastern Division, USSR Academy of Sciences]

[Abstract] Results are presented from the use of an approach suggested in a previous study for a description of the inhibiting effect of surfactants on the heterogeneous surface of an electrode. The new approach is used to process experimental data found in the literature on the inhibition of the reaction of cathodic separation of hydrogen on an iron electrode. The analysis shows that the inhibition of the hydrogen liberation reaction on the iron electrode is satisfactorily described by the equations presented in the previous work for the case when the adsorption energy of the surfactants and participants in the reaction changes symbatically. References 13: 12 Russian, 1 Western.

### Direct Question Ecological Veto—What Will It Cost to Close Eight Plants?

907M0119A Moscow SOVETSKAYA ROSSIYA in Russian No 21, 25 Jan 90 p 1 [Manuscript received 25 Jan 90]

[Article by L. Teushchakov: "Direct Question Ecological Veto—What Will It Cost To Close Eight Plants?"]

[Text] Agreed, it is an extraordinary case. For no apparent reason a manager who was far from pension age was removed and retired. And not just anybody, but a deputy minister. Was it a step taken in a fit of anger, or was there agonizing over this decision?

What M. M. Sobolev, deputy minister of the USSR Ministry of the Medical and Microbiological Industry, did cannot be called anything but an ultimatum to the state. Here are some lines from his statement addressed to Nikolay Ivanovich Ryzhkov: "I ask that you assign me to work not requiring me to take action to halt the production of protein-vitamin concentrate (BVK). If there is no such possibility in the Council of Ministers, then I ask you to release me from my position at my own request."

"Was it worth the risk?" I asked M. M. Sobolev. "They receive and sign your petition—then what?"

"I am fighting for the right cause," answered Mikhail Mikhaylovich; "therefore, I am not afraid of any risk."

This means that a protein-vitamin concentrate has become the reason for retiring a deputy minister. More specifically, a recent decree of the USSR Supreme Soviet, "On Urgent Measures for Ecological Improvement in the Country," states that "In 1990 the USSR Council of Ministers shall develop the appropriate state programs. In particular, these shall make provisions for the 1991 shutdown of the production of BVK from paraffinic crude oil...."

M. M. Sobolev thinks that this decree was passed in spite of the opinion of specialists who have a thorough knowledge of this problem. The last commission to examine the problem of producing and using protein-vitamin concentrate from paraffinic crude oil, which functioned in October 1989, included 13 prominent scientists, among them several members of the USSR Academy of Sciences: M. V. Ivanov, R. V. Petrov, and Ye. N. Mishustin. Twelve of them signed the document, which stated that the biotechnological production of feed protein is an economically advisable method for obtaining feed additives used in mixed feed for pigs and poultry. Animal products obtained from its use are safe for humans.

The scientists were unanimously agreed that it was not advisable to reprofile the plants producing BVK from paraffinic crude oil.

Then what is the problem? Have we stopped believing in science? On the contrary, every decision, especially those

requiring large expenditures, should be scientifically based and make economic sense. What is happening here?

Deputy Minister M. M. Sobolev asserts: "I am deeply convinced that halting the production of BVK is a big mistake, the negative consequences of which will soon be felt in many spheres of economic and public life. The national economy is being deprived of at least a million tons of high-quality protein. This is equivalent to annually taking a billion kilograms of meat from working people's tables. It will inevitably have an effect upon prices. Long term international agreements will be broken."

"The equipment is so unique," continues M. M. Sobolev, "that its reprofiling is practically impossible. This will lead to the elimination of eight modern enterprises where 14,000 people are working."

Frankly, the deputy minister painted a grim picture. But what do production workers think about this?

"I completely agree with scientists and workers in the ministry," A. N. Skvortsov, director of the Mozyr Feed Yeast Plant, says to Gomel residents. Incidentally, he is also chairman of the Association of BVK Plants. "Halting the production of protein-vitamin concentrate will inflict a blow upon biotechnology similar to the one inflicted upon genetics during the time of Lysenko."

What then, are we faced with the next case of "sabotage without dynamite"?

"I would call it something different," Aleksey Nikolayevich points out. "The predominance of incompetence, for example. Above all, this applies to our opponents, the initiative group from Kirishi and people with similar opinions...."

Are the people we interviewed correct on every point? The situation should not be simplified. It is an old conflict. The problem is, perhaps, not so much one of incompetence or, say, regional egoism (although one cannot get away from this) as it is one of imperfect equipment. At one time this caused air pollution and sometimes sickness.

What then was Deputy Minister M. M. Sobolev opposed to?

"I am opposed to endlessly breaking what it took hard work to build," said Mikhail Mikhaylovich. "We have to work together to correct the situation and not aggravate it. We, for example, understand our responsibility and are making steps in that direction. At every one of the eight BVK plants programs for ecologically clean production are being implemented. A similar program has also been developed for the entire sector. Plants now have maximum permissible concentrations of protein in the region where they are located."

However, are these measures sufficient? How will this situation turn out? These are by no means empty questions.

UDC 541.183:546.26:541.135

### Application of Carbon Materials of Different Porosities to Electrosorption of Organic Substances

907M0153A Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 26 Apr 89) pp 3-6

[Article by I. G. Lisitskaya, L. P. Lazareva, N. K. Gorchakova, V. V. Khabalov, and L. M. Vatrogova, Far Eastern University, Vladivostok]

[Abstract] Several samples of carbonaceous materials were tested for electrosorption of benzyl alcohol, caprolactam, and scarlet dye 5Skh to determine their potential utility in comparison with commercial activated carbon SKT. The specific surface areas of the samples ranged from 60 to 900 m<sup>2</sup>/kg (SKT). Evaluation of the adsorption isotherms in aqueous solutions demonstrated that adsorption of caprolactam and benzyl alcohol was proportional to the specific surface area. Adsorption of the dye by SKT was poor due to the large size of the molecule, which precluded entering pores <3 nm in diameter. Desorption of benzyl alcohol was attained with both anodal and cathodal polarization. Cathodal polarization enhanced the electrosorption of caprolactam. Finally, polarization of the adsorbents led to electrochemical destruction of the dye. Accordingly, polarization of the carbon adsorbent may be used to alter adsorption, lead to adsorbent regeneration, and effect destruction of certain molecules. Figures 3; references 10: 9 Russian, 1 Western.

UDC 541.045:532.711:628.165

### Application of Homo- and Heteroporous Models to Description of Semipermeability of Cellulose Acetate Membranes

907M0153B Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 29 May 89) pp 6-8

[Article by Ye. A. Tsapyuk and M. T. Bryk, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Experimental studies were conducted on the determination of sucrose retention coefficients by a series of cellulose acetate reverse-osmosis and ultrafiltration membranes to correlate the results with calculations based on homo- and heteroporous membrane models. With a sucrose concentration of 10 kg/m<sup>3</sup> and a pressure range of 0.1-2.4 MPa the experimental results were in good agreement with both models. However, modification of one of the membranes with gelatin—with the

effect of large-pore blockage—yielded data that correlated better with the heteroporous model. The latter indicates that the heteroporous membrane model presents a more realistic approach to evaluation of cellulose acetate membranes. Figures 4; tables 1; references 8: 6 Russian, 2 Western.

UDC 541.183.12

### Effects of Sulfonol on Charge Selectivity of Membrane MA-100

907M0153C Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 12 Jun 89) pp 9-11

[Article by V. D. Grebenyuk, L. K. Berkeliyev, R. D. Chebotareva, and Kh. N. Yevzhanov, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Electrodialysis studies were conducted with the anion-exchange membrane MA-100 to determine the effects of the surfactant sulfonol on anion selectivity. Employing a mixture of mono- and divalent anions and the addition of 25-100 mg/l sulfonol led to an increase in permeability for Cl<sup>-</sup>. The enhancement of Cl<sup>-</sup> permeability was directly proportional to the concentration of the surfactant and inversely proportional to the amperage. In the presence of 25-50 mg/l electro dialysis proceeded without a significant increase in the applied current density. Figures 5; references 9: 8 Russian, 1 Western.

UDC 628.165+66.065+546.46-36+27

### Coprecipitation of Boron With Magnesium Hydroxide From Highly Mineralized Thermal Waters

907M0153D Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 18 Jan 89; in final form 10 Jul 89) pp 11-14

[Article by V. I. Maksin, M. I. Akhmedov, and A. Sh. Ramazanov, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Trials were conducted on the extraction of boron from the highly mineralized thermal waters of Southern Sukhumi by employing coprecipitation with magnesium hydroxide. Studies at 20°C showed that the maximum concentration of boron (7.0-23 percent) was coprecipitated with magnesium hydroxide at pH 10.5-11.0 and 10-30 minutes of mixing. Minimal concentrations of boron (2.2-3.0 percent) were coprecipitated after 60-90 minutes of mixing, whereas mixing for 2 hours yielded boron-free magnesium hydroxide. Figures 2; tables 2; references 22: 21 Russian, 1 Western.

UDC 541.18.048

**Enhanced Clarification of Industrial Suspensions by Modified Polyacrylamide***907M0153E Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 9 Jun 89) pp 19-21*

[Article by G. A. Akselrud, A. A. Berlin, V. N. Kislenco, S. N. Kolivoshko, and M. A. Moldovanov, Lvov Polytechnical Institute]

[Abstract] A study was conducted on the effects of the modification of polyacrylamide flocculant (TU 6-01-1049-81) on the rate of flocculation of industrial lime-sulfur suspensions. The flocculant was modified with a mixture of epoxidated fatty acids or by low-degree cross-linking with epichlorohydrin. The target suspension consisted of particles with a size range of (0.4 to 2.5)  $\times 10^{-7}$  m, with a predominance of the fine fraction. Both modifications resulted in a more efficient flocculant, with the greater efficiency attributable to two different factors. Modification with the epoxidated fatty acids led to an increase in hydrophobicity of the flocculant, while minimal cross-linking enhanced efficiency by increasing the molecular dimensions of the flocculant. Figures 3; references 4: 3 Russian, 1 Western.

UDC 543.872:543.422.6

**Photometric Determination of Total Concentration of Organic Matter in Waste Waters***907M0153F Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 29 Mar 89) pp 45-46*

[Article by S. A. Bozin, A. T. Yershova, V. I. Mikhaykov, and V. S. Filimonov, KATEKNIUgol [expansion unknown], Krasnoyarsk]

[Abstract] A comparative analysis was conducted on the relationship between the chemical oxygen demand (COD) of waste waters and their optical density (OD) in order to determine whether OD measurements could be used to estimate organic matter levels. The data showed that for 75 parallel determinations over a COD range of 59 to 240 mg O/liter the corresponding OD readings were 0.175 to 1.745 and led to a linear regression equation of the following type:  $COD = 59.9 + (83.3 \times OD)$ . At  $P = 0.95$  the relative optimal deviation was 12 percent, and the relative error was <3 percent. Accordingly, the photometric method can be used for rapid screening of waste waters for the levels of organic matter. References 5: 4 Russian, 1 Western.

UDC 543.381

**Determination of Low Nitrobenzene Concentrations in Water by GLC With Electron-Capture Detector***907M0153G Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 17 Apr 89) pp 47-49*

[Article by A. I. Zatul, All-Union Scientific Research Institute for Water Protection, Kharkov]

[Abstract] In order to improve the sensitivity of the determination of nitrobenzene in water, an approach method was designed that is based on GLC in combination with an electron capture detector that allows analyses down to 0.006 mg/dm<sup>3</sup>. The following steps were involved: reduction of nitrobenzene by Fe in HCl solution, bromination of the resultant aniline, detection of the tribromoaniline by separation on a GLC column, and analysis of the eluants by the electron capture detector. Recovery studies over a range of starting concentrations of 6 to 1600  $\mu\text{g/liter}$  yielded corresponding recoveries of 5.8  $\pm$  0.4 to 1075  $\pm$  52.0  $\mu\text{g/liter}$ . Figures 2; references 18: 11 Western, 7 western.

UDC 628.1.03:543

**Turbidity as Indicator of Total Concentration of Suspended and Colloidal Particles in Water***907M0153I Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 19 Jun 89) pp 55-57*

[Article by Yu. G. Frolov and I. M. Mikerova, Moscow Institute of Chemical Technology imeni D. I. Mendeleev]

[Abstract] A turbidity factor ( $TF_v$ ) was designed as a means of relatively easy assessment of the total concentration of suspended and colloidal particles in water. Determination of  $TF_v$  relies on the same methodology as for the colloid index and is related to the modified fouling index (MFI) by the following relationship:  $TF_v = 4MFI \times V^2 \times T$ . The values of  $TF_v$  were shown to be linearly related to the concentration of suspended and colloidal particles, and this offers considerable advantages in monitoring water clarification prior to reverse-osmotic desalination and in selecting optimum flow parameters. Figures 3; tables 1; references 5: 4 Russian, 1 Western.

UDC 628.33:66.099.72

**Decolorization of Waste Waters With Incinerator Ash***907M0153J Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 10 May 89) pp 57-59*

[Article by S. G. Dyrikov, V. S. Dorofeyev, and V. I. Zhudina, Odessa Engineering and Construction Institute]

[Abstract] Trials were conducted on the utility of ash derived from the incineration of solid domestic refuse in



the decolorization of effluent waters from a biochemical plant. Ash derived in this manner was comparable in composition with ash in general and contained high levels of Al, Ca, and Fe oxides, compounds that are excellent coagulants. The plant effluent was represented by dark-brown water bearing 1,300 mg/liter of suspended matter represented by amino acids, carbohydrates, and proteins at a pH of 6.7-7.5. The efficiency of decolorization attainable with ash pretreated with 36 percent HCl ranged from 84-100 percent. In general, optimum results involved the addition of ash to 10 percent by volume, a pH of 7-8, a 15- to 20-minute mixing period, and a water temperature of 15-20°C. Figures 1; tables 1; references 5 (Russian).

UDC 661.846:556.3

### Extraction of Magnesium From Natural Underground Waters High in Sodium Chloride

907M0153K Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 30 Aug 89) pp 59-63*

[Article by L. I. Chernova, Yu. N. Chernov, V. V. Starkov, and S. V. Vasilchenko, All-Union Scientific Research Institute of Hydrogeology and Engineering Geology, Zelenyy, Nogin Rayon, Moscow Oblast]

[Abstract] Trials were conducted to devise an efficient means of removal of magnesium from underground waters high in Na and Cl by relying on milk of lime for the precipitation of MgOH. The water was derived from the Stavropol oil fields and contained 27.0 g/liter Na and 60.0 g/liter Cl ions. Optimum conditions for batch mode operation included a temperature of 50°C, the addition of 10 percent milk of lime for 15 minutes, and mixing for 15 minutes. Figures 4; references 16 (Russian).

UDC 622.765

### Turbulent Microflotation in Domestic and Industrial Sewage Treatment

907M0153L Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 16 Aug 89) pp 67-68*

[Article by N. N. Rulev, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] In view of their small size and ease of operation, an analysis was conducted on the use of turbulent microflotation plants in conjunction with incineration as a means of handling domestic and industrial sewage. Taking into consideration economic, construction, and location factors, the conclusion was that plants of this type appear to provide a viable solution to urban sewage. These on-site treatment facilities should be allocated on the basis of one plant per area with a population of 0.8

million. In addition, they are also suitable for location at individual industrial plants. Figures 2; references 4 (Russian).

UDC 628.35:661.86

### Immobilized Microorganisms in Biochemical Treatment of High Aluminum Waste Waters

907M0153M Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 18 Apr 89) pp 69-71*

[Article by M. R. Pavlova, V. I. Nezdoyminov, N. I. Kulikov, L. P. Usmanova, Ye. M. Novakovskiy, T. A. Buravtsova, and S. I. Kasyun, VNIKhIMPROYekT [expansion unknown], Tula Branch]

[Abstract] Laboratory and field trials were conducted with the use of immobilized *Rhodococcus rubropertinctus* for the removal of Al from industrial waste waters. The resultant data demonstrated that under optimum conditions, which included a temperature of 10-20°C and an immobilized heterotrophic culture with 1 percent *Rhodococcus rubropertinctus*, 76.4-99.0 percent of the Al was removed from water with an initial COD of 50-300 mgO/liter, 20-100 mg/dm<sup>3</sup> Al, and 1.0-45 mg/dm<sup>3</sup> anionic surfactant. The bioreactor installation operated at this efficiency for at least 6 months with no loss of the *Rhodococcus rubropertinctus* component in the biomass. Tables 2; references 12: 8 Russian, 4 Western.

UDC 579.695

### Cultivation of *Pseudomonas rathonis* T Biomass for Anion Surfactant Degradation

907M0153N Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 12 No 1, Jan 90 (manuscript received 8 Jul 89) pp 72-74*

[Article by I. A. Krivets, T. Yu. Grigoryeva, A. G. Sevruck, and S. S. Stavskaya, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Cultivation studies were conducted with *Pseudomonas rathonis* T to identify nutrient media favoring maximum biomass production for the biodegradation of the anionic surfactant volgonat [sic]. Optimal biomass yields on the order of 10 g/dm<sup>3</sup> were obtained on mineral media enriched with 0.5 percent synthetic fatty acids as well as media supplemented with 0.5 percent fatty acids and 0.05 percent enzymatic yeast lysate. The highest degree of volgonat biodegradation was obtained with culture grown in the presence of volgonat as the selective factor. Figures 1; tables 3; references 4 (Russian).

UDC 628.322

**Electrochemical Water Treatment**

907M01530 Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 12 No 1, Jan 90 (manuscript received 6 Jul 88; in final form 7 Jun 89) pp 78-80

[Article by V. D. Grebenyuk, G. I. Korchak, T. T. Sobolevskaya, I. D. Konovalova, N. D. Aksilenko, and M. Yu. Antamamonov, Scientific Research Institute of General and Communal Hygiene imeni A. N. Marzeyev; Institute of Colloid Chemistry and Water Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] The electrolyzers EL-1 and EL-2 were tested for their efficiency in reducing bacterial counts in water as a means of electrochemical water treatment under different operating conditions. With the use of anodal potentials varying from 100 to 300 V/cm<sup>2</sup>, the results showed that at the latter voltage 97-100 percent of the bacteria were eliminated in EL-2. In general, EL-2 was 1.4-fold as effective as EL-1 in water treatment, with the efficiency of elimination ranking as follows for the target microorganisms: *Escherichia coli* K-12 > *Staphylococcus aureus* > *Bacillus subtilis*. Tables 2; references 5 (Russian).

UDC 630\*863.5.002:628.35

**Decreasing Pollution of Hydrolysis Production Wastewater**

18410239A Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 3, Apr 89 p 22

[Article by N. I. Obukhov, chief of Yeast Shop, and L. G. Moreva and G. K. Sivkova, engineers, research laboratory, Syktyvkar Wood Processing Combine Production Association]

[Abstract] Biooxidation of polluted mash has been used at the authors' production association since late 1987 in a 600-m<sup>3</sup> apparatus with an airlift system. The following operating mode is suggested as a result of experimental testing: mash flow rate, 150-155 m<sup>3</sup>/hr; yeast suspension input rate, 30-40 m<sup>3</sup>/hr; yeast suspension concentration, 16-20 g/l; operating fluid depth, 4.0-4.2 m; pH, as required to maintain SR-2 microflora; and temperature,

37-40 °C. The capacity of the unit is rated at 2 t/day. The economic effect is 99,000 rubles per year.

UDC 630\*866.1.002.2:628.543.5

**Biological Purification of Medvezhyegorsk Flant Wastewater**

18410239B Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 3, Apr 89 p 23

[Article by O. A. Dobrynskiy, V. V. Isayev, L. S. Dorogova, and N. N. Kalokhtina, Central Scientific Research and Wood-Chemical Institute]

[Abstract] Studies were performed in 1987 to determine the reasons for the unsatisfactory operation of biological wastewater purification installations of the Medvezhyegorsk Colophony Extraction Plant. It was found that the installations operate in two modes: with and without the arrival of surface wastewater. The operation of the air filters was also analyzed. The unsatisfactory operation of the air filters results primarily from excessive pollution of the wastewaters. In winter the biological film of the air filters is severely chilled. The biofiltration process must be improved or replaced with an active silt process. A two-stage system with air filters in the first stage and aeration tanks in the second stage is suggested. Figures 2; References 5; Russian.

UDC 628.543+628.512

**Method of Using Prehydrolysate and Turpentine Condensate Vapors**

18410239C Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 3, Apr 89 p 26

[Article by A. L. Zhavoronkov, Baikal Paper and Pulp Combine]

[Abstract] Several versions of utilizing condensates to avoid polluting Lake Baikal were studied. In view of the high content of turpentine in the prehydrolysate vapor, it was decided to use the vapor in a condensation installation. Additional heat exchangers were installed to accommodate the large volume of vapor and gas. The system decreased the content of turpentine in the alkaline waste flow by 30 percent and cut in half in the gases emitted.

UDC 546.87'23

### Synthesis of Bismuth Selenides From Initial Components

907M0011C Moscow NEORGANICHESKIYE MATERIALY in Russian Vol 25 No 9 Sep 89 (Manuscript received 10 Jun 87) pp 1441-1444

[Article by A. E. Nadzhip, L. D. Dudkim, All-Union Scientific Research, Planning-Design and Technological Institute of Sources of Current]

[Abstract] A study is made of the process of the formation of bismuth selenides of stoichiometric composition from mixtures of powders of the initial components. Specimens were prepared from pure initial components by mixing calculated quantities of bismuth and selenium powder with a particle size not over 63  $\mu\text{m}$ . The reaction in the mixture of components is similar to combustion, which is confirmed by experiments studying the process of propagation of the synthesis reaction. A liquid-phase combustion process is confirmed. Figures 4; References: 7 Russian

UDC 621.315.592

### Optical and Electrical Properties of $\text{Cu}_2\text{CdSnSe}_4$ and $\text{Cu}_2\text{CdCeSe}_4$ Crystals

907M0011D Moscow NEORGANICHESKIYE MATERIALY in Russian Vol 25 No 9, Sep 89 (Manuscript received 24 Jul 87) pp 1445-1448

[Article by N. N. Konstantinova, G. A. Medvedkin, I. K. Polushina, Yu. V. Rud, A. D. Smirnova, V. I. Sokolova, and M. A. Tairov, Physics and Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences]

[Abstract] Crystalline chemical analogues of the triple compound  $\text{CuInSe}_2$  are produced by the substitution of  $\text{Cd}_4\text{In}$ . The end products are the quaternary compounds  $\text{Cu}_2\text{CdSnSe}_4$  and  $\text{Cu}_2\text{CdCeSe}_4$  crystals. A plan is presented for formation of the semiconductor substances as well as the parameters of their unit cells and forbidden-zone widths. The physical properties of the compounds produced are similar to their ternary analogues. The optical anisotropy of the single crystals is determined. Figures 3; References 8: 3 Russian, 5 Western.

UDC 546.824'431-31

### Influence of Properties of Initial Materials on Formation of Semiconductor Ceramic for Posistors

907M0011H Moscow NEORGANICHESKIYE MATERIALY in Russian Vol 25 No 9, Sep 89 (Manuscript received 11 Aug 87) pp 1548-1551

[Article by B. B. Leykina, Yu. P. Kostikov, and A. O. Olesk]

[Abstract] A study is made of the properties of the basic initial component  $\text{TiO}_2$  and special additives introduced

in the formation of the characteristics of the posistor ceramic  $\text{Ba}_{0.997}\text{Y}_{0.003}\text{TiO}_3$ . The microstructure significantly influences the oxidation-reduction reactions in the synthesis of the ceramic since it determines the rate of gas transfer of the ceramic. The properties of the titanium dioxide thus decisively influence the characteristics of the posistor semiconductor ceramic. Various initial materials require constant adjustment of the technology. The greatest reproducibility is achieved in hydrated materials. Figures 2; References 3: 2 Russian, 1 Western.

UDC 666.11.01

### Effect of Electrostatic Field on Crystallization Processes in Glass-Forming Melt

907M0035E Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 15 No 4, Jul-Aug 89 (manuscript received 15 Feb 88) pp 544-48

[Article by V. A. Iliyev and S. I. Kontrov, Leningrad Technological Institute imeni Lensovet]

[Abstract] A hypothesis of crystallization in glass-forming melts altered by an electrostatic field was developed to explain the operating mechanism of the field and find a way of controlling the crystallization process. If the melt does not occupy the space between electrodes in the device so that no current passes through it, the current of the field inside approaches zero, and the electrostatic effect will only occur in surface layers. The activation energy for diffusion of particles through the interface surface between phases plays a vital role in the crystallization process. The critical dimensions of crystallization nuclei and the thermodynamic potential of crystallization in the formation of critical nuclei are reduced. In an electrostatic field with a constant potential in the electrodes in the glass-forming melt the following occur: the specific heat and temperature of crystallization increase, i.e., the energy gain from the crystallization process and supercooling increases; the rates of nucleus formation and linear crystallization increase; and the tendency of glass-forming melts to crystallization also increases. Figures 2, references 28: 25 Russian, 3 Western.

UDC 535.34:537.226

### Optical Properties of High-Purity Zinc Selenide

907M0051A Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 5 Sep-Oct 1989 (Manuscript received 21 Jul 88) pp 43-48

[Article by A. Ye. Belyanko, Ye. M. Gavrishchuk, A. Yu. Dadanov, M. V. Zhukovskiy, N. I. Lipatov, A. N. Moiseyev, A. P. Okonechnikov, V. A. Sidorov, O. A. Soboleva, Institute of General Physics, USSR Academy of Sciences, Moscow]

[Abstract] A study is made of the properties of zinc selenide single crystals grown from a melt and cut from

the end and central portions of the ingot. Polycrystalline specimens produced by chemical precipitation from the gas phase, by sublimation and by organometallic synthesis were also studied. The optical, luminescent and photoelectric properties were compared. The purest selenide is obtained by chemical precipitation from the gas phase. The highest concentration of electrically and optically active defects is found in the single crystals grown from the melt. Specimens produced by chemical precipitation from the gas phase are most promising for the creation of IR laser optical elements. Figures 3; References 13: 9 Russian, 4 Western.

UDC 621.762.2:546.48'24:547.1'13

**Photoluminescence of Epitaxial Layers of GdTe Produced by Chemical Precipitation from Organometallic Compound Vapor on GaAs Substrates**

907M0051B Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 5 Sep-Oct 1989 (Manuscript received 10 May 89) pp 54-58

[Article by S. M. Batmanov, V. N. Liverko, A. N. Moiseyev, P. G. Sennikov, M. A. Shakarov, Institute of Chemistry of High Purity Substances, USSR Academy of Sciences, Gorkiy]

[Abstract] A study is presented of certain specifics of the low-temperature photoluminescence spectra of epitaxial CdTe layers on the GaAs obtained by the reaction of dimethylcadmium with diethyltellurium. The spectra are quite sensitive to the purity of the organometallic compounds used. Purer compounds eliminate the lines representing recombination of free exciton, while the lines representing recombination of bonded excitons expand and a "self-activated" luminescence band appears in the long-wave area due to recombination of a donor-cadmium vacancy complex. Figure 1; References 20: 5 Russian, 15 Western.

UDC 621.315.592

**Photoluminescence of In<sub>0.53</sub>Ga<sub>0.47</sub>As Layers at 77**

907M0051C Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 5 Sep-Oct 1989 (Manuscript received 26 Apr 89) pp 59-61

[Article by L. M. Batukova, B. N. Zvonkov, I. G. Malkina, T. N. Yankova, A. N. Sidorenko, A. A. Tumanov, Gorkiy Research Physical-Technical Institute; Gorkiy State University imeni N. I. Lobachevskiy]

[Abstract] A study is made of the photoluminescence of In<sub>0.53</sub>Ga<sub>0.47</sub>As layers grown by liquid-phase epitaxy and doped with lanthanum, tin and zinc. The spectra were measured at 77 K, excitation level 10<sup>3</sup>W/cm<sup>2</sup>, exciting laser radiation wavelength 0.514 μm. The spectra of specimens doped with lanthanum contained a band corresponding to the zinc impurity. The variation in

spectral half width with electron concentration is determined in specimens doped with tin, serving as a calibration curve for determination of the electron concentration at 6·10<sup>16</sup>cm<sup>-3</sup> and greater. Figures 2; References 8: 3 Russian, 5 Western.

UDC 546.56'86'23:54-484:543.7

**Production, Purification and Certain Properties of CuSbSe<sub>2</sub>**

907M0051D Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 5 Sep-Oct 1989 (Manuscript received 6 Jun 88) pp 147-152

[Article by M. Yu. Rigan, N. P. Stasyuk, V. I. Tkachenko, Uzhgorod State University]

[Abstract] The compound CuSbSe<sub>2</sub> is produced in highly pure form and some of its physical, chemical and thermodynamic properties are investigated. The polycrystalline CuSbSe<sub>2</sub> was obtained by melting elementary or binary components in stoichiometric ratio in evacuated quartz ampules. The content of copper, antimony and selenium was verified by chemical analysis. A combination of methods was used to purify the initial components. Single crystals of CuSbSe<sub>2</sub> dissolve in nitric acid. They dissolve slowly in concentrated sulfuric acid. Their solubility increases with increasing temperature. Thermodynamic studies indicate that the compound has a tendency toward partial decomposition in the dissolved state. Figure 1; References 13: Russian.

UDC (546.34'77'212:546.34'883'212).07+54-483

**Synthesis of Lithium Metaniobate and Metatantalate of High Purity**

907M0051E Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 5 Sep-Oct 1989 (Manuscript received 18 May 89) pp 153-157

[Article by L. A. Agulyanskaya, V. V. Belov, Z. I. Shapiro, and A. I. Auglyanskiy, Institute of Chemistry and Technology of Rare Mineral Elements, Kola Affiliate imeni S. M. Kirov, USSR Academy of Sciences, Apatity]

[Abstract] A study is presented of certain specifics of the solid-phase synthesis of LiNbO<sub>3</sub> and LiTaO<sub>3</sub> from highly pure components in order to produce products of homogeneous phase composition. The process of synthesis begins with reaction of the pentoxide with an Li<sub>2</sub>CO<sub>3</sub> melt. The passivating film thus formed disappears by reaction with Nb<sub>2</sub>O<sub>5</sub>(Ta<sub>2</sub>O<sub>5</sub>). The synthesis is completed by reaction of Li<sub>3</sub>NbO<sub>4</sub>(Li<sub>3</sub>TaO<sub>4</sub>) with LiNb<sub>3</sub>O<sub>8</sub>(LiTa<sub>3</sub>O<sub>8</sub>). Achievement of products of homogeneous phase composition thus results from the conditions of reaction of Li<sub>3</sub>MeO<sub>4</sub> and LiMe<sub>3</sub>O<sub>8</sub>. Figures 3; References 14: 13 Russian, 1 Western.

UDC 541.127+542.944-.03+66.040.27

**Formation of Anhydrous Iron Trichloride by Action of Natural Gas Plus Chlorine on Iron-Containing Waste Slags**

907M0055A Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 42 No 6 Jun 1989 (Manuscript received 9 Mar 89), pp 351-356

[Article by A. A. Mantashyan, V. A. Martirosyan, and A. V. Zaprosyan, Yerevan Polytechnical Institute imeni K. Markx]

[Abstract] A new approach is suggested to the problem of chlorination of slags. It is based on a gas-phase chain reaction of natural gas with chlorine. The essence of the approach is that the active center atoms and free radicals arising as a result of the chain reactions have high reactivity and easily react with various substances. Also studied is the possibility of using the method to extract iron from waste slag as anhydrous  $FeCl_3$ . The process occurs over the temperature range of 673 to 1,273 K with a natural gas:chlorine ratio between 1:4 and 1:10. Figures 4; References 11: Russian.

UDC 620.193.41

**Study of Corrosion-Electrochemical Behavior of Iron, Chromium, and Chrome Steel in Dilute Alkaline Silicate Solution**

907M0055B Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 42 No 6 Jun 1989 (Manuscript received 3 Feb 88), pp 363-367

[Article by A. R. Oganesyanyan and V. N. Ovchiyan, Institute of General and Inorganic Chemistry, Armenian Academy of Sciences, Yerevan]

[Abstract] The corrosion-electrochemical behavior of type O8Cr17Ti steel and its basic components—iron and chromium—is studied in a dilute alkaline silicate solution. The kinetic variation of the currents of dissolution of steel and its components is studied in the area of potentials from -1.4 to +0.7 V relative to a comparison electrode. In the dilute alkaline silicate solution in the area of potentials of passivation of pure chromium, passivating layers are formed on the steel with good protective properties. The layers are apparently a mixture of spinel oxides of chromium and iron. Figures 3; References 12: 10 Russian, 2 Western.

UDC 669.35:536.7

**Thermodynamic Properties of Liquid Cu-Li Alloy Systems**

907M0066G Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 10, Oct 89 pp 1106-1108

[Article by M. V. Mikhaylovskaya and V. S. Sudavtsova, Kiev University]

[Abstract] The enthalpy of making copper-lithium melts was studied. Results showed that in the interval of compounds that contain solid solutions based on copper, the formation of Cu-Li melts is somewhat exothermic. Formation of alloys with more than 23 percent lithium proceeds endothermically. Partial molar, integral, and surplus free energies and entropies were calculated to obtain more complete thermodynamic information on the liquid Cu-Li alloys. Data indicate that one or several types of atoms may predominate in copper-lithium melts, depending on the lithium concentration. Figures 2, table 1, references 5: 4 Russian, 1 Western.

UDC 542.63

**Reverse Diffusion of Gold and Iron in Silicon During Heat Treatment in Oxygen + Chlorine Medium**

907M0140A Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 21 Dec 87) pp 5-8

[Article by T. V. Moiseyenkova, T. P. Svistelnikova, A. A. Stuk, S. A. Alontsen, and V. A. Kharchenko, Branch of Scientific Physical-Chemical Research Institute imeni L. Ya. Karpov]

[Abstract] Reverse diffusion of a rapidly diffusing admixture during thermal treatment was investigated on silicon samples at a temperature of 800°C in a chlorine-containing atmosphere (CCA). In particular, the behavior of iron and gold introduced into monocrystalline silicon samples was studied. Three series of samples were analyzed: a sample treated in air at 820°C for 2 hours, a sample treated in air at 820°C followed by annealing in CCA, and a sample treated in CCA only. Radioactive  $^{195}Au$  and  $^{59}Fe$  were used to measure diffusion of the test metals. The data showed that the activity of the first series decreased insignificantly, with the admixture diffusing into the sample; the radioactivity in the second group dropped by 30-60 percent, indicating some removal of the rapidly diffusing admixture; and the radioactivity of the third group dropped 5- to 10-fold, depending on the polishing method of the silicon surface. Thus it was shown that reverse diffusion of a rapidly diffusing admixture can occur in silicone, evidently stimulated by chemical processes occurring at the gas-solid interface. Figures 2; references: 5 (Russian)

UDC 539.216.2

**GaAs Alloying With Tin During Liquid Phase Epitaxy Process From Bismuth Alloy**

907M0140B Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 24 Nov 87) pp 9-13

[Article by N. A. Jakusheva and G. M. Beloborodov, Institute of Semiconductors Physics, Siberian Division, USSR Academy of Sciences]

[Abstract] Substitution of gallium by bismuth during liquid-phase epitaxy (LPE) of gallium arsenide leads to considerable changes in the behavior of alloying doping agents. In the present work GaAs alloying with tin was investigated and showed a considerable increase in the coefficient of distribution of tin in the system Bi-GaAs-Sn as compared with the Ga-GaAs-Sn system. In the case of epitaxy of GaAs from bismuth on (100) and (111)A bases, the tin distribution coefficient was virtually identical, whereas for the orientation (111)B it was six to seven times higher. In the temperature range from 1,073 down to 933 K the Sn distribution coefficient was not a function of the temperature. The degree of electric compensation in GaAs layers depends on the concentration of electrons in a layer but is independent of the temperature of their formation or crystallographic orientation. Figures 3; references 7: 6 Russian, 1 Western.

UDC 537.311.33:546.47'191.1+546.48'861.1

### Polishing of Semiconductor Surface Type A<sup>III</sup>B<sup>V</sup> With Colloidal Compositions

907M0140C Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 24 Dec 87) pp 18-22

[Article by A. S. Artemov, N. K. Voronka, D. I. Pishchikov, S. F. Marenkin, and I. M. Parenko, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences]

[Abstract] Preparation of an ideal surface of semiconductor crystals is an important technological problem that has not been adequately solved for A<sup>III</sup>B<sup>V</sup>-type materials. An attempt was made to evaluate the potential of using colloidal composition to polish such semiconductors. CdSb(010) and ZnAs<sub>2</sub>(110) crystals were used in this study. Thin 2-mm plates were prepared, polished with a suspension of Al<sub>2</sub>O<sub>3</sub>M14 followed by diamond paste ACM 3/2 or ACM 2/1, and then finished with colloidal compositions (aminoethoxy aerosol modified with Si-O\*(CH<sub>2</sub>)<sub>2</sub>(NH<sub>2</sub>)<sub>2</sub>). This appeared to be a chemical and mechanical process, its rate depending on the colloidal composition, preliminary treatment of the surface, the type of material being polished, and technological procedure. A mirror surface is obtained without any macrodefects such as scratches, cracks, or etching particles. Figures 6; references: 5 (Russian).

UDC 621.382.823.002

### Ga<sub>x</sub>In<sub>1-x</sub>As<sub>y</sub>Sb<sub>1-y</sub> Epitaxy Using Antimony as a Solvent

907M0140D Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 2 Dec 87) pp 23-27

[Article by V. I. Vasilyev, V. V. Kuznetsov, and V. A. Mishurnyy, Leningrad Electrotechnical Institute imeni V. I. Ulyanov]

[Abstract] Solid solutions Ga<sub>x</sub>In<sub>1-x</sub>As<sub>y</sub>Sb<sub>1-y</sub>(I), isoperiodic GaSb, and InAs are used effectively in the production of electronic optical equipment suitable for the spectral range from 1.7 to 3.5 μm. On the basis of thermodynamic and kinetic concepts the characteristics of liquid-phase epitaxy of isoperiodic heterostructures (I) on GaSb bases were determined by using antimony as a solvent. The experiments were carried out at 907 K in a stream of hydrogen. The composition of the starting liquid phases and temperature of the formation of planar heteroborders were determined. The results obtained were analyzed in the framework of ideas on coherent phase interlinking on the heteroborder with consideration of the transfer of components in liquid phase. The results showed that it is possible to use this method to predict formation conditions for heterostructures in the system Ga-In-As-Sb on GaSb(100) bases from alloy solutions enriched with antimony. Figures 4; references 13: 7 Russian, 6 Western.

UDC 546.87'24

### Crystallization of Bi-Sb Alloys at High Cooling Rates

907M0140E Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 28 Dec 87) pp 28-33

[Article by V. M. Glazov, K. B. Poyarkov, and O. A. Shamrov, Moscow Institute of Electronic Technology]

[Abstract] The Bi-Sb alloys are widely used in solid-state cryogenics. Their phase equilibrium diagram shows mutual solubility of the components in the solid and liquid phases. However, because of segregational phenomena, it is difficult to chemically produce homogeneous solid solutions. One possible method for production of such homogeneous materials is based on very fast cooling of alloys. In the present work an attempt was made to carry out nondiffusional crystallization of Bi-Sb alloys with different compositions (12, 20, 50, and 65 percent Sb) by using a cooling rate of 10<sup>6</sup> - 10<sup>8</sup> K/s. It was shown that solid solutions of Bi and Sb could indeed be obtained by this method with compositions analogous to the original alloys; bismuth-enriched alloys exhibited a greater tendency to nondiffusional crystallization. The solidification process became more complex as the cooling rate decreased. Investigation of Bi and Sb distribution by micro-x-ray spectroscopic analysis pointed out a narrow interval (within an order of magnitude) of the cooling rate in which the crystallization of the solid solutions switched to the nondiffusional mechanism. Figures 4; references 16: 15 Russian, 1 Western.

UDC 535.215:541.133

### Principal Laws of Silver Azide Photoconductivity

907M0140f Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 10 Dec 87) pp 91-93

[Article by Yu. Yu. Sidorin and G. M. Diamant, Kamerovsk State University]

[Abstract] Investigation of light-induced solid-phase silver azide decomposition required additional studies of crystal photoconductivity in order to obtain principal laws of the generation, recombination, capture, and transfer of nonequilibrium charge carriers. An absence of the absolute values of light absorption coefficients of these crystals made the interpretation of results very difficult. Also, it was necessary to begin to consider the effect of light-induced photochemical reaction on photoconductivity. In this study it was shown that during the determination of photoconductivity in the range of natural absorption by silver azide, a photochemical reaction occurs that leads to an accumulation of additional recombination centers; in the range of additional illumination it resulted in the disappearance of previously accumulated centers. A mechanism was described to explain all photoconductivity properties observed experimentally. Figures 3; references 5: 2 Russian, 3 Western.

UDC 548.55

#### Synthesis and Investigation of Ammonium Tungsten Oxide Bronze

907M0140G Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 24 Nov 87) pp 125-129

[Article by V. L. Volkov, Institute of Chemistry, Ural Division of USSR Academy of Sciences]

[Abstract] Tungsten oxide bronzes  $M_xWO_3$  have a number of interesting physicochemical properties: they are inert to the chemical action of acids and bases, they are good electron-conducting agents, and they may be used as oxidation-reduction electrodes and catalysts. An attempt was made to synthesize ammonium tungsten oxide bronze without the use of high pressure and hydrogen. Ammonium tungstites  $(NH_4)_{10}W_{12}O_{41} \cdot xH_2O$  and  $(NH_4)_4W_5O_{17} \cdot 2.5H_2O$  were used as starting materials. Their annealing at 633-673 K in an enclosed volume of inert gas yielded hexagonal bronze whose final composition depended on the temperature and the duration of the process. At temperatures above 800 K,  $(NH_4)_xWO_3$  (where  $x = 0.44$ ) undergoes a structural change to form  $\beta$ - $(NH_4)_{0.44}WO_3$  of hexagonal syngony; when  $x = 0.33$ , the compound does not change, and with  $x < 0.33$ , it breaks down partially due to the evolution of ammonia and water. When  $x > 0.27$ , the temperature of total decomposition in air increases rapidly. Specific electroconductivity at 298 increases similarly when  $x > 0.3$ . Figures 5; references: 7 (Western).

UDC 546.821/824.431:541.45.881

#### Effect of Surface Microphases on Reduction of Ceramics Based on $CaTiO_3$ , $SrTiO_3$ , and $BaTiO_3$

907M0140H Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 11 Aug 87) pp 135-137

[Article by B. B. Leykina, M. A. Kvantov, and Yu. P. Kostikov]

[Abstract] A comparative investigation of the properties of reduced ceramic from calcium, strontium, and barium metatitanates was carried out in an attempt to analyze factors determining the effect of surface microphases on the reduction of these materials. The samples were prepared in air at 1,670 K with preliminary annealing at 1,470 K. Reduction was carried out in purified hydrogen at 1,650 K for 2 hours. Calcium and barium titanates showed a similar degree of reduction; strontium exhibited a much lower degree of reduction. Reductive thermal treatment of these samples led to the appearance of microheterogeneities. The degree of reduction depended on the surface microphases and their action blocking further reduction on the surface of the starting  $MTiO_3$  crystals. References 9: 7 Russian (1 by Western author), 2 Western.

UDC 537.226.33:666.655

#### Effect of Complex Additives' Concentration on Structure and Properties of Lead Zirconate Titanate

907M0140I Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 8 Dec 87) pp 138-142

[Article by V. V. Dorofeyeva, O. S. Didkovskaya, V. V. Klimov, S. E. Shaparenko, V. M. Golubitskiy, and A. M. Vorobyeva, All-Union Scientific Research Institute of Reagents and Chemically Pure Materials for Electronic Technology]

[Abstract] The goal of this work was to investigate the effect of complex additives on the structure and dielectric and piezoelectric properties of lead zirconate titanate (LZT) ceramics. The study material consisted of a solid solution of  $Pb(Zr_{0.52}Ti_{0.48})O_3$  and the additives  $BiNi_{1/3}O_3$  and  $ZrBi_{2/3}Mn_{1/3}O_3$ . Heating these components to 1,120-1,220 K resulted in the formation of monophasic solid solutions with a wide range of concentrations of their components. The temperature of this process did not relate to the amount of the additives. Optimal LZT properties were obtained with 2-3 mole percent complex additives. The optimal effects observed with small quantities of such additives point out the feasibility of using thus modified LZT in the formation of piezoceramic materials for a variety of end applications. Figures 4; references 12: 10 Russian (1 by Western authors), 2 Western (by Russian authors).

UDC 541.133;537.312.6

#### Physicochemical Properties of Lanthanum Manganite Alloyed With Strontium

907M0140J Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 17 Dec 87) pp 184-188

[Article by L. A. Tikhonova, G. I. Samal, P. P. Zhuk, A. A. Tonoyan, and A. A. Vecher, Byelorussian State University imeni V. I. Lenin and Scientific Research Institute of Physicochemical Problems]

[Abstract] Recent studies have shown the potential of using the complex rare earth oxides  $\text{LnBO}_3$  (B= Cr, Ni, Co, Fe, Mn) with perovskite type structures as electrode materials for liquid and solid electrolytes. In the present work the effect of various factors (synthetic conditions, thermal treatment, gas medium) on the electric and thermal properties of polycrystalline samples was investigated in the temperature range 300-1200 K. All of these distorted perovskite structures showed an increased symmetry from rhombohedral toward cubic. The effect of strontium on the structure of lanthanum manganite and its electric properties was studied. The study showed that, depending on the concentration of the introduced strontium, the specimens showed p- or n-type conductivity at room temperature. The relative elongation curves of the investigated specimens increased with increasing concentration of the strontium, ranging from  $5.4$  to  $12.3 \times 10^{-6}$  per K. Figures 4; references 16: 5 Russian, 11 Western (1 by Russian authors).

UDC 546.28:66.046.516

#### Defects Forming During Hardening of Germanium-Doped Silicon

907M0140K Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 16 Nov 87) pp 210-212

[Article by V. V. Borshchenskiy, D. I. Brinkevich, and V. V. Petrov, Byelorussian State University imeni V. I. Lenin]

[Abstract] The effect of isovalent admixtures in Si[Ge] on the processes of the generation and annealing of thermal defects formed during the tempering process (ZTD) was investigated. n- and p- silicon alloyed with Ge was studied during its formation from a molten state. The effectiveness of the insertion of defects after the hardening increased in all samples with increasing  $T_{\text{hard}}$ . The increase in the concentration of holes at temperatures below 1,270 K related to the annealing of thermal

donors. At higher  $T_{\text{hard}}$  the donor type ZTD predominated. At concentrations less than  $3 \times 10^{19} \text{ cm}^{-3}$  germanium showed no significant effect on the formation of ZTD. After the hardening process both the Hall mobility of charge carriers and the tangent of the temperature function angle in n-Si[Ge] decreased. ZTD annealing in Si[Ge] occurs later than in the control material. The increased concentration of ZTD was thought to be connected with spacial separation of the vacancy and internodal type defects that prevented their annihilation and led to an increased concentration of active internodal iron. Figures 2; references 9:8 Russian 1 Western.

UDC 546

#### Preparation and Properties of Thick Films of High-Temperature Superconductors $\text{LnBa}_2\text{Cu}_3\text{O}_{7-x}$ (Ln= Y, Ho, Dy)

907M0140L Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA NEORGANICHESKIYE MATERIALY in Russian Vol 26 No 1, Jan 90 (manuscript received 1 Jul 88) pp 214-216

[Article by G. E. Vedernikov, B. V. Velikanov, Yu. S. Fedayev, S. Ya. Tubin, S. P. Agalakov, V. P. Agalakov, G. P. Shveykin, V. A. Gubanov, G. V. Bazuyev, Yu. F. Zhuravlev, M. V. Kuznetsov, and N. A. Kirsanov, Institute of Chemistry, Ural Division of USSR Academy of Sciences]

[Abstract] Thick films of superconductors were synthesized on the basis of  $\text{LnBa}_2\text{Cu}_3\text{O}_{7-x}$  (Ln= Y, Ho, Dy) compounds, and their properties were investigated. The samples were prepared by ceramic technology from the oxides of rare earth elements, copper and barium carbonate at  $925^\circ\text{C}$ , followed by annealing at  $400^\circ\text{C}$  in air. X-ray phase analysis showed that such films contained the parent compound only in the rhombic symmetry phase. These films exhibited a polycrystalline microstructure with the chemical composition of compact superconductors. Figures 3; references: 2 (Russian).



UDC 547.26'118

**Synthesis of Diorganyl-S-(2-trimethylsilyloxy-1-propene-1-yl)thiophosphites**

907M0076L Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 20 Sep 88) pp 2390-2391

[Article by M. A. Pudovik, I. L. Nikolayeva, and A. N. Pudovik, Organic and Physical Chemistry Institute imeni A. Ye. Arbuzov, Kazan]

[Abstract] A study shows that acid chlorides of trivalent phosphorus react at room temperature with 1-trimethylsilylthia-2-trimethylsilyloxy-1-propene to form diorganyl-S-(2-trimethylsilyloxy-1-propene-1-yl)thiophosphites. These compounds represent a mixture of E- and Z-isomers. Their IR-spectra show a line at 1,620-1,630  $\text{cm}^{-1}$ , which corresponds to the C=C double bond.

UDC 547.246:547.1'13

**Kinetics of Joint Thermal Gaseous Phase Decomposition of Trimethylarsine and Trimethylgallium***907M0076D Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 25 Jan 88) pp 2268-2270*

[Article by V. A. Yablokov, A. V. Dozorov, S. V. Mitrofanova, and B. S. Yavich, Engineering Design Institute imeni V. P. Chlakov, Gorkiy]

[Abstract] If gaseous trimethylarsine and trimethylgallium are combined at 20°C, a crystalline complex with low vapor tension is formed. At higher temperatures the complex reverts to the gaseous phase with partial decomposition to the initial compounds. The present work demonstrates that the complete decomposition takes place at 450°C in a first-order reaction and that the reaction rate constant is 1.5-2 times greater than that of the initial organometallic compounds. References 7: 4 Russian, 3 Western.

UDC 547.583.9

**Thalliumorganic Compounds. Part III. Disproportionation of Phenylthallium Dicarboxylates in Acetone***907M0076E Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 15 Mar 88) pp 2270-2273*

[Article by A. I. Idelevich, I. F. Gunkin, and M. N. Rakhlevskaya, Saratov Polytechnical Institute]

[Abstract] Symmetrization of arylthallium bis(trifluoroacetates) in acetone is a convenient method for preparing diarylthallium compounds. The effect of an aromatic radical on the disproportionation of monoaryl thalliumorganic compounds was studied in a previous work where it was demonstrated that symmetrization in activated systems is encumbered by decomposition of the initial thallium compounds. In the present work phenylthallium dicarboxylates were synthesized and disproportionated in boiling acetone. Symmetrization of monophenyl thalliumorganic compounds was found to extend to various phenylthallium dicarboxylates, the ease of disproportionation being a function of the strength of the corresponding carbonyl group. Acetone serves as a reducing agent for thallium (III) salts. References 10: 3 Russian, 7 Western.

UDC 547.254.7:541.127.3

**Study of Thermal Decomposition of Butyl Zincorganic Compounds***907M0076F Leningrad ZHURNAL OBSHCHEY KHIMII in Russian, Vol 59 No 10, Oct 89 (manuscript received 4 Apr 89) pp 2336-2342*

[Article by A. Ye. Sokolovskiy and A. K. Bayev, Byelorussian Technological Institute imeni S. M. Kirov, Minsk]

[Abstract] Thermal decomposition of butyl zincorganic compounds provides a convenient method for studying the effects of hydrocarbon chain length and structure on the kinetics and mechanism of the process. In the present work a study was made of the thermal decomposition of primary (dibutyl), tertiary (di-tert-butyl), and branched (di-isobutyl)zinc at 452-505 K. The results demonstrate that dibutylzinc decomposes in a radical-chain mechanism where some of the carbon and hydrogen enter the condensed phase. Di-tert-butylzinc also decomposes in a radical mechanism, while di-isobutylzinc follows a mixed radical and olefin-hydride mechanism. Figures 3; references 12: 6 Russian, 6 Western.

UDC 547.541.012

**Interphase Transfer of Potassium Hydroxide to Toluene in Presence of Crown Ethers***18410238G Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 11 Nov 87) p 749*

[Article by O. I. Kachurin, I. B. Frolova, and Z. A. Okhrimenko, Institute of Physical and Organic Chemistry and Carbon Chemistry, Ukrainian Academy of Sciences, Donetsk]

[Abstract] Many authors believe that the contribution of the reaction on the surface of the solid phase in interphase catalysis by crown ethers is slight and the limiting stage of the reaction is the transfer of the nucleophil to the solution. The quantity  $K'_c = x/(C_{0-x})$  represents the thermodynamic equilibrium of alkali transfer and remains constant with a variation in the quantities of participants in the reaction. The constant is related to the transfer coefficient  $x/C_0$ . Experimental data show that equilibrium occurs rapidly in solid KOH-toluene-crown ether. Experiments were performed that demonstrate a strong influence of the structure of the catalyst on the effectiveness of the interphase transfer process. Figures 3; References 7: 6 Russian, 1 Western.

UDC [539.216:539:26]:546.814

**Composition and Degree of Oxidation of Tin in Vacuum Condensates Obtained by Evaporation of  $\text{Ln}_2\text{Sn}_2\text{O}_7$  Stannates***18410238H Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 7, Jul 89 (Manuscript received 16 Dec 87; resubmitted 28 Mar 89) p 772*

[Article by G. A. Teterin, M. Ya. Khodos, Yu. F. Zhuravlev, V. D. Kozlov, and Yu. V. Vorobyev, Institute of Physics and Chemistry, Ukrainian Academy of Sciences, Odessa; Institute of Chemistry, Urals Science Center, USSR Academy of Sciences, Sverdlovsk]

[Abstract] A study is made of electron beam evaporation of compounds with incongruent melting. Specimens of rare-earth distannates were prepared by coprecipitation.

X-ray-electron spectra of vacuum condensates indicate that the rare earth metal is absent in the film obtained. The results show that the rare- earth distannates disproportionate under the influence of the electron beam. The

vacuum condensate is greatly enriched in and may even completely consist of oxides with lower interparticle metal-oxygen interaction energy. Figure 1; References 5: 4 Russian, 1 Western.

UDC 547.241

**Conversions of  
Di-ter-Butylbis(dimethylamino)methyl Phosphine***907M0076A Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 16 Feb 88) pp 2206-2211*

[Article by I. V. Shevchenko, M. V. Furmanova, V. P. Kukhar, and O. I. Kolodyazhnyy, Bioorganic Chemistry Institute, Kiev]

[Abstract] During recent years considerable interest arose in compounds containing the P-C-N group, many of which are highly biologically active. However, the chemical properties of these compounds, especially aminomethyl phosphines, have not been well studied. In the present work a study of some of the properties of the title compound shows that in contrast to analogous phosphines with other alkyl groups at the phosphorus atom, it reacts with hydrogen chloride with cleavage at the P-C bond. Other proton-donor reagents, even those as weak as aniline, also split the P-C bond. The title phosphine reacts vigorously with acids, methanol, and acetoacetic ester at room temperature. Other reactions demonstrate that the title compound has a labile P-C bond that splits readily with proton-donor or electrophilic reagents. References 10: 5 Russian, 5 Western.

UDC 547.438.1+547.442.4

**Reactions of 1,5-Diketones. Part LI. Reaction of  
Arylaliphatic 1,5-Diketones With  
Bis(trimethylsiloxy) Phosphine***907M0076B Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 21 Dec 87) pp 2223-2228*

[Article by V. I. Vysotskiy, S. V. Levankov, and Yu. V. Prikhodko, Far Eastern State University]

[Abstract] Bis(trimethylsiloxy) phosphine, the synthetic equivalent of hypophosphorous acid, is known to react vigorously with carbonyl compounds, but 1,5-diketones were not studied. In the present work a study of the reactions of bis(trimethylsiloxy) phosphine with 1,5-diphenyl-1,5-pentanedione and 1,3,5-triphenyl-1,5-pentanedione shows that the first diketone adds two

molecules to form a linear addition product, 1-hydroxy-5-trimethylsiloxy-1,5-diphenylpentane-1,5-diphosphonic acid. The second diketone reacts to form the cyclic products 2,4,6-triphenyl-2,3-dihydro-4H-pyran-2-phosphonic acid and 1,2,6-trihydroxy-1-oxo-2,4,6-triphenylphosphorinane. The ratio of one product to the other varies according to the reaction conditions. Corresponding methyl esters were obtained by reaction of the acids with diazomethane. References 3 (Russian).

UDC 547.26'118+546.133.1

**Reactions of Esters and Esteranhydrides of  
Trivalent Phosphorus Acids With tert-Butyl  
Hypochlorite***907M0076C Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 4 Mar 88) pp 2228-2232*

[Article by T. Kh. Gazizov, Yu. V. Chugunov, and A. G. Abulkhanov, Organic and Physical Chemistry Institute imeni A. Ye. Arbuzov, Kazan]

[Abstract] Triethyl phosphite reacts with ethyl hypochlorite to form triethyl phosphate. Derivatives of P(III) acids react with alkyl hypochlorites, with the phosphorus atom attacking the chlorine in the hypochlorite to exchange anions and form an intermediate. Tertiary phosphines, in the presence of an alcohol, also react with hypochlorites to give an alkyl chloride. If P(III) acid derivatives react with hypochlorites with the phosphorus atom attacking the halogen and pass through an anion exchange into a quasiphosphonium compound, then the reactions of hypochlorites with mixed phosphites should also pass through a quasiphosphonium compound containing electron-acceptor radicals bound to the phosphorus atom through an oxygen. An analysis of their decomposition, in relation to the properties of the radicals, should yield information on the mechanism of the second stage of the Arbuzov reaction. In the present work the decomposition of simulated quasiphosphonium compounds was studied with reactions of triethyl phosphite, diethyl(tert-butyl) phosphite, and diethylacetyl phosphite with tert-butyl hypochlorite. The results indicate that the second stage of the Arbuzov reaction includes selective dealkylation of the intermediate product at the tert-butyl group, or selective deacylation. References 10: 6 Russian, 4 Western.

UDC 547.26'118

### Reactions of Certain Vinyl Phosphites With Trimethylsilyldiethylamine

907M0076G Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 14 Sep 88) pp 2378-2379

[Article by A. R. Burilov, I. L. Nikolayeva, M. A. Pudovik, and A. N. Pudovik, Organic and Physical Chemistry Institute imeni A. Ye. Arbuzov, Kazan]

[Abstract] Silylated vinyl mercaptans and vinyl phosphites having functional groups present at the ethylene bond have not yet been studied. Vinyl phosphites have been prepared by phosphorylation of S-acetylated mercaptoacetone with ethyl- and pyrocatechinchlorophosphites. Infrared spectra of the latter shows absorption lines corresponding to the ethylene and carbonyl groups, while NMR-spectra show E- and Z-isomers of phosphorus. In the present work silylation of the above phosphites with triethylsilyldiethylamine unexpectedly resulted in the formation of vinylthiophosphites.

UDC 547.2 41

### Synthesis and Reactivity of Dialkylaminomethylphosphonites

907M0076H Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 14 Sep 88) pp 2379-2381

[Article by A. A. Prishchenko, M. V. Livantsov, N. V. Boganova, and I. F. Lutsenko, Moscow State University imeni M. V. Lomonosov]

[Abstract] Previously unavailable dialkylaminomethylphosphonites may be used to study the mutual effects of nitrogen and phosphorus atoms joined with a methylene group, as well as for the synthesis of new organophosphorus compounds. A convenient method for the synthesis of dialkylaminomethylphosphonites is based on the reaction of dibutoxyphosphine with a butoxymethyl(dialkyl)amine. Especially interesting is the behavior of dialkylaminomethylphosphonites under conditions of the Arbuzov reaction in connection with the lability of the P-C bond in dialkylaminomethylphosphines. The resulting phosphine is readily quaternized with the first equivalent of methyl iodide at the nitrogen atom to form an intermediate phosphonite that then reacts with excess methyl iodide to form the normal phosphinate of the Arbuzov reaction. The same phosphonite reacts with trimethylacetyl chloride and carbon tetrachloride to rupture the P-C bond at the quasiphosphonic stage, thereby preserving the tricoordinated phosphorus atom in the product. A highly reactive intermediate, chloromethyl(dialkyl)amine, rearranges the second phosphonite equivalent to yield a phosphinate. This unexpected course of the Arbuzov reaction has been observed previously with dialkoxymethylphosphonites and their analogues. References 5 (Russian).

UDC 547.241

### Synthesis of Tetraalkyl Esters of Dimethylaminomethylenediphosphorus-Containing Acids

907M0076I Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 14 Sep 88) pp 2381-2382

[Article by A. A. Prishchenko, M. V. Livantsov, N. V. Boganova, P. V. Zhutskiy, and I. F. Lutsenko, Moscow State University imeni M. V. Lomonosov]

[Abstract] Aminoalkylphosphorus-containing acids and their derivatives, which are used widely in organic synthesis, have a high capability of forming complexes with various metal ions. In the present work a convenient method is presented for the synthesis of new tetraalkyl esters of dimethylaminomethylenediphosphorus-containing acids. Dibutoxyphosphine is heated to 130°C with dimethylformamide dimethylacetal to form dimethylaminomethylene-bis-phosphonite. Dialkyl(trimethylsilyl)phosphites also react with the above acetal at 130°C in the presence of zinc chloride according to the Arbuzov reaction to form aminomethylene-bis-phosphonates. References 5: 2 Russian, 3 Western.

UDC 547.241

### Dialkylaminomethylation of Trimethylsilyl Esters of Trivalent Phosphorus

907M0076J Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript received 14 Sep 88) pp 2383-2384

[Article by A. A. Prishchenko, M. V. Livantsov, N. V. Boganova, and I. F. Lutsenko, Moscow State University imeni M. V. Lomonosov]

[Abstract] Organophosphorus compounds containing the dialkylaminomethyl group have many useful properties. In the present work trimethylsilyl esters of trivalent phosphorus are dialkylaminomethylated with bis(dialkylamino)methane as a convenient means of synthesizing corresponding tetracoordinated phosphorus compounds containing a functional group. Specifically, trimethylsilyl esters of phosphorous and phosphonous acids were treated with bis(dialkylamino)methane according to the Arbuzov reaction in the presence of zinc chloride as a catalyst at 120°C to form the corresponding phosphonate and phosphinate. Trimethylsilyl esters of hypophosphorous acid containing an active P-H or P-O-Si group react under similar conditions with excess bis(dialkylamino)methane by dual dialkylaminomethylation to form bis(dialkylaminomethyl)phosphinate. References 3: 2 Russian, 1 Western. INPUT FILE: 907M00.76K

UDC 547.341

**Preparation of Diethyl Ester of  
Acetylenephosphonic Acid**

907M0076K Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 21 Sep 88) pp 2389-2390

[Article by B. U. Minbayev, O. A. Sivolobova, and B. D. Abiyurov, Organic Synthesis and Carbon Chemistry Institute, Karaganda]

[Abstract] In a previous work a method was described for preparing the diethyl ester of acetylenephosphonic acid from diheterosubstituted acetylene. Later, the same ester was prepared in a 35 percent yield by alkaline splitting of phosphonacetylene alcohol with cesium carbonate. In the present work the ester was prepared by alkaline splitting with potassium carbonate at a 75 percent yield. References 2: 1 Russian, 1 Western.

UDC 547.26'118.07

**Synthesis of  
2-Trimethylsiloxy-1,3,2-oxathiaphospholenes**

907M0076M Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 59 No 10, Oct 89 (manuscript  
received 20 Sep 88) pp 2392-2393

[Article by A. R. Burilov, I. L. Nikolayeva, M. A. Pudovik, and A. N. Pudovik, Organic and Physical Chemistry Institute imeni A. Ye. Arbuzov, Kazan]

[Abstract] A study shows that reaction of various 2-chloro-1,3,2-oxathiaphospholenes with bis(trimethylsilyl)acetamides results in the formation of new 2-trimethylsiloxy-1,3,2-oxathiaphospholenes. The reaction takes place at room temperature, lasts one hour, and terminates with an intermediate that can be converted to a silyl ester by fractionation.

UDC665.662

**Oligomer Enrichment of Gasoline Fractions From Thermal Destruction Processes**

907M0053A Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 9, Sep 89 pp 9-10

[Article by Zh. F. Galimov, S. V. Novoselov, and Kh. M. Gibadullina, Ufa Petroleum Institute]

[Abstract] Gasoline fractions resulting from refining petroleum residues are high in sulfur, nitrogen, oxygen, and olefins. These components degrade gasoline quality and prevent their direct use as motor fuels. The unsaturated compounds also promote resin formation during storage and coke formation in the equipment and on the catalysts if they are enriched by known high-temperature methods. With the continued refining of low-grade stocks, the rational use of gasoline fractions from thermal destruction processes becomes more acute. Hydrofining presents problems with resin formation in the heat exchangers and coking in the furnace pipes and first-stage catalyst bed, while blending with straight-run fractions only dilutes the concentration of di- and mono-olefins. The oligomer method of refining that was developed at the Ufa Petroleum Institute consists essentially of the selective conversion of unsaturated sulfur-, nitrogen-, and oxygen-containing compounds and di- and mono-olefins into oligomers (low-molecular weight compounds). Clean distillate below 150°C is contacted with solid acid catalyst to form oligomeric unsaturated compounds that are dissolved and removed from the reactor and further fractionated. This results in the formation of a chemically stable distillate and oligomeric resins that could be further fractionated if necessary. The method has been run successfully in the pilot plant stage.

UDC62.634.2.66.022.38

**Low Viscosity Marine Fuel With Improved Low-Temperature Properties**

907M0053B Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 9, Sep 89 pp 11-12

[Article by N. K. Kondrasheva, Ufa Petroleum Institute]

[Abstract] A study examined the possibility of converting high-speed marine diesel engines to low-viscosity fuel containing heavy straight-run diesel fractions along with cracking and coke oven gas oils. Low-viscosity marine fuel with an elevated boiling point is designated for marine power plants in place of the diesel fuel L-0.5

(GOST 305-82), which is becoming scarce. In accordance with specification TU 38.010567 the pour point of marine diesel fuel must not exceed -10°C. However, northern shipping lines require a winter-grade fuel (GOST 305-82). An experimental lot of a low-viscosity marine diesel fuel meeting pour point and filtration requirements (GOST 22254-76) was produced at the Novo-Ufa Petroleum Refinery. Improved low-temperature characteristics were obtained by adding 0.1 percent VES-408 and Depren "D" additives. These additives are solutions of ethylene-vinyl acetate copolymers in light catalytic gas oil and m-xylene, respectively. The mechanism of the pour point depression of these additives is not yet clear. Figure 1; references 7 (Russian).

UDC 662.758:665.567

**Mechanism of Alcohol-Ester Deicing Additives in Motor Fuels**

907M0053D Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 9, Sep 89 pp 22-24

[Article by O. P. Lykov, V. I. Slovetskiy, N. V. Frolova, G. V. Kitashova, and V. Ye. Yemelyanov, Petroleum Refining SRI (A-U), Moscow]

[Abstract] Most carburetor deicing additives contain surfactants or low-molecular weight water-soluble oxygen compounds such as the lower alcohols, glycols, and esters. A clear concept of the mechanism of carburetor icing is needed before an efficient deicing additive can be developed. In the present work a study was made of the deicing mechanism of gasoline additives obtained from alcohol production vat bottoms containing 16-39 percent C<sub>4</sub>-C<sub>8</sub> alcohols, 21-23 percent butyrates, 14-16 percent butyrals, about 4 percent butyl ethers, and up to 14 percent monoglycol esters and other compounds. Apparently, the deicing mechanism takes place in two stages. In the first stage, i.e., the premicelle stage, oxygen components of the vat bottoms are adsorbed on the surfaces of water droplets, and this creates an adsorption layer that inhibits aggregation of the droplets. In the second micellar stage, surfactants are present in the bulk of the gasoline form micelles that solubilize the water particles and prevent aggregation. During vaporization of the fuel mixture in the carburetor, the concentration of surfactant components of the additive, having different boiling points, is redistributed between the vapor and liquid phases, the higher-boiling components being concentrated in the liquid phase. Figures 5; references 5 (Russian).

UDC 678.744.322.01.004.1

**Acrylic Copolymers***907M0102A Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 8-9*

[Article by A. Ye. Kulikova]

[Abstract] More than 60 varieties of acrylic copolymers have been developed at the Institute of Chemistry and Technology of Polymers imeni V. A. Kargin, but only 50 are being produced in commercial quantities in the USSR. In general, Soviet production of acrylic copolymers falls into three categories: copolymers that are soluble in water, copolymers that are soluble in organic solvents, and copolymers that serve as modifiers of PVC and other homopolymers. At the present time only some 25-30 percent of the Soviet demand for acrylic copolymers is being met. In view of this, strenuous efforts are being made to increase production, expand the product line, and improve quality.

UDC 678.743.22:66.095.26

**Suspension Polymerization of Vinyl Chloride in Reverse Condenser Reactors***907M0102B Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 9-12*

[Article by A. A. Mironov, A. D. Gutkovich, V. V. Shebyrev, E. P. Rybkin, and N. N. Olnev]

[Abstract] Mathematical analysis was conducted on polymerization of vinyl chloride suspensions in reactors equipped with reverse condensers to the defined parameters that would support isothermic conditions. Correlation of theoretical calculations with experimental studies on 1.25-, 20-, and 200-m<sup>3</sup> reactors led to the formulation of an equation relating the diameter of the PVC granules, thermal factors, stabilizer employed, and hydrodynamic conditions. The data may be utilized in the design of improved reactors for vinyl chloride polymerization. Figures 1; references 5 (Russian).

UDC 678.743.22:66.095.26:62.18

**Physicochemical Aspects of Reactor Fouling With Polymer in Vinyl Chloride Polymerization***907m0102C Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 12-15*

[Article by V. A. Popov, Ye. P. Shvarev, L. V. Levagina, I. I. Gorbachevskiy, V. S. Etlis, and V. Ya. Kolesnikov]

[Abstract] A common and serious problem encountered in vinyl chloride polymerization is that of fouling of the reactor surface with polymer, a condition that has an adverse effect on the product. Physicochemical investigations have shown that this is a complex process involving adsorption of the monomer to the surface followed by polymerization of the adsorbed polymer.

Subsequent events in the process included swelling of the adsorbed polymeric film and adhesion of small polymeric particles from the aqueous phase to the polymer-coated surface. Preventive measures include steps that increase the wetting angle, at least to 100° or better, and inhibit polymerization in the boundary layer. Tables 3; references 10: 4 Russian, 6 Western.

UDC 678.744.335:66.095.26:541.126.2

**Initiation of Methyl Methacrylate Polymerization by Macroradicals in Polymeric Matrix***907m0102D Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 15-16*

[Article by V. I. Arulin, A. L. Yefimov, V. I. Kucheryavaya, and A. I. Dyachkov]

[Abstract] Analysis of methyl methacrylate polymerization led to the observations that in the gel phase long-lived "immured" radicals accumulate in the polymeric matrix that support postpolymerization after the initiator is removed. Accordingly, dilatometric studies were conducted on the process of methyl methacrylate polymerization. The studies demonstrated that the addition of a polymeric primer containing such radicals leads to polymerization in the absence of any other initiator. Polymerization initiated in this manner proceeds at a constant rate, with retention of a distinct interface between the polymeric and monomeric phases indicating a laminar process. The final product has a homogenous molecular mass, unlike the results with block polymerization, and possesses a higher degree of optical homogeneity. Laminar polymerization carried out by this technique results in polymers of controlled thickness, configuration, and cross-sectional homogeneity. Figures 1; references 6 (Russian).

UDC 678.5:66.095.26:547.264:547.264:547.391.1

**Kinetics of Emulsion Copolymerization of Butyl Acrylate With Water-Soluble Monomers***907M0102E Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 16-20*

[Article by Yu. I. Bulkin, N. N. Usacheva, G. S. Lomonosova, A. V. Trubnikov, M. D. Goldfeyn, N. V. Kozhevnikov, and B. A. Zyubin]

[Abstract] Since theoretical understanding of the polymerization process in emulsions remains incomplete, detailed kinetic analysis was conducted on the copolymerization of butyl acrylate (BA) with methyl methacrylamide (MMA), acrylamide (AC), and methacrylamide (MA). Dilatometric studies revealed that under otherwise identical conditions copolymerization of BA with MA proceeded at a slower rate than homopolymerization of BA. In addition, the rate of copolymerization decreased with an increase in the concentration of MA in the emulsion. The rate of copolymerization was not affected by the concentration of AC or MMA, although



there was a tendency toward coagulation in view of their colloidal instability. Graphical presentations are made of the effects of emulsifying agents (S-10 and sodium lauryl sulfate) on the rates of copolymerization in the different emulsions under helium and air, and there is an indication of the reaction orders vis-a-vis different components. Figures 2; tables 1; references 6: 2 Russian, 4 Western.

UDC 678.744.322.021.17

### Storage-Related Structural Transformations in Acrylic Latex

907M0102F Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 28-31

[Article by B. L. Khavkina, N. A. Zaytseva, I. Ya. Matveyeva, T. N. Sinitsina, and N. G. Shveykina]

[Abstract] Storage-related structural changes in acrylic latex were monitored over a 12-month period of storage at room temperature in order to obtain a better appreciation of time-dependent changes in the chemical and colloidal properties that occur in these materials. Potentiometric, conductometric, and turbidimetric plots confirmed the gradual changes in acrylic latex films prepared from butyl acrylate, methyl methacrylate, and methacrylic acid in a ratio of 58:35:7. These changes were reflected in deterioration of thermomechanical parameters and the twofold reduction in the probable radius of the particles after 12 months. The changes, however, were not monotonous in nature, as is evidenced by the fact that during the first 4 months of storage tensile strength actually improved, to be followed by deterioration thereafter. The findings were indicative of micro- and macromolecular changes involving variable changes in fluidity in the different components, segregation into phases, and separation, among others. Figures 2; tables 1; references 2 (Russian).

UDC 678.049.16:536.6

### Properties of Thermostable Anaerobic Compositions

907M0102G Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 33-35

[Article by A. L. Mokrousov, S. B. Meyman, D. A. Aronovich, and A. P. Sineokov]

[Abstract] An analysis was conducted on the contribution of selected chemical groups to the thermostability of anaerobic compositions. Studies conducted at 350°C showed that physicochemical data were in excellent agreement with thermogravimetric data, both showing best results with compositions based on (iso)cyanurates containing allyl groups over compositions based on methacrylate derivatives of isophthalic acid. The greater

thermal stability of the former was, at least in part, attributable to polymerization of the allyl components and the consequent structuring. Allyl derivatives of isocyanuric and isophthalic acids, in addition to high thermostability, were also resistant to a number of aggressive reagents such as nitric acid, alkali, boiling brine, hydrogen peroxide, and so forth. Figures 2; tables 1; references 8 (Western).

UDC 678.744.322.049.16:539.4

### Strong Acrylic Adhesives

907M0102H Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 40-42

[Article by Z. S. Khamidulova and A. P. Sineokov]

[Abstract] A brief review is presented of the second generation of acrylic adhesives. Special attention is paid to the performance of the Soviet products Anaterm-105 and Anaterm-106 when used in bonding metals. Significant improvements were made in the properties of these adhesives by the introduction of elastomer additives that, for example, raised the impact resistance to 80 kJ/m<sup>2</sup> even at 150°C. Anaterm-105 has been shown to perform well over a temperature range of minus 60 to plus 150°C, and Anaterm-106 extends the range to 200°C. Bonding strength in the case of Anaterm-105 does not deteriorate for 5,000 hours at 150°C and for 500 hours at 200°C in the case of Anaterm-106. These improved adhesives have been a significant factor in advancing bonding technology and in the development of new applications. Figures 1; tables 1; references 3: 2 Russian, 1 Western.

UDC 678.744.322.029.5:669

### Modification of Acrylic Copolymer for Bonding Metal to Plasticized PVC

907M0102I Moscow PLASTICHESKIYE MASSY  
in Russian No 12, Dec 89 pp 42-45

[Article by A. Yu. Generalova, L. A. Gershteyn (dec.), M. I. Frolova, V. I. Chervyakova, and A. I. Sorokin]

[Abstract] Testing was conducted with various acrylic copolymers to determine their performance characteristics in bonding PVC films to metal surfaces. The combinations of n-butyl acrylate and vinyl acetate, acrylic acid, and acrylic esters were further improved with various additives in a determination of tensile strength, break points, and other physicochemical parameters. Low-molecular weight additives, such as epoxy and perchlorovinyl resins, ensured the greatest bonding strength depending on the composition of the copolymer. Maximum adhesive strength, 2.2 kN/m, was attained with a molar ratio of carboxyl to epoxy groups of 1:1 to 1:1.5. Figures 2; tables 2; references 9: 5 Russian, 4 Western.

UDC 541.15:678.742

**Radiothermal Luminescence of Irradiated Mixtures of Polyethylene and Ethylene-Vinyl Acetate Copolymers***907M0080C Kiev TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA in Russian Vol 25 No 5, Sep-Oct 89 (manuscript received 4 Apr 88) pp 633-637*

[Article by T. N. Gordiychuk and V. P. Gordienko, Physical Chemistry Institute imeni L. V. Piszarshevskiy, Kiev]

[Abstract] Radiothermal luminescence (RTL) has been used previously to study the structure of high-molecular weight compounds and mixtures of polymers. In the present work RTL was used to study the degrees of compatibility of binary mixtures before and after the action of fast electrons by using various mixtures of high- and low-pressure polyethylene and ethylene-vinyl acetate copolymers. The results show that the temperature position of maximum luminescence is a function of the ethylene-vinyl acetate copolymer concentration. The components are compatible if the position of the luminescence maximum lies within the glassification temperature range. Figures 2; references 9 (Russian).

UDC 546.799.5

**Sulfate Compounds of Americium (V)***907M0096A Leningrad RADIOKHIMIYA in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 20 Dec 89) pp 14- 16*

[Article by A. M. Fedoseyev and N. A. Budantseva]

[Abstract] There are only a few pentavalent actinoids with simple compositions whose properties and structure have been studied, and their number should be increased to further develop the coordination chemistry of these compounds. The present study was conducted to compare the behavior of americium (V) sulfates with neptunium (V) sulfates. The americium (V) sulfate having the composition  $(AmO_2)_2SO_4 \cdot H_2O$  was isolated. This compound has no analogues with simple neptunium (V) compounds. The difference in behavior between neptunium and americium compounds is evidently due to the weaker cation-cation reactions of americium. Double americium (V) sulfates  $CsAmO_2SO_4 \cdot H_2O$  and  $Co(NH_3)_6AmO_2(SO_4)_2 \cdot H_2O$  were prepared. The latter have structures that are iso to corresponding neptunium (V) compounds. The cesium-americium (V) double sulfate is formed under such conditions where neptunium (V) would yield a disulfate complex. Infrared spectra and x-ray analysis data are presented. Figure 1; references 4 (Russian).

UDC 535.37:546.799.6

**Chemiluminescence of Curium During Reduction of  $Cm^{(IV)}$  to  $Cm^{(III)}$** *907M0096B Leningrad RADIOKHIMIYA in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 20 Dec 89) pp 16- 19*

[Article by A. B. Yusov and A. M. Fedoseyev]

[Abstract] Chemiluminescence of the reduction of curium (IV) to curium (III) was first reported 1986. Previously, it was noted in the literature that this type of weak luminescence was associated with the dissociation of terbium complexes. Chemiluminescence of rare earth element ions has been known in general for a long time, although its observation has been limited to organic reactions only, where the rare earth metal ion acted mainly as an acceptor of energy without changing its chemical state. This resulted in a significant increase in the chemiluminescent output of organic reactions, and therefore the newly observed type of chemiluminescence presents interest as an additional means of studying the kinetics and mechanism of corresponding reactions of f-elements. In the present work new chemiluminescent reactions were observed in the reductions of curium (IV) and terbium (IV) during acid dissolution of their double oxides with lithium. The chemiluminescent output during dissolution in  $H_2SO_4$  and  $HClO_4$  was estimated at  $10^{-7}$  to  $10^{-10}$  quanta. It is assumed that the low output is due not to the reduction of the tetravalent f-element in solution but to that remaining on the surface of the solid phase, so the excitation energy becomes dissipated throughout the crystal lattice. The most probable chemiluminescent stage in both the new and previously observed chemiluminescent reactions is the reaction of curium with water. Figure 1; references 7: 5 Russian, 2 Western.

UDC 535.37:546.799.6

**Temperature Extinction of Photoluminescence of Polytungstate Complexes of Curium (III)***907M0096C Leningrad RADIOKHIMIYA in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 20 Dec 88) pp 19- 23*

[Article by A. B. Yusov and A. M. Fedoseyev]

[Abstract] Luminescence of aqueous solutions of curium (III) complexes with isopoly- and heteropolytungstate anions has been reported previously. The polytungstate ligand evidently plays a dual role, being an energy donor for curium (III) and extinguishing its luminescence. It was concluded that the luminescence extinction of curium (III) with the polytungstate ligand takes place through a charge transfer mechanism between the excited  $Cm^{*(III)}$  and  $W^{(IV)}$  to form the intermediate state  $Cm^{(IV)}$  and  $W^{(V)}$ . In the present work a study was made

of the chemiluminescent lifetime of curium (III) complexes with polytungstate anions as a function of temperature. Activation energies for temperature extinction of luminescence were determined, and it was demonstrated that the data agree well with the hypothesis of luminescence extinction by the charge transfer mechanism. The luminescent properties of the complexes were found to be directly related to the stability of tetravalent curium present in them. Figures 3; references 9: 5 Russian, 4 Western.

UDC 543.8+546.799.5

#### Effect of Ultrasound on Redox Reactions of Americium Ions in Aqueous Solutions

907M0096D Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 28 Oct 88) pp 23- 26

[Article by M. V. Nikonov, V. P. Shilov, and N. N. Krot]

[Abstract] Ultrasound causes the formation of free radicals and their conversion products in aqueous solutions, the processes being similar to radiochemical conversions. Sonochemical reactions of  $\text{Np}^{(\text{V})}$  and  $\text{Pu}^{(\text{IV})}$  have been studied previously. In the present work spectrophotometry was used to study americium ion stability in various states of oxidation subjected to ultrasound. The results show that in 0.5 mole per liter solutions of either perchloric or nitric acids, americium (VI) is rapidly reduced, first to americium (V), and then to americium (III). The stability of americium (V) increases with the concentration of the acid. Ultrasound accelerates the oxidation of americium (V) to americium (VI) with ozone in 1 mol/l nitric acid solution at room temperature. Figures 2; references 7: 6 Russian, 1 Western.

UDC 543-8-546.799.4

#### Effect of Ultrasound on Reduction of Plutonium (IV) With Hydrazine and Hydroxylamine in Nitric and Perchloric Acids

907M0096E Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 24 Jan 89) pp 27- 30

[Article by M. V. Nikonov and V. P. Shilov]

[Abstract] The reduction of plutonium (IV) with agents such as hydrazine and hydroxylamine occupies an important place in radiochemical practice. Reduction with hydrazine at room temperature is a slow reaction requiring either higher temperature or a catalyst. It has recently been demonstrated that some reactions of actinoid ions may be accelerated with ultrasound, and the same was found true for plutonium (IV) reactions with hydrazine. In the present work a spectrophotometric study of the reduction of plutonium (IV) with hydrazine and hydroxylamine in nitric and perchloric acid solutions at 18 to 20°C demonstrates that this reaction takes place about 10 times faster with ultrasound in the case of

hydrazine while the former has little or no effect on reduction with hydroxylamine. Figures 4; references 5 (Russian).

UDC 546.295

#### Formation of Xenon Isotopes in Reactions With High-Energy Protons in Artificial Targets and Meteorites

907M0096F Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 30 Aug 88) pp 65- 69

[Article by B. N. Belyayev, S. O. Berezinskiy, and A. Yu. Shchukolyukov]

[Abstract] Modeling radiation conditions of objects in outer space in an accelerator provides information on nuclear processes taking place in space in meteorites and in lunar material. Cosmogenic xenon in meteorite rocks originates from the nuclear splitting reactions of cesium and barium in rare earth elements with cosmic protons, while the formation of cosmogenic Xe in ferrous meteorites is chiefly the result of nuclear reactions with Ir, Pt, and Au. A systematic mass spectrometric study of the cumulative yields of Xe isotopes in reactions of protons with energies ranging from 25 MeV to 30 GeV with Cs, Ba, and rare earth element nuclei has been conducted previously. Experimental data also exist for Ta, W, and Re targets. These data are analyzed in the present work and compared with computed values. Figures 3; references 15: 6 Russian, 9 Western.

UDC 541.28:547.1'3

#### Nuclear Chemical Method for Preparing Tritium-Containing Heteroorganic Compounds. Part 2. Nuclear Chemical Synthesis and Comparative Characteristics of Heteroorganic Compounds

907M0096G Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 20 Oct 88) pp 72- 74

[Article by V. D. Nefedov, M. A. Toropova, N. Ye. Shchepina, V. V. Avrorin, and V. V. Shchepin]

[Abstract] The capability of identical generation of phenyl cations for different elements of groups V and VIa makes it possible to compare the effects of spatial and electron characteristics on the course of nuclear chemical synthesis. The reaction intensity of tritiated phenyl cations with nucleophilic sites of complete phenyl derivatives of groups V and VIa elements may be characterized by the onium cation yield. In the present work the results of nuclear synthesis of organic derivatives of groups V and VIa were used to compare the reactivity of unshared electron pairs of heteroorganic compounds with the relative stability of the organic onium cations.

Group Va elements are characterized by more pronounced vibrations and stability of the onium cations. References 19: 15 Russian, 4 Western.

UDC 535.37:546.791.6

#### Use of Kinetic Luminescence Characteristics To Determine Uranium Mass Fraction in Base Substance

907M0096H Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 13 Feb 88) pp 87- 93

[Article by V. M. Aleksandruk, S. A. Nikitina, Ye. B. Preobrazhenskaya, and A. V. Stepanov]

[Abstract] Luminescent methods for determining uranium in solution require that some components be extinguished or otherwise canceled through the use of additives. A recently proposed alternative involves temporary resolution with allowance for the kinetic characteristics of the luminescence extinction of the excited uranyl. This permits a determination of the initial uranyl luminescence intensity without relying on additives, and it has a linear relation to the concentration of uranium in the solution. In the present work a study was made of those factors affecting the determination of uranium by the initial luminescence intensity in the presence of an extinguishing agent during excitation by pulsed laser. Corrections must be made for temperature and light absorption in the extinguisher solution to get reliable results. By making use of the kinetic characteristics of luminescence, it is possible to determine the concentrations of both the uranium and the extinguishing agent simultaneously. The study was conducted on the basis of determining uranium in iron in a 1 mole per liter phosphoric acid solution. At a total uranium concentration of 0.08 percent, the mean relative deviation was 5 percent with insignificant variance between the determined and true values. Figures 6; references 6: 2 Russian, 4 Western.

UDC 543:546.791:546.74

#### Oxideometric Determination of Uranium (VI) in Presence of Nitrates With Nickel Boride

907M0096I Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 23 Feb 89) pp 93- 95

[Article by N. V. Tremasov and A. T. Groysberg]

[Abstract] Volumetric methods based on the reduction of  $U^{(VI)}$  to  $U^{(IV)}$  with liquid zinc amalgam in a Jones reducer are used to determine the uranium content. The

final step in the determination is titration with an oxidizing agent such as potassium permanganate or dichromate. However, nitrate ions must not be present. Disadvantages of the procedure include a lengthy analysis time, difficulty in eliminating nitrates, and toxicity of the reducer. Metal borides resulting from thereaction of 3d- elements (Fe, Ni, and Co) with sodium or potassium tetrahydroborate have been found to be effective as reducing agents. In the present work it was demonstrated that nickel boride may be used as a reducing agent in the determination of uranium (VI) in the presence of nitrates. The nitrate ions are converted into ammonium salts, while the uranium (VI) is reduced to uranium (IV), and the analysis is concluded with oxideometric titration in a single analytical operation with a 7- to 10-fold decrease in time as compared with using the Jones reducer.

UDC 541.15

#### Radiation Chemical Behavior of Bivalent Palladium in Nitric Acid Solutions

907M0096J Leningrad *RADIOKHIMIYA* in Russian Vol 31 No 5, Oct-Nov 89 (manuscript received 4 Feb 89) pp 95- 100

[Article by M. V. Vladimirova and S. V. Kalinina]

[Abstract] Gamma-radiolysis of nitric acid solutions of Pd (II) has been studied, and absorption spectra of the irradiated solutions have been obtained. It has been demonstrated that complex formation between Pd (II) and nitric acid takes place throughout the entire range of concentrations and radiation dosage. It was also established that Pd (II) increases the radiation chemical accumulation of  $HNO_2$  and that with or without the presence of nitric acid, reduction of palladium to the metal form does not take place. The presence of palladium in spent nuclear fuel elements as a fission product affects several processes when processing the fuel by extraction technology. Since the behavior of metals in ionized form also has an effect on radiation chemical processes, a study was made of the radiation chemical behavior Pd (II) in nitric acid solutions under stationary gamma-radiation. Complex formation was shown to take place throughout the entire range of component concentrations studied. Calculations based on spectrophotometric and chemical analysis data indicate that the complexes vary in composition, depending on the  $HNO_3$  concentration. The presence of palladium in the nitric acid solutions also has an effect on the accumulation of  $HNO_2$  during irradiation. With or without the presence of nitric acid, palladium reduction to the metal form, i.e. palladium black, did not take place. Figures 4; references 4 (Russian).

UDC 678.632'32'21.001.13

**Promising Areas of Application of Phenol  
Formaldehyde Resins and Binders Based on Them.**

907M0016A Moscow *PLASTICHESKIYE MASSY*  
in Russian No 8, Aug 89 pp 3-4

[Article by T. M. Popova, T. K. Sbeglova, Zh. A. Sukholentsva]

[Abstract] The growth of the construction industry requires expansion of the production of such materials

as plywood and composition board, which utilize phenol formaldehyde resins in their manufacture. Machine building also consumes large quantities of phenol formaldehyde resins. Phenol powder binders are used primarily in the manufacture of casting molds and rods, abrasive tools, and products. The total demand for phenol powder binder products is expected to increase by more than 80% during the 12th and 13th five-year-plans. Existing production facilities are to be reconstructed during the 13th Five-Year-Plan.

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