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ADSORPTION

UDC 541.135.5

ADSORPTION OF ATOMIC HYDROGEN AND SUBMONOLAYER COPPER DEPOSITS ON RHODIUM MONOCRYSTAL SURFACE

Moscow ELEKTROKIMIYA in Russian Vol 20, No 11, Nov 84  
(manuscript received 25 Nov 83) pp 1550-1555

LAPA, A. S., SAFONOV, V. A., PETRIY, O. A. and KORENOVSKIY, N. L.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] Voltage-change measurements were made of the adsorption of atomic hydrogen and copper adatoms to mono- and polycrystalline rhodium electrodes in 0.5 M H<sub>2</sub>SO<sub>4</sub> as an approach to the study of surface phenomena. Analysis of voltage peaks for atomic hydrogen adsorption and desorption demonstrated that the process was reversible and most pronounced for Rh(110), less so for Rh(100), and least reversible in the case of Rh(111). These observations were in good agreement with the atom packing density on Rh surface. Crystallographic orientations also influence copper adsorption. The quantity of Cu adatoms corresponding to a monolayer on the surface changed in relation to the density of the Rh atoms on the surface, in analogy to the observations with the hydrogen atoms. Thus, the behavior of atomic hydrogen and copper adatoms show similar features on poly- and monocrystalline Rh surfaces. Such methods, then, in conjunction with potential determinations, can be used to study the energy characteristics of polycrystalline rhodium surfaces. Figures 4; references 6: 3 Russian, 3 Western.  
[86-12172]

UDC 541.183.5:538.221

PREPARATION OF FERROMAGNETIC CARBON ADSORBENTS UTILIZING DISPERSED STEEL POWDER

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 6, Nov-Dec 84  
(manuscript received 11 Jul 84) pp 28-30

VORON, G. L., KHIMCHENKO, Yu. I. and CHUBAR', T. V., IKKhKhV [expansion unknown], UkSSR Academy of Sciences

[Abstract] The advantages of using ferromagnetic carbon adsorbents over conventional non-magnetic adsorbents lies in the possibility of employing the

magnetic field at certain stages of production, such as separation of the adsorbent from the solution and recovery of fine particles. Ferromagnetic adsorbents are not widely used industrially owing to the lack of a low cost and dependable method for producing them. In the present work powdered steel (grade ShKh), recovered from ball bearing production slurry, was combined with phenolformaldehyde resin and heat treated to form adsorbents containing 2-33% by weight of powdered steel. Tests show that these adsorbents have high magnetic and adsorption characteristics and that the ShKh grade of steel currently used in ball bearing production can be used for low cost ferromagnetic adsorbent production. Figures 3; references 7 (Russian).

[113-12765]

UDC: 541.182.02

INFLUENCE OF ORGANIC MEDIUM ON AGING OF ALUMINUM HYDROXIDE AND STRUCTURE OF ADSORBENTS PRODUCED

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian No 5, Sep-Oct 84 (manuscript received 14 Oct 83) pp 8-11

KOMAROV, V. S. and DUBNITSKAYA, I. B., Institute of General and Inorganic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] A study was made of the influence of aging of aluminum hydroxide in organic solvents on the pore structure of xerogels. Aluminum hydroxide was obtained by precipitation by ammonia from a 3%  $AlCl_3$  solution at pH 8. A portion of the hydrogel, washed to remove salts, was aged for 14, 45 and 90 days then dried at 20°C. A second portion was evacuated and placed in an aging medium, the mother liquor, ethyl alcohol and dioxane, without washing of salts. The results show that with decreasing dielectric constant of organic-aqueous mixtures the process of changing the state and internal structure of the gel is interrupted. These gels return to their initial state when washed with water. This phenomenon is of great practical interest, since it allows the initial structure of the gel to be retained for a long period of time, thus facilitating the study of its properties. References 13: 11 Russian, 2 Western.

[66-6508]

AEROSOLS

UDC: 543.544

DETECTION AND ASSAY OF CHEMICAL COMPOSITION OF AEROSOLS BY PYROLYTIC  
GAS CHROMATOGRAPHY

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 39, No 10, Oct 84  
(manuscript received 20 Apr 83) pp 1869-1873

SOTNIKOV, Ye. Ye., BABANOV, N. I. and VOLKOV, S. A., Scientific Research  
Physical Chemistry Institute imeni L. Ya. Karpov, Moscow

[Abstract] A study was made of problems of trapping and identifying aerosols by pyrolytic gas chromatography with pyrolysis under static conditions. This procedure leads to the formation of a small number of products, facilitating their separation on the chromatographic column and decreasing analysis time. Rapidity is achieved at the cost of decreasing the information content of the pyrogram, requiring the use of selective detectors. The studies showed that crushed quartz makes the best filtering material for analysis of solid cotton, wooland protein-vitamin concentrate aerosols with particle size 5-20  $\mu\text{m}$ . Crushed quartz trapped dust particles better than powders of fused quartz of the same particle size. Filtering materials with good adsorption properties are best for simultaneous trapping of liquid and solid aerosols. However, their low strength, difficulty of complete cleansing of resin and ash prevent these materials from being used repeatedly. Figures 2; references 7 (Russian).  
[70-6508]

UDC 541.18.057.182.21.3

MECHANISMS OF AEROSOL FORMATION IN PROXIMITY OF HEATED POLYMER-GAS  
INTERFACE

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 46, No 6, Nov-Dec 84  
(manuscript received 4 Jul 83) pp 1059-1064

ALEKSEYEV, V. A., SMIRNOV, V. V. and UVAROV, A. D., Institute of Experimental  
Meteorology, Obninsk

[Abstract] When solid materials are heated, aerosol particles are formed a long time before the temperature reaches the combustion point. An attempt was made to explain principal mechanisms of the formation of pyrolytic aerosol and the effect of temperature and nature of the polymer on dispersion of the aerosol, using common polymers. It was established that for polymers like polyethylene and polytetrafluoroethylene, the intensity of aerosol formation is determined by the concentration of the polymer chain fragments which form the aerosol through coagulation and polymerization of various fragments, and their size. This phenomenon of aerosol formation at low temperature polymer pyrolysis could be used in design of simple generators for polydispersed submicron size aerosols with varying chemical compositions. Figures 3; references 8 (Russian).  
[110-7813]

UDC 541.182.024

USE OF NET-SHAPED DIFFUSION BATTERY IN DETERMINATION OF AEROSOL DISPERSIVENESS

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 46, No 6, Nov-Dec 84  
(manuscript received 18 Jul 83) pp 1136-1141

MAVLIYEV, R. A., ANKILOV, A. N., BAKLANOV, A. M., GORBUNOV, B. Z.,  
KAKUTKINA, N. A., KUTSENOGIY, K. P., PASHCHENKO, S. E. and MAKAROV, V. I.,  
Institute of Chemical Kinetics and Combustion, Siberian Department of USSR  
Academy of Sciences

[Abstract] The construction and calibration of a net-shaped "diffusion battery" developed at the Institute of Chemical Kinetics and Combustion was described. The use of this battery in determination of polydispersed aerosol parameters was evaluated and the results obtained with it--while determining the diameters of test aerosols AgI and AgCl in the particle range 4-200 nm--were compared with those obtained from chemical and emission mass analysis, showing excellent agreement. It was concluded that this battery makes it possible to determine the distribution by dimensions and mass concentration of a polydispersed aerosol in the above-mentioned particle size range. Figures 4; references 10: 8 Russian, 2 Western.  
[110-7813]

ANALYTICAL CHEMISTRY

UDC 542.61

DETERMINATION OF OXYGEN CONCENTRATION IN WATER-ORGANIC SOLVENTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 11, Nov. 84  
(manuscript received 28 Feb 83) pp 2439-2444

KRUNCHAK, V. G., SEVERINETS, L. Ya., RYKALINA, A. G., RODICHEV, A. G.,  
SHIRKO, K. D., L'VOVA, T. I. and SUSAREVA, S. M., All-Union Scientific  
Technologic Institute of Antibiotics and Enzymes Intended for Medical Use

[Abstract] An apparatus is described for the determination of oxygen concentration in water-organic solvents, based on blow-off by an inert gas and redox potential measurement on Cu-ammonia complexes. The selected redox system--Cu(II)-Cu(I)-NH<sub>3</sub>-H<sub>2</sub>O--was found to be reversible, with changes in the ratio of Cu(II) and Cu(I) lending themselves to quantitation by measurement of the oxidation potential. Oxygen uptake by the Cu(II)-Cu(I)-NH<sub>3</sub>-H<sub>2</sub>O follows quantitative parameters and is suitable for oxygen determinations in both organic and water-organic is irreversible, and equivalent to 7.8 ml O<sub>2</sub>/liter for 100% acetone and 3.7 ml O<sub>2</sub>/liter for 80% acetone. Irreversibility in the case of acetone was ascribed to peroxide formation. Figures 5; references 17: 1 Czech, 7 Russian, 9 Western.  
[109-12172]

UDC 541.135.3+546.822.5

TEMPERATURE EFFECTS ON DIFFUSION OF URANIUM INTO LIQUID ZINC MEASURED BY ANODAL POTENTIAL STABILIZATION IN CHLORIDE MELTS

Moscow ELECTROKHIMIYA in Russian Vol 20, No 11, Nov 84  
(manuscript received 2 Nov 83) pp 1540-1542

BYKOV, A. P., GOL'DSHTEYN, S. L. and SMIRNOV, G. B., Ural Polytechnic  
Institute imeni S. M. Kirov, Sverdlovsk

[Abstract] The technique of stabilized anodal potentials was used in studies on the diffusion of uranium into liquid zinc, using NaCl-KCl-5 wt% UCl<sub>3</sub> and LiCl-KCl-5 wt% UCl<sub>3</sub> melts. Measurements were conducted at 923, 973, 1023 and 1073°K. An equation was derived relating lnD (D = diffusion constant)

to the reciprocal of the temperature. Determinations of the energy of activation yielded a value of  $115.83 \pm 18.64$  kJ/mole, low enough to confirm the fact that the process was one of diffusion. References 9: 8 Russian,

1 Western.

[86-12172]

UDC 542.232.536.7.001.24

#### THERMODYNAMIC ANALYSIS OF TRANSFORMATIONS IN COMPOSITE MATERIALS

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 6, Nov-Dec 84  
(manuscript received 4 Jan 84) pp 30-32

PASHCHENKO, A. A., BORSUK, P. S., DEMYANENKO, V. A. and SVIDERSKIY, V. A.,  
Kiev Polytechnic Institute

[Abstract] Heating filled silicon-organic composite materials to 700°C results in interaction of the filler material with the thermal decomposition products to form ceramic materials that are of high interest. In the present work a thermodynamic analysis was conducted on the processes taking place between the thermal decomposition products of polyorganosiloxane and chrysotile asbestos filler. The study shows that cordierite can be formed at temperatures above 1400K. With an excess of clay in respect to SiO<sub>2</sub> (the destruction product), it is possible to form cordierite, mullite and clay ceramics. Figures 3; references 5 (Russian).

[113-12765]

UDC 541.49:54.412.2:546.821

#### AZODERIVATIVES OF PYROCATECHOL AS REAGENTS FOR TITANIUM (IV)

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
pp 99-103

GUSEYNOV, Kh. I., SHABANOV, A. L., ALIZADE, T. D. and YELCHIYEV, A. B.,  
Azerbaijan Institute of Petroleum and Chemistry imeni M. A. Azizbekov

[Abstract] New azoderivatives of pyrocatechol were studied as possible analytical reagents for titanium (IV): antipyrinazopyrocatechol (AAP) and benzidinebisazopyrocatechol (BBAP). The complex of Ti(IV) with AAP [Ti(OH)<sup>3+</sup>]: [H<sub>2</sub>R = 1:2 is soluble in water while that of BBAP is not (R = AAP or BBAP). In the interval of pH 1-6, the BBAP complex is soluble in alcohol, dioxane, acetone, and DMFA. Addition of an organic solvent to aqueous solution shifts the tautomeric equilibrium towards the azoid form. The complex structure and chemical reactions involved were presented. An analytical method was described for determination of titanium. The following elements appear to

interfere with the determination of Ti (IV): Mo (VI), Al, Fe (II, III), W (VI), V (V), Zr, Ga, Cu (II) as well as H<sub>2</sub>O<sub>2</sub>, tartrate, oxalate, fluoride, trilon B and ascorbic acid. Figures 2; references 15: 13 Russian, 2 Western.  
[91-7813]

UDC: 543.42:546.86:546.87

ATOMIC ABSORPTION DETERMINATION OF ANTIMONY AND BISMUTH IN NATURAL OBJECTS BY HYDRIDE METHOD WITH ACCUMULATION OF ELEMENTS IN GRAPHITE TUBE

Moscow ZHURNAL ANALITCHESKOY KHIMII in Russian Vol 39, No 10, Oct 84  
(manuscript received 10 Aug 82) pp 1768-1772

BROVKO, I. A., TURSUNOV, A., RISH, M. A., and DAVIROV, A. D., Samarkand State University imeni A. Navoi

[Abstract] Atomic absorption methods were developed for determination of antimony and bismuth in the form of gaseous hydrides in combination with a simple and reliable method of concentrating the elements to be determined. The method of concentration of antimony and bismuth based on thermodissociation of their hydrides in a heated hollow graphite rod with subsequent electrothermal atomization of the elements was suggested for determination of antimony and bismuth. The gaseous metal hydrides entering the heated accumulator-atomizer are dissociated and deposited on its inner surface. The hydride dissociation process is autocatalytic. Conditions of concentration of antimony and bismuth from aqueous solutions were studied. Figures 4; references 13: 5 Russian, 8 Western.  
[70-6508]

UDC: 543.257.1:541.134:546.82

MECHANISM OF ION TRANSFER THROUGH LIQUID MEMBRANES CONTAINING CHELATES OF MOLYBDENUM(VI) WITH N-BENZOYL-N-PHENYLHYDROXYLAMINE AND N-CINNAMOYL-N-PHENYLHYDROXYLAMINE

Moscow ZHURNAL ANALITCHESKOY KHIMII in Russian Vol 39, No 10, Oct 84  
(manuscript received 24 Oct 83) pp 1829-1833

SHPIGUN, L. K. and ABANINA, E. N., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, USSR Academy of Sciences, Moscow; Moscow State University imeni M. V. Lomonosov

[Abstract] Results are presented from a study of the transport properties of molybdenum(VI) and other ions in systems including liquid membranes containing chelates of Mo(VI) with N-arylsubstituted hydroxamic acids in a number of organic solvents in contact with aqueous solutions of Mo(VI) of



varying compositions. The kinetics of diffusion of  $^{99}\text{Mo}$  from an aqueous solution of ammonium molybdate through a membrane containing Mo(VI) chelates as a function of the organic reagent and solvent in the membrane phase and pH of the aqueous solution were studied to determine the role of the aqueous solution-liquid membrane phase division boundary in supporting selectivity of the membrane with respect to Mo(VI). It is found that the lability of Mo(VI) in the chelate is a very important factor in determining the ion transport through the membrane. Interphase transfer of Mo(VI) is quite selective. The calculated values of apparent isotope exchange rate constants at the phase division boundary and effective values of transmembrane diffusion coefficients depend on the nature of the chelate-forming reagent and the organic solvent in the membrane phase. Figures 4; references 7: 4 Russian, 3 Western.  
[70-6508]

UDC 543.53

COMPARATIVE AND INTERPOLATIONAL METHODS IN RADIOANALYTICAL CHEMISTRY,  
APPLICATION OF ISOTOPE INDICATORS

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 39, No 11, Nov 84  
(manuscript received 8 Jun 83) pp 1961-1968

SHAMAYEV, V. I., Moscow Chemical-Technologic Institute imeni D. I. Mendeleev

[Abstract] Two new, highly sensitive radiochemical analytical methods were developed in which the interphase distribution of radionuclide was utilized as a function of the concentration of the element being determined: an interpolation method and a comparative one. Both methods included a preliminary removal of the interfering elements with radiometric compensation for the losses of the element being determined. Using cesium and bismuth as models, the sensitivities of both methods were compared to the radiosubstoichiometric method based on theoretical calculations and experimental data. It was shown that these newly developed methods make it possible to lower the sensitivity of the assay by 30-100 fold in comparison to the radiosubstoichiometric methods. Figures 3; references 7: 4 Russian, 3 Western (2 by Russian authors).  
[107-7813]

UDC 543.51.543.8

SEARCH FOR CHARACTERISTICS OF MASS-SPECTROMETRIC ANALYTICAL METHOD FOR  
MULTICOMPONENT MIXTURES OF ORGANIC COMPOUNDS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 39, No 11, Nov 84  
(manuscript received 25 May 83) pp 1991-1997

KHOTS, M. S. and BOGEL'FER, N. M., All Union Scientific Research Institute  
of Petroleum Reprocessing, Moscow

[Abstract] Mass spectrometry is widely used for analysis of individual organic compounds and their mixtures. A method was proposed for evaluation of analytical characteristics of quantitative mass-spectrometric determination methods of homologous and group composition of polycomponent mixtures. Systematic errors and lower limits of detection were discussed. The method is based on a combination of regression and dispersion analytical techniques. Experimental and theoretical data were reported of the calculation of detection thresholds and the sensitivity range for the components of the samples being analyzed by the quantitative mass-spectrometric method. The results obtained agreed well with published data. Figures 3; references 6 (Russian). [107-7813]

UDC 543.272

CHROMATOGRAPHY IN WATER VAPOR OVER COLUMNS WITH POROUS POLYMERIC  
ADSORBENTS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 39, No 11, Nov 84  
(manuscript received 12 Oct 83) pp 2073-2077

RUDEKNO, B. A. and DZHABAROV, F. Z., First Moscow Medical Institute  
imeni I. M. Sechenov

[Abstract] A chromatographic method was developed operating in a stream of water vapor over columns with two types of porous polymeric adsorbents (PS): polysorb-1 and chromosorb-102 (Johns-Manville Co, USA); retention rates of alcohols and carboxylic acids determined in nitrogen and water vapor were compared. The sensitivity of the flame-ionization detector was excellent in this system. It was shown that the retention indices of aliphatic alcohols and saturated carboxylic acids in a stream of water vapor differed insignificantly from those obtained in a stream of nitrogen. Chromatography in water vapor flow showed improved detection peaks, especially in case of polar compounds; their chromatographic separation was very effective. Figures 3; references 6 (Russian). [107-7813]

CATALYSIS

UDC 541.128

STRUCTURE OF MODIFIED  $\text{Al}_2\text{O}_3$ -NiO-MoO<sub>3</sub> HYDROCRACKING CATALYSTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 11, Nov 84  
(manuscript received 28 Jul 83) pp 2477-2484

VOROB'YEV, V. N., AGZAMKHODZHAYEVA, D. R., MIKITA, V. P. and ABIDOVA, M. F.,  
All-Union Scientific Research Institute of Chemical Technology of Medical  
Industry; OMSKNEFTEORGSIINTEZ Production Association

[Abstract] Electronic diffusion spectra were analyzed for multicomponent  $\text{Al}_2\text{O}_3$ -NiO-MoO<sub>3</sub>-B<sub>3</sub>O<sub>3</sub> formed at 300-600°C, which indicated the production of amorphous substances identified as alumomolybden borates and alumonickelmolybden borates. When subjected to temperatures of 650-800°C these substances undergo crystallization with clearly delineated phases. Above 900°C, decomposition of these substances results in the formation of molybdenum and boron oxides. When doped with alkaline-earth and rare-earth elements, the alumomolybden borates and alumonickelmolybden borates become very efficient catalysts in the hydrocracking of heavy oil, exceeding the efficiency of the alumonickelmolybdenum catalyst, and appear to be promising for industrial application. Figures 4; references 9: 6 Russian, 3 Western. [109-12172]

UDC 541.128+541.183

EFFECTS OF PREPARATION METHOD ON STRUCTURE OF SURFACE Cr-ION SITES OF ALUMINUM OXIDE CATALYSTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 11, Nov 84  
(manuscript received 4 May 83) pp 2484-2490

VOROB'YEV, V. N., MELKUMYAN, F. Sh. and RAZIKOV, K. Kh.

[Abstract] Since  $\text{Cr}_2\text{O}_3$ - $\text{Al}_2\text{O}_3$  catalysts have been shown to be highly efficient in oxidative ammonolysis of alkylpyridines in laboratory tests and, therefore, have industrial potential, electron spectroscopy was employed to ascertain the effects of the method of preparation on oxidation levels of Cr in surface active sites. Oxides and hydroxides of aluminum were

saturated with aqueous  $\text{CrO}_3$  and  $\text{Cr}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  solutions. Analysis of the electronic spectra demonstrated that similar processes applied to the aluminum oxide and hydroxide samples. In the case of aluminum oxide the threshold for the formation of structure with Cr in the lower state of oxidation corresponds to lower chromium concentrations than in the case of aluminum hydroxide. With aluminum hydroxide  $\text{Cr}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  and  $\text{CrO}_3$  layers formed at 20 wt%  $\text{Cr}_2\text{O}_3$ , while with aluminum oxide they formed at a  $\text{Cr}_2\text{O}_3$  concentration of 10 wt%. The difference could not be attributed to the specific surface area of aluminum oxide ( $330 \text{ m}^2/\text{g}$ ) with aluminum hydroxide ( $240 \text{ m}^2/\text{g}$ ). The data obtained in these studies illustrate the fact that the surface characteristics of  $\text{Cr}_2\text{O}_3$ - $\text{Al}_2\text{O}_3$  systems can be controlled by the methods of preparation, Figures 2; references 18: 12 Russian, 6 Western.  
[109-12172]

UDC 541.134:541.128

#### MEASUREMENT OF POTENTIAL OF CATALYST SUSPENSION UNDER HIGH HYDROGEN PRESSURE

Moscow ELEKTROKIMIYA in Russian Vol 20, No 11, Nov 84.  
(manuscript received 20 Dec 82; after revision, 4 Jul 83) pp 1435-1438

BIZHANOV, F. B. and DINASYLOVA, Sh. D., Institute of Organic Catalysis and Electrochemistry, Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] Description is provided of an instrument devised to measure the potentials of catalyst suspensions (Pt, Pd, Ru, and Rh blacks, 5% Pd and Pt on activated charcoal, 5% Pd/ $\text{BaSO}_4$ , and spongy Ni). The catalysts were suspended in  $\text{H}_2\text{O}$  (pH 6.6), 0.1 N  $\text{H}_2\text{SO}_4$ , 0.1 N NaOH, or Britton's universal buffer under a 10 MPa hydrogen pressure. The catalysts in question were seen to behave as reversible hydrogen electrodes. Analysis of the potential values in relation to pH and pressure showed that they followed the Nernst equation, Figures 6; references 7: 5 Russian, 2 Western.  
[86-12172]

UDC 66.095.264:661.715.332 661.7:547,313.6

#### CATALYTIC DIMERIZATION OF PROPYLENE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 645-646

ZHUKOVSKIY, S. S., FEDOROV, B. M., TABER, A. M. and VASSERBERG, V. E.

[Abstract] The products of propylene dimerization, hexenes, are desirable intermediates for industrial organic synthesis. However, the currently-used homogeneous metal-complex catalysts are costly and preclude the possibility of continuous production of oligomers. A previously-developed, heterogeneous oligomerization catalyst,  $\text{Pi-C}_3\text{H}_5\text{NiCl}/\text{Al}_2\text{O}_3$ , was shown to be highly active and stable. This catalyst can be prepared in a simple and rapid manner by

complex formation in an adsorption layer of oxide carrier in a separate unit of the propylene dimerization process. Hexenes are produced at high yield (90-94%) with technical and economic indicators exceeding that of the homogeneous analog. Figure 1; references 5: 4 Russian, 1 Western.  
[114-12765]

UDC 661.7:547.532

#### CATALYTIC CONVERSION OF PYROLYTIC GASOLINE AND TOLUENE

Moscow KHIMICHESKAYA PROMYSHELNNOST' in Russian No 11, Nov 84 pp 652-654

SYUNYAKOVA, Z. F., VALITOV, R. B., SHMELEV, A. S., MAZITOV, M. F.,  
FASKHUTDINOVA, R. A. and SOKOLOVA, G. P.

[Abstract] Benzene is derived from petroleum stock by catalytic reforming or by refining pyrolytic products and toluene. A study was made of the conversion of pyrolytic gasoline and toluene over an iron-chromium oxide catalyst in a steam-hydrogen medium at atmospheric pressure. Feedstock consisted of pyrolytic gasoline obtained by pyrolysis of straight-run gasoline fractions at 800°C and 1:1 ratio of steam:feed stock. Data show that a high concentration of aromatic hydrocarbons is formed. Hydrodealkylation of toluene also showed a higher selectivity towards benzene formation. A 9-stage mechanism for hydrodealkylation of toluene over iron-chromium catalyst, rate constants and activation energy data are presented. References 11 (Russian).  
[114-12765]

UDC 661.53.094.373

#### PASSIVATION OF IRON CATALYSTS FOR AMMONIA SYNTHESIS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 673-675

CHESNOKOVA, R. V., MINAYEV, D. M., VASILEVICH, A. A., KUZNETSOV, L. D.  
ALEKSEYEV, A. M. and MISHCHENKO, Sh. Sh.

[Abstract] Passivation of iron catalysts for ammonia synthesis has practical significance since the catalysts are produced in the reduced state and they must often be passivated during production shut-downs and catalyst recharging, owing to the pyrophoric nature of iron. Passivation consists of imparting a monoatomic layer of oxygen on the surface of the catalyst with a nitrogen-hydrogen mixture containing 0.1-0.2% oxygen. Research shows, however, that passivation of ammonia synthesis catalysts may go as far as 50 monolayers of oxygen. A study was made of the oxidation of reduced magnetite and various industrial ammonia synthesis catalysts at 50, 100, 150 and 200°C under dynamic conditions with oxygen-helium mixtures containing 0.1, 1.0 and 3.0% (by volume) of oxygen. The results show that passivation

with these mixtures is possible and that catalyst over-heating to 200°C has no effect on its catalytic properties, Figures 3; references 9 (Russian). [114-12765]

UDC 661.217:66.094.197

PREPARATION OF ELEMENTAL SULFUR BY CATALYTIC REDUCTION OF SULFUR DIOXIDE USING NATURAL ZEOLITE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 676-677

ASENOV, AL., DYANKOVA, Ye. and KOSTOVA, M., Higher Chemical-Technologic Institute, Sofia

[Abstract] A study was made of the possibility of using clinoptilolite as a catalyst to reduce sulfur dioxide with hydrogen and natural gas. Laboratory tests in a non-isothermal continuous reactor with a stationary bed catalyst of natural clinoptilolite from northern Beli Bair in northwestern Rodopakh (Bulgaria) show that this material is entirely suitable for reducing sulfur dioxide to elemental sulfur with hydrogen or natural gas. It has highly selectivity while maintaining a high degree of sulfur conversion over a wide range of conditions. Figures 5; references 6: 2 Russian, 4 Western. [114-12765]

UDC 661.53.094.373.001

EFFECT OF pH OF CATALYST MASS NTK-4 ON ITS PROPERTIES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 577-678

SHARKINA, V. I., MIKHALINA, L. N., SOBOLEVSKIY, V. S. and SEMENOVA, T. A.

[Abstract] A study was made of the effects of changing the pH of the mother liquor during preparation of copper-zinc-chromium catalyst NTK-4 (used for steam conversion of carbon monoxide). A catalyst suspension was divided into three portions, leaving one portion unchanged. The second sample was washed with distilled water to neutral reaction, and the third was treated with ammonia water to alkaline reaction. Analysis of the macrostructure and properties shows that alteration of pH from 4.64 to 8.54 results in improved rheological properties of the suspension leading to increased particle dispersion and mechanical strength which facilitates pelletizing. Figures 3; references 4: 3 Russian, 1 Western. [114-12765]

UDC 66.012.16.662.69:54-14

ANALYSIS OF WORK OF NATURAL GAS CONVERSION CATALYSTS

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 6, Nov-Dec 84  
(manuscript received 22 Feb 84) pp 8-11

DENBNOVETSKAYA, Ye. N., GRISHAGIN, P. I. and GARKUSHA, V. V., Institute of Gas, UkSSR Academy of Sciences

[Abstract] Mixed nickel catalyst GIAP-16 is still used for steam conversion of natural gas, although it has low resistance to heat and the components of the reaction mixture. Carrier-based catalyst KSN-2, developed at the Institute of Gas, UkSSR Academy of Sciences, has a lower nickel content, high heat resistance and the same activity as GIAP-16. It is similar to the Japanese made catalyst C-11-2. Tests conducted at Cherkassk Production Association "Azot" in 1979 showed catalyst KSN-2 can be successfully used in tubular reactors for ammonia production and for secondary reforming of natural gas. It is therefore recommended that catalyst GIAP-16 be replaced with KSN-2, which retains high activity and strength after prolonged use. Figures 2; references 3 (Russian).

[113-12765]

UDC 541.183

STUDY OF METALSILICATE CATALYSTS BY INFRARED SPECTROSCOPY

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
pp 11-15

KAKHRAMANOVA, Kh. T., TAGIYEV, D. B., ZUL'FUGAROV, Z. G. and NABIYEV, B. A., Institute of Inorganic and Physical Chemistry

[Abstract] Experimental results were reported of the investigation of the effect of the relationship of metal oxide to silicon; the nature of an oxide, treatment conditions and modification with orthophosphoric acid (OPA) on the acidic properties of Be, Mg, Ca and Sr silicates. It was shown that an insertion of alkali-earth metal (AEM) oxide into silicon oxide tetrahedron took place in coprecipitated AEM silicates. Molar quantity of the inserted oxide decreased with increased ionic radii of AEM. In case of Ca- and Sr-silicates, treatment of AEM with OPA led to disappearance of the IR absorption bands characteristic of free metal oxides. Based on the absorption spectra of adsorbed ammonia, it was established that the proton donor groups of modified magnesium silicate are more reactive than the starting magnesium silicate. Figures 2; references 11: 8 Russian (1 by Western author),

3 Western.  
[91-7813]

UDC 547.592.2 547.562.1:66.095.253

ALKENYLATION OF o-CHLOROPHENOL WITH PIPERYLENE IN PRESENCE OF OXIDE TYPE CATALYSTS

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
pp 32-36

NKANGA EDVIN, MUGANLINSKIY, F. F. and KAS'YANOV, V. V., Azerbaijan Institute of Petroleum Chemistry imeni M. Azizbekov

[Abstract] The goal of this study was to investigate the alkenylation of o-chlorophenol (OC) with piperylene (PP) in presence of sulfuric acid and other acidic type catalysts such as KU-2, benzoysulfonic acid and (BSA)-monohydrate as well as boron trifluoride etherate (BTFE). The principle products of this reaction are 4-(penten-3-yl-2)-o-chlorophenol (I) and  $\alpha,\gamma$ -dimethylallyl-o-chlorophenyl ether (II). Analysis of the results showed that KU-2 catalyst was not very active nor selective, leading to considerable oligomerization of the diene. BSA appeared to be equivalent to  $H_2SO_4$  but slightly less selective in respect to the final products. The least active was BTFE which basically led to oligomerization of piperylene. Thus,  $H_2SO_4$  was the most active and selective catalyst reaching 89-90% selectivity in respect to I. The yield of the synthesized and characterized I and II reached a maximum with an increase in temperature and in concentration of the catalyst. References 9: 7 Russian, 2 Western.  
[91-7813]

UDC 66.097.6 + 665.656.6

LEAD MODIFIED PLATINUM AND PLATINUM-RHENIUM CATALYSTS FOR REFORMING

Iyanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHOLOGIYA in Russian Vol 27, No 10, Oct 84 (manuscript received 13 May 83)  
pp 1192-1196

PAULIKHIN, B. M. and LEVINTER, M. Ye., Department of Chemical Technology of Petroleum and Gas Processing, Kuybyshev Polytechnic Institute  
imeni V. V. Kuybyshev

[Abstract] In this work the deposition of lead on aluminum oxide carrier was studied in preparation of platinum-lead and platinum-rhenium catalysts. The effect of the metal and chlorine content in these catalysts on their properties was investigated. Introduction of 0.6% of lead as a replacement or supplement of platinum increased the aromatizing activity of catalysts as well as their selectivity and stability while decreasing the coke formation. The investigated catalysts can be ordered in the following series according to their activity and stability: Pt-Re-Pb>Pt-Re>Pt-Pb>Pt. Lead, just like rhenium, stabilized the activity of platinum in these catalysts. Oxygen chemisorption at 20°C expressed by atomic ratio of O/Pt changed as follows: 0.69, 0.64, 0.59 and 0.50 along with the above series of catalysts; in absence



of Pt, Pb/Al<sub>2</sub>O<sub>3</sub> did not show any oxygen chemisorption. Figures 4; references 7: 5 Russian (2 by Western authors), 2 Western.  
[93-7813]

UDC 541.13+541.128

SURFACE ALLOYS OF NICKEL, NICHROME AND STAINLESS STEEL (Kh18N10T) WITH ALUMINUM

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 5, Sep-Oct 84 (manuscript received 7 Dec 82) pp 14-18

ZABOTIN, P. I., TIBEKINA, A. A., BALMAGAMBETOV, S. A., ARSTANOV, B. A.,  
PICHUGOV, Yu. V. and KHISAMETDINOV, A. M., Institute of Organic Catalysis  
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[Abstract] Galvanostatic and phase x-ray testing was conducted in 20% KOH on surface alloys obtained by thermodiffusion of aluminum into nickel, nichrome or stainless steel. Time-potential curves were used to calculate the absolute quantity of electricity expended in the anodic dissolution of each phase. Plotting this quantity versus agglomeration temperature indicate that Ni-Al and (Ni-Cr)-Al systems have three phases which are selectively soluble in base, while stainless steel-Al systems have four. The presence of chromium lowered the temperature of phase formation. At low agglomeration temperatures, quantity of electricity expended increased with temperature, due to the low electrical conductivity of the aluminum layer, which was introduced as a suspension. The data suggest the formation of intermetallic compounds of complex composition or structure. X-ray analysis indicated that Ni<sub>2</sub>Al<sub>3</sub> predominated in the Ni-Al alloys from 400° to 800°C, while NiAl<sub>3</sub> was not observed. This compound may not be detectable by the method used. In the stainless steel-aluminum systems a phase was observed which did not correspond to intermetallics of Al with Fe, Ni or Cr. The best temperature range for thermodiffusion formation of alloys containing alkali soluble phases is 600-800°C. Figures 3; references 7: 6 Russian, 1 Western.  
[43-12126]

UDC 541.183

#### INTERACTION OF NITROGEN OXIDES WITH COBALT CATALYSTS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 5, Sep-Oct 84 (manuscript received 5 Sep 83) pp 22-25

ALTYNBEKOVA, K. A., Institute of Organic Catalysis and Electrochemistry,  
Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] Temperature-programmed desorption was used to study the interaction of nitrogen oxides with cobalt catalysts, either without carrier or coated on 1% or 10% Co/Al<sub>2</sub>O<sub>3</sub>. Desorption from beta-Co occurred at 55°-280° and from CoO at 70°-450°. Desorption from Co<sub>3</sub>O<sub>4</sub> gave two overlapping peaks from 150°-400° and 270°-550°. The 1% Co/Al<sub>2</sub>O<sub>3</sub> exhibited three desorption peaks while the 10% gave four. Chromatographic analysis demonstrated the presence of N<sub>2</sub>O, O<sub>2</sub>, N<sub>2</sub> and NO<sub>2</sub> in the desorbed gases. Only N<sub>2</sub>O was desorbed from CoO and Co<sub>3</sub>O<sub>4</sub>. NO did not decompose when desorbed from alumina. Oxidation of the cobalt by the adsorbed oxygen was observed. The Co/Al<sub>2</sub>O<sub>3</sub> catalysts were more active than those without carrier, Figures 3; references 12: 4 Russian, 8 Western.  
[43-12126]

UDC 541.128

#### EFFECT OF CARRIER ON MECHANISM OF ACETOPHENONE HYDROGENATION ON RHODIUM CATALYSTS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 5, Sep-Oct 84 (manuscript received 5 Oct 83) pp 29-32

ZAKUMBAYEVA, G. D., BEKETAYEVA, L. A., AYTAMGAMBETOVA, S. Z. and  
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Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] Chromatography and infrared spectroscopy were used to study the effect of carrier type and rhodium dispersion on acetophenone hydrolysis. Carriers tested were Al<sub>2</sub>O<sub>3</sub>, MgO, TiO<sub>2</sub> and SiO<sub>2</sub>. The hydrogenation curves were complex, consisting of two parts. In the first part, reduction of the carbonyl predominated, while in the second section, reduction of the benzene ring was more pronounced. The selectivity of the catalyst depended on the acid-base properties of the carrier, the degree of catalyst reduction and the adsorption properties of the acetophenone. On Rh/SiO<sub>2</sub> catalysts, the carbonyl group is more activated than on Rh/MgO. Decreasing the concentration of rhodium from 5% to 1% lowered the specific rate of hydrogenation by a factor of two to three. Figures 3; references 4: 2 Russian, 2 Western.  
[43-12126]

UDC: 547.315.2.057:541.128.13:546.623

CATALYTIC ACTIVITY OF ALUMINUM SILICATES IN PRODUCTION OF ISOPRENE FROM  
4,4-DIMETHYL-1,3-DIOXANE

Moscow NEFTEKHIMIYA in Russian Vol 24, No 5, Sep-Oct 84  
(manuscript received 17 Jun 83) pp 650-656

IVANOVA, N. G., KITAYEV, L. Ye., NOVIKOVA, L. A., KUBASOV, A. A.,  
SHARF, V. Z., YUSHCHENKO, V. V., GRYAZNOVA, Z. V. and DANYUSHEVSKIY, V. Ya.,  
Moscow State University; Institute of Organic Chemistry, USSR Academy of  
Sciences

[Abstract] A study is made of the catalytic properties of aluminophosphates in decomposition of 4,4-dimethyl-1,3-dioxane (DMD) in isoprene, as well as the structural characteristics of these phosphates as a function of preparation conditions of catalysts and P/Al ratio. With  $P/Al < 1$ , the strong Lewis-type centers predominate, leading to the formation of large quantities of isobutylene.  $P/Al > 1$ , proton centers predominate and decomposition of dimethyl dioxane occurs primarily in the isoprene. IR spectroscopy and DTA are used to show that aluminophosphates with  $P/Al < 1$  contain acid orthophosphate and polyphosphate ions in addition to  $PO_4^{3-}$ . As the catalysts operate, their activity is decreased, as a result of changes in the structure of the specimens accompanied by the formation of crystalline  $AlPO_4$ . Figures 3; references 10: 7 Russian, 3 Western.  
[69-6508]

UDC: 547.313.3:542.943.7

EPOXIDATION OF PROPYLENE IN PRESENCE OF MOLYBDENUM CATALYSTS BASED ON A  
WEAKLY ACID CATIONITE

Moscow NEFTEKHIMIYA in Russian Vol 24, No 5, Sep-Oct 84  
(manuscript received 31 Oct 83) pp 673-678

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[Abstract] The catalytic activity of polymer molybdenum complexes is compared under conditions of homogeneous-catalytic oxidation of propylene by 1-phenylethylhydroperoxide (EBHP, ethylbenzene hydroperoxide). The information obtained illuminates the structure of catalytically-active centers and the valent state of adsorbed molybdenum in heterogenized complexes obtained in aqueous and anhydrous media under various conditions. The catalysts are obtained by treating macroporous weakly-acid Vofatite SA-20 cationite in hydrogen form with aqueous and glycol solutions of molybdenum salts. The activity and selectivity of polymer complexes produced in an organic medium are identical with activity and selectivity of the

homogeneous molybdenum naphthenate catalyst. The degree of catalytic action is determined by the content of molybdenum in the polymer catalysts, the mobility, mutual placement and valent states of the catalytically active centers in the SA-20 macromolecules. It is proven that coordination bonds are formed between adsorbed molybdenum and electron donor carboxyl groups of the cationite as it is modified. Figure 1; references 19: 15 Russian, 4 Western.  
[69-6508]

UDC: 547.533:542.943.7

PATHS OF FORMATION OF BENZALDEHYDE AND BENZYL ALCOHOL DURING OXIDATION OF  
TOLUENE WITH COBALT-BROMIDE CATALYST IN ACETIC ACID SOLUTION

Moscow NEFTEKHIMIYA in Russian Vol 24, No 5, Sep-Oct 84  
(manuscript received 17 May 83) pp 679-683

BATYGINA, N. A., BUKHARKINA, T. V. and DIGUROV, N. G., Moscow Institute of  
Chemical Technology imeni D. I. Mendeleev

[Abstract] A study is presented of the formation and consumption of benzyl alcohol in the process of liquid-phase oxidation of toluene. Kinetics of oxidation of benzyl alcohol were studied at 40°C with variable initial concentration of alcohol and catalyst. It was found that benzaldehyde and benzyl alcohol are formed in parallel with decomposition of benzylhydroperoxide under the mild experimental conditions used. Benzyl alcohol is consumed in the reaction of oxidation primarily by reacting with the complex (Co<sup>3+</sup> ...Br<sup>-</sup>). The equilibrium concentration of Co<sup>3+</sup> decreases during the reaction. An increase in benzyl alcohol concentration therefore inhibits development of radical chain oxidation of benzaldehyde. Figures 3; references 7: 5 Russian, 2 Western.  
[69-6508]

UDC: 541.128.13

COMPARISON OF REACTIVITY OF NORMAL  $C_1 - C_4$  ALCOHOLS ON Fe-Te-Mo-O CATALYST

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B; GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE in Russian No 10, Oct 84 (manuscript received 29 Apr 84) pp 37-40

ZHIZNEVSKIY, V. M., KOZHARSKIY, V. A. and KUCHER, R. V., academician, Ukrainian SSR Academy of Sciences, L'vov Polytechnic Institute

[Abstract] The oxidation of  $C_1 - C_4$  alcohols was studied under identical conditions in order to determine the influence of carbon-chain-growth in these alcohols on their reactivity. Studies were performed on an Fe-Te-Mo-C catalyst, grain size 0.5-1 cm in a vibration-fluidized bed reactor. It was found that the limiting stage in the reaction of aldehyde formation is the stage of separation of the hydrogen atom at the hydroxyl group of the alcohol. Since the difference in bond strength is not great for these alcohols, the activation energy of the process is approximately the same. As molecular mass of an alcohol increase, its resistance to processes of destructive oxidation significantly decreases. Acetaldehyde, the major intermediate product in peroxidation of EtOH, is more stable than alcohol in this process, while propionic and N-butyric aldehydes are less resistant to processes of oxidation than the initial alcohols. Propionic aldehyde is the most reactive. Figures 4; references 4 (Russian). [73-6508]

UDC: 66.097.38:[661.7:547.322.32]

REGENERATION OF SPENT INDUSTRIAL CATALYSTS OF VINYL CHLORIDE SYNTHESIS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 10, Oct 84 pp 593-594

DAPUSTIN, M. A. and KRISHTAL', N. F.

[Abstract] A study was made of the possibility of reusing spent catalysts of synthesis of vinyl chloride from acetylene. The catalysts were regenerated in the presence of oxidizers and dichloroethane to preserve the residual quantity of mercuric chloride while simultaneously activating the carrier. In another series of experiments regeneration was performed at elevated temperatures in a current of inert argon plus nitrogen gas to prevent corrosion of equipment. The regenerated mercuric chloride catalysts containing about 15%  $HgCl_2$  were more stable than spent catalysts on which the active phase had been applied without preliminary regeneration. Best results were achieved with a specimen pretreated with a mixture of concentrated hydrogen peroxide and concentrated hydrochloric acid. References 6: 1 Russian, 5 Western. [80-6508]

UDC 541.128:541.183

THERMODESORPTION IN CATALYTIC SYSTEMS. PART 20. WATER VAPOR ADSORPTION ON  
Al-Ca COMPONENTS OF CATALYSTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11,  
Nov 84 (manuscript received 17 Aug 83) pp 2427-2431

NISSENBAUM, V. D., DANYUSHEVSKIY, V. Ya., GOLOSMAN, Ye. Z., YAKERSON, V. I.  
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USSR Academy of Sciences, Moscow; Novomoskovsk Branch, State Scientific  
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[Abstract] Thermodesorption, derivatography and x-ray phase analysis were employed in studies on water vapor adsorption on Al-Ca systems, using samples differing in phase composition and variable CaO/Al<sub>2</sub>O<sub>3</sub> ratios (0.2 to 1.7). The studies conducted at various temperatures under helium carrier gas demonstrated that specific water vapor adsorption is dependent on the C<sub>12</sub>Al<sub>7</sub> component, which also affects the thermodesorption spectrum. The C<sub>12</sub>Al<sub>7</sub> phase increases with an increase in temperature and favors increased water adsorption, as well as the appearance of two thermodesorption maxima. Formation of C<sub>12</sub>Al<sub>7</sub> phase is favored by high CaO/Al<sub>2</sub>O<sub>3</sub> ratios, and both factors jointly are responsible for enhanced adsorption of water from the gaseous phase. In distinction to liquid water, water vapors react with the Al-Ca components without a change in the phase composition, showing that such catalysts can be used extensively in processes involving gaseous water. Figures 4; references 11: 10 Russian, 1 Western.  
[108-12172]

UDC 541.128:542.943+542.944

CATALYTIC SYSTEMS IN OXIDATIVE CHLORINATION OF HYDROCARBONS. PART 3.  
CHARACTERISTICS OF COPPER SALT-CONTAINING ALUMINUM OXIDE CATALYSTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11,  
Nov 84 (manuscript received 15 Jul 83) pp 2431-2437

SOLOMONIK, I. G., KURLYANDSKAYA, I. I., YAKERSON, V. I., KUDRYAVTSEVA, T. F.,  
ASHAVSKAYA, G. A., FLID, M. R., TREGER, Yu. A. and SONIN, E. V., Institute of  
Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow;  
State Scientific Research and Planning Institute of the Chlorine Industry

[Abstract] Studies were conducted on the effects of phase composition of aluminum oxide catalysts on the physicochemical characteristics of copper salt components, and on their catalytic behavior in oxidative chlorination of ethylene. The reaction of the copper salts with microspherical aluminum oxide surface resulted in a variety of copper structures, the nature of which was predicated on the phase composition and redox characteristics of the base surface, as indicated by electron diffusion spectra, thermodesorption data and diffractography. In the case of aluminum oxide characterized by the

presence of small quantities of delta and epsilon  $Al_2O_3$ , in addition to the gamma and theta forms with admixtures of beta and chi forms, the catalytic Cu particles coalesced during chlorination and led to alterations in the hydrodynamics of the pseudoliquid layer. Figures 6; references 18:  
12 Russian, 6 Western.  
[108-12172]

UDC 541.128:542.941.7:547.484

ENANTIOSELECTIVE HYDROGENATION OF ETHYL ACETOACETATE ON Cu-Ni CATALYSTS:  
EFFECTS OF CATALYST PREPARATION METHODS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11,  
Nov 84 (manuscript received 19 Jul 83) pp 2443-2444

CHERNYSHEVA, V. A., ZUBAREVA, N. D. and KLABUNOVSKIY, Ye. I., Institute  
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[Abstract] An assessment is made of the techniques used in catalyst preparation on the effectiveness of Cu-Ni catalysts (Cu:Ni = 1:1) in promoting hydrogenation of ethyl acetoacetate. A catalyst preparation yielding the highest optical yield (50%) was obtained by reduction of the catalytic mixture with a mixture of hydrogen and nitrogen ( $H_2:N_2 = 1:10$ ) at 250°C for 1 h, then treatment with 0.5% (+) tartaric acid for 1 h at 50°C, pH 10.5. These experiments demonstrated that the method of catalyst preparation has a significant effect on activity and enantioselectivity, and that manipulation of the techniques can yield catalysts with desired properties.

References 3 (Russian).  
[108-12172]

UDC 541.128:542.71:546.11

CATALYTIC EVOLUTION OF HYDROGEN FROM WATER BY REDUCED 12-SILICOTUNGSTIC ACID  
IN PRESENCE OF HETEROGENEOUS RHODIUM-POLYMER CATALYSTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11,  
Nov 84 (manuscript received 16 Aug 83) pp 2447-2454

SAIDKHANOV, S. S., SAVINOV, Ye. N., KOKORIN, A. I., VOLKOV, A. I.,  
SAVINOVA, Ye. R. and PARMON, V. N., Institute of Catalysis, Siberian  
Department, USSR Academy of Sciences (AS), Novosibirsk; Andizhan Pedagogical  
Institute, Andizhan; Institute of Chemical Physics, USSR AS, Moscow

[Abstract] Kinetic studies were conducted on the production of hydrogen from water under the influence of reduced 12-phosphotungstic acid (PTA) imbedded in Rh-polymer catalyst (Rh(III)-AN-221 [anion exchange resin], ca. 1% Rh). Studies on the evolution of  $H_2$  following 270-400 nm illumination

of water and water-alcohol mixtures in the presence of immobilized PTA (27% PTA) showed that the effectiveness of the heterogeneous catalyst was limited by the rate of photochemical generation of PTA. The high efficiency of the Rh-polymer catalyst was due not only to the finely dispersed Rh, but also to the immobilized PTA anions which functioned in the transfer of electrons to Rh. The PTA anions were also seen to function as intermediate electron acceptors when immobilized in Rh-polymer in oxidative photocatalytic (>415 nm) release of H<sub>2</sub> involving activation of Ru(II), Ry(bipy)<sub>3</sub><sup>2+</sup>, and mercaptoethanol as the irreversible electron donor. Catalysts involving finely-dispersed metallic particles in polymers appear, therefore, to be as efficient as colloid catalysts, and yet are characterized by greater stability. Figures 5; references 13: 5 Russian, 8 Western, [108-12172]

UDC 541.128

#### HYDROGEN REDUCTION OF Al-Ni-Mo CATALYSTS USED IN HYDRODESULFURIZATION

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(man script received 17 Feb 83) pp 2727-2729

VAGIN, A. I., YEROFEYEV, V. I., BURMISTROVA, N. V. and KALECHITS, I. V.,  
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Sciences, Tomsk

[Abstract] Studies were conducted on the kinetics and thermodynamics of reduction of a number of Al-Ni-Mo catalysts under hydrogen at temperatures ranging from 200 to 450°C. Used in hydrodesulfurization, such catalysts undergo reduction and conversion of the metal oxides to metal sulfides. The rate of reduction was directly proportional to the temperature of the study, with calculated energies of activation for the reduction process ranging from 62 to 87 kJ/mole for the different catalysts. Comparison with data for Al-Co-Mo catalysts showed that the energies of activation for the reduction of the Al-Co-Mo catalysts were somewhat lower than for the Al-Ni-Mo catalysts, indicating that the Al-Ni-Mo catalyst reduction is more difficult than that of the Al-Co-Mo catalyst. Figures 2; references 6: 5 Russian, 1 Western, [106-12172]



UDC 66.092:662.75

HYDROGENATION OF HETEROCYCLIC COMPOUNDS IN COAL DISTILLATES ON LARGE-PORE CATALYSTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 84 pp 12-14

MALOLETNEV, A. S., KRICHKO, A. A., YULIN, M. K. and GYUL'MALIYEV, A. M., IGI [expansion unknown]

[Abstract] Different types of Al-Co-Mo and Al-Ni-Mo catalysts were tested for their effectiveness in hydrogenation of heterocyclic compounds in coal distillates derived from the brown coal of Irsh-Borodinskiy deposits. The wide-pore catalysts (AS-19) and (AS-24) contains 2% less active components than do common commercial catalysts, with pores having a radius of more than 100 nm accounting for a volume of 0.2-0.3 cm<sup>3</sup>/g, in conjunction with a specific surface area of 130-300 m<sup>2</sup>/g. Hydrogenation was conducted for 10 h under a hydrogen pressure of 5 MPa, initially at 200°C to hydrogenate unsaturated hydrocarbons, and subsequently at 380°C to decompose heterocyclic compounds and hydrogenate bicyclic aromatic hydrocarbons into tetrahydroaromatic hydrocarbons. The wide-pore catalysts were found more efficient than the standard commercial catalysts, removing completely the nitrogen and oxygen compounds, and assuring 96.7% elimination of unsaturated hydrocarbons and 94.6% removal of sulfur-containing compounds. The Al-Co-Mo (AS-19) catalyst was somewhat more efficient than the Al-Ni-Mo (AS-24) in the elimination of sulfur, but both retained initial catalytic efficiency for more than 300 h. References 9: 8 Russian, 1 Western, [96-12172]

UDC 662.773:66.094.17

EFFECTS OF Ni-W CATALYST POROSITY ON EFFICIENCY OF DESTRUCTIVE HYDROGENATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 5 Sep 83) pp 89-95

NAVALIKHINA, M. D., GOLOVINA, G. S. and PETROV, Yu. I., Institute of Combustible Mineral Deposits

[Abstract] Assessment was made of pore size of Ni-W catalysts with heteropoly compounds (HTP) on spherical hydrocarbon or Al<sub>2</sub>O<sub>3</sub> bases, in relation to catalytic efficiency in destructive hydrogenation. Analysis of the activity and selectivity exhibited in hydrodemethylation of toluene and liquid phase hydrogenation of coal showed that maximum demethylation was obtained with 12 wt% HTP (93.4% at 625°C and 5 MPa) on a hydrocarbon base. On Al<sub>2</sub>O<sub>3</sub> both selectivity and activity deteriorated. These observations were consonant with the effects of HTP on the pore structure of the catalyst, and demonstrated that maximum demethylation of toluene prevails when the pore size exceeds 100 Å. Hydrogenation of coal was similarly affected by the

porosity of the catalyst: the quantity of HTP required for maximum transformation of coal into liquid products was dependent on the base and on pore size distribution in the  $38-10^5$  Å radii range. Figures 4; references 10: 6 Russian, 4 Western, [104-12172]

UDC 541.128

#### EFFECTS OF SMALL KI ADDITIONS ON Pt-ADSORPTION CATALYSTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(manuscript received 5 May 83) pp 2893-2894

SHEKHOBALOVA, V. I., Chemical Faculty, Moscow State University  
imeni M. V. Lomonosov

[Abstract] An assessment was made of the effects of pretreatment of Pt/SiO<sub>2</sub> catalyst (3.8 wt% Pt) by KI ( $10^{-7}$  to  $10^{-2}$  M/100 mg catalyst) on the concentration of "soluble" Pt and its effectiveness in liquid phase decomposition of H<sub>2</sub>O<sub>2</sub>. Plots of catalytic activity and surface fraction of Pt atoms vs. KI concentration revealed that in the KI concentration range of  $7 \times 10^{-7}$  to  $10^{-5}$  M catalytic activity fall to virtually zero, while the relative concentration of "soluble" Pt increases to unity. On further increase in the KI concentration, the catalyst remains inactive, while [Pt<sup>4+</sup>] on the surface decreases. A lack of change in the order of the reaction and in the energy of activation indicates that the mechanism of H<sub>2</sub>O<sub>2</sub> decomposition was unaffected, i.e., the structure and composition of the active centers remains unaffected by KI concentration. Figure 1; references 6 (Russian). [106-12172]

UDC 541.128.13+546.723.31+66.091.514

#### IRON OXIDE CATALYSTS FOR HYDROCARBON SYNTHESIS AND POLYCONDENSATION OF CO + 3H<sub>2</sub> MIXTURES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(manuscript received 9 Feb 83) pp 2714-2718

SAVEL'YEV, V. S., RUDENKO, A. P., KULAKOVA, I. I., OGLOBLINA, A. I. and FLOROVSKAYA, V. N., Moscow State University imeni M. V. Lomonosov

[Abstract] Fe<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> catalysts were found to promote polycondensation of CO + 3H<sub>2</sub> mixtures within the temperature span of 375-525°C with the formation of CH<sub>4</sub>, CO<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, H<sub>2</sub>O and condensation products (polycyclic aromatic hydrocarbons). In addition to polycondensation of CO + 3H<sub>2</sub>, the condensation products also arose from the formation of CO<sub>2</sub> via the  $2CO \rightarrow C + CO_2$  mechanism. The rate of conversion of CO and H<sub>2</sub> is directly related to the

temperature, with product formation related to the duration of the reaction. On the basis of these considerations, polycondensation is assumed to involve a polymerization-depolymerization stage with the involvement of polycyclic aromatic intermediates in the following polymolecular process:  $mCO + \frac{1}{2}H_2 \rightleftharpoons$  [intermediate polycondensation products]  $\rightarrow kC_nH_{2n+2} + pC_nH_{2n} + rH_2O + sCO_2$ . Figures 2; references 6 (Russian).  
[106-12172]

UDC 541.183

#### NITROETHANE CHEMOSORPTION ON Pt-Rh ELECTRODEPOSITED CATALYSTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(manuscript received 7 Feb 83) pp 2797-2800

GRISHINA, T. M., Moscow State University imeni M. V. Lomonosov

[Abstract] Potentiometric studies were conducted on the adsorption of nitroethane on electrodeposited Pd, Rh and Pd-Rh electrodes, which demonstrated that on degassed surfaces under argon and a temperature range of 10-80°C nitromethane undergoes decomposition on Rh surfaces. Products of nitroethane decomposition were not detected on Pd surfaces. The differences between the catalysts were attributed to nonreducing centers due to Rh, with overlap of hydrogen and oxygen regions. As the Pd concentration in the catalyst increases, the overlap diminishes and, concomitantly, the concentration of acceptor centers is also reduced. As a result, the adsorption of non reducible substances decreases, Figure 1; references 14: 13 Russian, 1 Western.  
[106-12172]

UDC 66.092.412.35:665.663

#### EFFECTS OF MODIFIERS ON FORMATION KINETICS OF CONDENSATION PRODUCTS ON PYROLYTIC VANADIUM CATALYSTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(manuscript received 21 Nov 83) pp 2839-2841

ADEL'SON, S. V., RUDYK, Ye. M., SMIRNOVA, G. Yu, and ZHAGFAROV, F. G.,  
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[Abstract] Catalytic parameters responsible for coke formation on catalysts was studied with unmodified vanadium catalysts (2.9 wt%  $KVO_3$ ) and modified vanadium catalysts (4-5 wt%  $KVO_3$  and 0.1-3.0 wt%  $K_2CO_3$ ,  $K_2SO_4$ ,  $Fe(NO_3)_3$  or  $H_3BO_3$ ) during pyrolysis of the benzene fraction. The modifiers were seen to significantly lower coke formation, with a concomitant slight increase in the production of ethylene and unsaturated hydrocarbons. Coke formation

was most depressed by the addition of  $H_3BO_3$ . Evaluation of the kinetic plots and electron microscopy of the catalysts showed that the modifiers induced rearrangement of the crystalline lattice of the catalyst. Coke formation was affected by loss of its precursors from the catalyst surface, which was partially covered by a glass phase. Figures 3; references 5 (Russian).  
[106-12172]

UDC: 541.128:543.422.6

ELECTRON SPECTROSCOPIC STUDY OF ALUMINUM-NICKEL-MOLYBDENUM CATALYST FOR DEALKYLATION OF TOLUENE

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian  
No 5, Sep-Oct 84 (manuscript received 17 Jun 83) pp 17-20

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[Abstract] A study was made of the valence and coordination state of nickel and molybdenum in initial and hydrogen-reduced catalyst specimens. Catalyst processing conditions are as close as possible to the conditions of catalysis. The catalyst was prepared by saturation of gamma-aluminum oxide with an ammonia solution of ammonia-nickel diamine molybdate and subsequent drying at 120°C followed by heat treatment at 520-540°C. The results indicate that the initial ANM catalyst is a complex system in which bivalent nickel ions are included in the composition of the nickel molybdate and aluminum-nickel spinel in octahedral and tetrahedral coordinations.  $Mo^{6+}$  ions are in tetrahedral coordination. Heat treatment of catalysts in a current of hydrogen facilitates conversion of a portion of the molybdenum from tetrahedral to octahedral coordination with the formation of  $Al_2(MoO_4)_3$ . Molybdenum acting as a modifying additive significantly changes the electron properties of the nickel which is apparently one of the main reasons for the high activity and selectivity of the catalyst. Figure 1; references 15: 10 Russian, 5 Western.  
[66-6508]

UDC: 541.127:542.941.7:547.538.241

CATALYTIC PROPERTIES OF POLYNUCLEAR Pd(O) COMPLEX WITH PHENYLACETYLENE

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 21 Jul 83) pp 1090-1094

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[Abstract] A study is presented of the properties and structures of the catalytically active product of reaction of  $Pd(DBA)_2$  [bis(dibenzylideneacetone)-palladium] with phenylacetylene; the kinetics of hydrogenation of phenylacetylene

in the presence of this catalyst were studied. The studies showed that at molar ratios of the initial reagents  $PA/Pd > 10$ , the Pd content in the end product was independent of reaction duration, number of intermediate precipitations from benzene, or variations in the method of separation. Chromatographic study of the reaction product showed that hydrogenation to about 80% PA conversion is selective for styrene. Only traces of ethylbenzene are present in the mixture. The activation parameters of the limiting stage were estimated in experiments performed at various temperatures. Figures 3; references 12: 8 Russian, 4 Western.  
[78-6508]

UDC: 541.128

OXIDATION OF CARBON MONOXIDE BY STRONG OXIDIZERS IN PRESENCE OF Pd(II) COMPLEXES

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 29 Jul 83) pp 1095-1100

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[Abstract] A study is presented of the kinetics of oxidation of CO by strong oxidizers--Bichromate, Ce(IV) and  $MnO_4^-$ --in aqueous solution in the presence of both aqua and halide Pd(II) complexes. The reaction kinetics were studied by the absorption of CO in aqueous solutions of Pd(II) sulfate and oxidizer in a static installation with shaking of the reactor and circulation of the gas phase through a 10% NaOH absorber solution which selectively removes  $CO_2$  from the gas phase, Bichromate ions oxidize CO to  $CO_2$  in the presence of  $PdSO_4$ , reducing the Cr(VI) to Cr(III). The absorption curves of CO by aqueous  $PdSO_4$  and  $Cr_2O_7^{2-}$  solutions have a steady linear section extending to the point of almost complete consumption of the oxidizer. One of the sub-stages of the complex first stage, oxidation of Pd(II) to Pd(0), is shown to be the limiting stage in the system. Figures 4; references 14: 11 Russian, 3 Western.  
[78-6508]

UDC: 541.128

STUDY OF CATALYTIC ACTIVITY OF Cr(III) IONS IN DECOMPOSITION OF HYDROGEN PEROXIDE

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 16 Nov 83) pp 1105-1108

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India

[Abstract] The catalytic activity of  $\text{Cr}^{3+}$  ions applied to the surface of aluminum oxide is compared to the activity of the same ions in aqueous solution. It is found that the heterogeneous catalyst is more active than the homogeneous catalyst. The linear variation of  $\log(a-x)$  with time--obtained in studies of the decomposition of hydrogen peroxide using chromium nitrate applied on aluminum oxide or in aqueous solution as the catalyst--indicates that the process is a first order one. The linear relationship between  $\log k$  and  $\log(\text{Cr}^{3+}$  content) in both homogeneous and heterogeneous processes shows that the rate of formation of oxygen molecules depends on the quantity of catalysts. Nitrate ions were not observed to catalyze decomposition of hydrogen peroxide. Decomposition of  $\text{H}_2\text{O}_2$  on the aluminum oxide used was found to be quite slow. A mechanism is suggested for the process and an equation derived from it for the reaction rate. Figures 2; references 9 (Western), [78-6508]

UDC: 541.144.8

STUDY OF REACTION OF OLIGOMERIZATION OF ETHYLENE ON ALUMINUM-NICKEL CATALYST ACTIVATED BY PHOTOREDUCTION AND THERMAL REDUCTION WITH HYDROGEN

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 17 Nov 82) pp 1124-1128

YELEV, I. V., SHELIMOV, B. N. and KAZANSKIY, V. B., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] An attempt was made to produce  $\text{Ni}^+$  ions on the surface of  $\gamma\text{-Al}_2\text{O}_3$  and determine their influence on oligomerization of ethylene. The data showed that ethylene is included in the coordination sphere of  $\text{Ni}^+$  ions which may in principle cause its activation. The  $\text{Ni}^+$  ions do not change their degree of oxidation in the process. This agrees with the assumption that  $\text{Ni}^+$  ions are contained in the active center of the reaction of oligomerization of ethylene. More detailed information on the conversion of the ethylene molecule in the coordination sphere of the  $\text{Ni}^+$  ions cannot be obtained by EPR methods because of the disappearance of the EPR signal upon adsorption of the ethylene. Figure 1; references 11: 4 Russian, 7 Western. [78-6508]

UDC: 546.74+541.49+541.64

STUDY OF IMMOBILIZED CATALYSTS. PART 12. SPECIFICS OF COVALENT BONDING OF Ni(II) WITH MACROMOLECULAR CARRIERS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 17 Jun 83) pp 1140-1144

BRAVAYA, N. M., POMOGAYLO, A. D. and VAYNSHTEYN, E. F., Chernogolovka Section, Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] A study is made of the mechanism of attachment of Ni(II) by covalent bonding to a polyethylene-graft-polyacrylic acid medium. Acrylic acid was grafted to the surface of the powdered polyethylene by gas phase graft polymerization. IR spectra of the specimens obtained proved chemical bonding of Ni(II) to the functional groups of the graft polymer. When the Ni(II) is fixed to the substrate, a band appears at  $1560\text{ cm}^{-1}$ , relating to asymmetrical valence oscillations of the carboxylate ion, the intensity of the band increasing with an increase in the quantity of bonded Ni(II). The interaction of  $\text{Ni}(\text{CH}_3\text{COO})_2$  with the substrate is an equilibrium and reversible reaction, equilibrium being reached almost immediately after mixing. The quantity of Ni(II) bonded at 283 K corresponds to the quantity of Ni(II) remaining bonded with the polyethylene graft polyacrylic acid substrate after interaction at 343 K and subsequent cooling to 283 K. The quantity of bonded Ni(II) increases linearly with an increase in the temperature from 283 to 363 K. Figures 4; references 7 (Russian).

[178-6508]

UDC: 541.128.13

INFLUENCE OF HYDROGEN ON CATALYTIC FORMATION OF CARBONACEOUS DEPOSITS FROM HYDROCARBONS ON NICKEL

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 22 Jun 83) pp 1152-1156

CHESNOKOV, V. V., BUYANOV, R. A. and AFANAS'YEV, A. D., Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] The influence of hydrogen on carbonizing of nickel is studied from the standpoint of the mechanism of the carbide cycle considering the specifics of mass transfer of atomic carbon and the effect of hydrogen on the system in various stages of the process of the formation of the carbon phase. Addition of hydrogen to the reaction mixture decreases the initial rate of formation of carbon. Electron microscope studies of carbonized specimens shows that when the hydrocarbon is diluted with argon, or hydrogen up to a partial pressure of 17.5 kPa, the carbonaceous deposit is a layer shielding the surface of the nickel. Above this hydrogen pressure, tubular filaments

of carbon are formed. It is found that the hydrogen hydrogenates the carbon deposited on the accessible surface of the nickel at an increasing rate as the process continues. With a hydrogen dilution factor of over 300, hydrogenation of carbon occurs so rapidly that practically all of the carbon atoms formed are hydrogenated before they dissolve in the nickel. Figures 3; references 15: 8 Russian, 7 Western.  
[78-6508]

UDC: 541.128.13;542.343,7;546.770

COMPARISON OF CATALYTIC AND ADSORPTION PROPERTIES OF MULTICOMPONENT OXIDE CATALYSTS BASED ON MOLYBDENUM

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 3 Aug 83) pp 1157-1163

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[Abstract] The method of programmed thermodesorption is used to study the interaction of oxidizable substances with model-bismuth-molybdenum catalysts in which a portion of the bismuth is replaced by Ni, Fe or Co. The change in phase composition of the initial catalysts and chemical composition of their surface was monitored. Catalytic activity of the specimens in oxidative dehydrogenation of 1-butene and oxidative ammonolysis of propylene were compared with thermal desorption data. The data established the relationship between catalytic and adsorption properties of multicomponent oxide catalysts. In spite of the significant difference in chemical composition of the specimens studied, there are no basic differences in the nature of interaction of the reacting substance with the catalyst surface, particularly for the weaker form of adsorption. Differences are found in the absolute quantities of this form per unit surface of active mass, which is the basis of correlation between activity and adsorption properties. Figures 4; references 14: 7 Russian, 7 Western.  
[78-6508]



UDC: 541.128.3

X-RAY PHASE STUDY OF COMPLEX OXIDE CATALYSTS IN CATALYTIC REACTION OF  
OXIDATION OF PROPYLENE

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 15 Nov 83) pp 1164-1168

SHIRYAYEV, P. A., SHASHKIN, D. P., ZURMUKHTASHVILI, M. Sh., MARGOLIS, L. Ya.  
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Moscow

[Abstract] A study is presented of phase conversions and restructuring of the crystalline structure of individual components of a complex catalyst during the course of the catalytic reaction of oxidation of propylene in a reaction chamber specially designed for the purpose. Gamma resonance spectroscopy is used to study the status of iron ions in the structure of the catalysts. X-ray phase analysis of the catalyst was performed in the newly modified x-ray chamber-reactor. Some increase in the intensity of the main  $\text{CoMoO}_4$  line with a constant decrease in intensity of the corresponding  $\text{Fe}_2(\text{MoO}_4)_3$  line is observed after the five hours operation of the catalyst. The interphase boundary between  $\beta\text{-CoMoO}_4$  and  $\text{Fe}_2(\text{MoO}_4)_3$  facilitates epitaxial accumulation of bivalent iron molybdate on the most defective faces of the cobalt molybdate. After treatment of the catalyst with a catalytic mixture the singlet line corresponding to trivalent iron molybdate is transformed to a 4-line spectrum characteristic for  $\beta\text{-FeMoO}_4$ , isostructural to  $\beta\text{-CoMoO}_4$ . After 5 hours operation of the catalyst, the  $\text{Fe}_2(\text{MoO}_4)_3$  phase is still partially observed in the spectra, though it cannot be determined by the x-ray method. In the time of the reaction some 65% of the trivalent iron molybdate is converted to the  $\beta\text{-FeMoO}_4$  phase. A detailed study of Mossbauer spectra shows that in the initial specimens there is a certain quantity of bivalent iron seeds. Maximum selectivity during the course of oxidation of propylene is achieved before a stable catalyst composition is reached. Figures 4; references 7: 5 Russian, 2 Western, [78-6508]

UDC: 541:128.375:541.57

VARIATION IN REACTION RATE OF FULL OXIDATION OF BUTANE AND DISTRIBUTION OF  
 $\text{CO}_3\text{O}_4$  ON  $\alpha\text{-Al}_2\text{O}_3$  AS FUNCTIONS OF SATURATION CONDITIONS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 15 Jun 83) pp 1220-1224

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[Abstract] A study is reported of the influence of saturation conditions on distribution of active component and oxidation rate of butane on a

$\text{CO}_3\text{O}_4/\alpha\text{-Al}_2\text{O}_3$  catalyst. Varying the nature of the saturation solutions yields several different types of distribution of active component over the carrier grain: uniform when applied from an alcohol solution, nonuniform when applied from a saturated aqueous solution, with maximum content of active components in a ring at a definite depth when applied from a solution containing zirconyl nitrate, mixed distribution when applied from a solution containing PVA. The variation of oxidation rate as a function of distribution was determined. Studies also showed that increasing the heating temperature of the catalyst in all cases resulted in a decrease in oxidation rate of butane. Distribution was found to effect thermal stability of the catalyst. Figures 2; references 11: 9 Russian, 2 Western.  
[78-6508]

UDC: 541.128+546.57

STUDY OF INTERACTION OF COMPONENTS IN PROCESS OF PREPARATION OF  $\text{Ag}/\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$  CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 29 Sep 83) pp 1239-1242

KORONTSEYICH, A. Yu., VOROB'YEV, V. N., SERODZHEY, A. T., KARIMOV, R. Kh., ABDURAKHMANOV, M. A. and RAZIKOV, K. Kh., All-Union Scientific Research Chemical-Technologic Institute of the Medical Industry, Tashkent

[Abstract] A study is presented of the nature of centers arising in various stages of preparation of  $\text{Ag}/\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$  catalysts. Silver catalysts were prepared by saturating commercial aluminosilicate with a solution of silver nitrate. X-ray diffraction diagrams were produced using filtered copper radiation, electron diffusion reflection spectra were obtained on a Specord M40 spectrophotometer. Two processes were found to occur in the system at high temperatures: sintering of small metallic silver crystals into large crystals measuring over 500 A, and, interaction of the silver with the carrier. In catalysts based on individual silica gel and aluminum oxide, as heating temperature increases the concentration of compounds with ions  $\text{Ag}^{2+}$  and  $\text{Ag}^{3+}$  increases, whereas on aluminosilicate due to the specific properties of the carrier compounds with silver ions in high degrees of oxidation are present only if silver content is high. Since the  $\text{Ag}^{2+}$  and  $\text{Ag}^{3+}$  ions in the carrier matrix do not participate directly in the catalytic process, the good operational qualities of the  $\text{Ag}/\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$  catalyst result from the relative inertia of the carrier in processes of formation of higher silver ions. Figure 1; references 4 (Russian),  
[78-6508]

UDC: 541.124

EPR SPECTRA OF HIGH VALENCE COMPLEXES OF MANGANESE. POSSIBLE RELATIONSHIP WITH OXYGEN-LIBERATING CENTER OF PHOTOSYNTHESIS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 1 Jul 83) pp 1252-1254

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[Abstract] An attempt was made to detect polynuclear compounds of manganese in previously-studied, model oxygen-liberating systems by the method of electron paramagnetic resonance. Asymmetry in superfine structure was determined, related to the fact that the energy of superfine interaction is comparable to that of the Seeman interaction. Identity of the spectra of the sulfate and dipyridyl complexes of Mn(IV)-Mn(III) indicated that the sulfate complex and dipyridyl complex both include the structural fragment

$\begin{array}{|c|} \hline 0 \\ \hline \end{array} \begin{array}{|c|} \hline \\ \hline \end{array}$   $\begin{array}{|c|} \hline \\ \hline \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array}$ . In sulfuric acid solutions, the fraction of paramagnetic

particles was 5 to 10% of the total quantity of manganese. Comparing the results with the data for natural systems it was concluded that the spectrum of the mixture of binuclear Mn(IV)-Mn(III) system with an Mn(IV) complex is close to the spectrum of the manganese center in the  $S_2$  state in photosynthetic systems. EPR spectra of the manganese center in photosystem II could thus be modeled by simple compounds of manganese capable upon further oxidation of forming complexes which oxidize water to liberate molecular oxygen. There is, therefore, no need to assume the participation of iron ions in the catalytic center of photosystems II. Figure 1; references 9; 2 Russian, 7 Western, [78-6508]

UDC: 541.128

STUDY OF CHEMOSORPTION OF OXYGEN ON RECRYSTALLIZED PLATINUM FOIL BY AUGER SPECTROSCOPY AND THERMAL DESORPTION

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 23 Jun 83) pp 1265-1268

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[Abstract] Adsorption of oxygen is studied on recrystallized platinum foil by electron Auger spectroscopy and thermodesorption. Studies were performed on an LEED-240 Varian installation with a semicylindrical analyzer. Study of the kinetics of adsorption of oxygen at 300 and 500 K shows that the rate

of adsorption and limiting surface content decrease with increasing platinum temperature. Even cooling of a specimen after adsorption at 500 K to 300 K and further adsorption do not achieve the level of surface filling achieved by simple 300 K adsorption. A scheme is suggested for adsorption of oxygen onto a rough platinum surface. Figures 2; references 21: 3 Russian, 18 Western.  
[78-6508]

UDC: 541.128

#### STUDY OF ADSORPTION OF CARBON MONOXIDE ON PLATINUM BY AUGER SPECTROSCOPY

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 23 Jun 83) pp 1268-1271

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[Abstract] Title experiments were performed on a Varian LEED-240 installation with residual gas pressure  $2 \cdot 10^{-8}$  Pa. The concentration of adsorbed carbon monoxide was determined while the carbon monoxide chemisorbed onto the platinum was titrated. Under the conditions used in the experiments, Auger spectroscopy is nondestructive, which is verified by study of the adsorption kinetics of carbon monoxide on platinum. Figures 3; references 12: 1 Russian, 11 Western.  
[78-6508]

UDC: 541.128

#### REGENERATION OF PLATINUM REFORMING CATALYST WITH CARBON DIOXIDE USED AS OXIDANT

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 25 Nov 83) pp 1271-1273

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[Abstract] There is great interest in the regeneration of coked catalysts by the use of a relatively mild oxidant such as carbon dioxide. The interaction of carbon and carbon dioxide gas is accompanied by significant absorption of heat and therefore cannot cause deactivation of the catalyst due to heating. The authors studied the regeneration of coked catalysts

with carbon dioxide gas in a differential reactor. During heating of the catalyst, dried and purified N<sub>2</sub> was circulated. After the required temperature was reached, carbon dioxide gas was introduced and the gaseous reaction products drawn off. The data obtained indicated that CO<sub>2</sub> can be an effective oxidant for regeneration of aluminoplatinum catalysts. The time of full regeneration of a catalytic grain containing 7% coke is about 8 hours at 40°C, about 4.5 hours at 550°C. Figures 3; references 4: 3 Russian, 1 Western.  
[78-6508]

CHEMICAL INDUSTRY

ATOMIC ENERGY UPSETS CIA FORECAST OF DWINDLING ENERGY RESOURCES

Moscow IZOBRETATEL' I RATSIONALIZATOR in Russian No 11, Nov 84 p 3

[Article: "Atomic Energy for Metallurgy and Chemistry"]

[Text] Speaking at a press conference in the State Committee for Science and Technology, USSR Academy of Sciences President A. P. Aleksandrov recalled the main stages in the development of Soviet power engineering. "I have managed to preserve an interesting document," said Anatoliy Petrovich, "instructions from the Academy of Sciences to determine where in the Soviet territory of the country (this was the time of the civil war) reserves of clay could be found for high-voltage insulators. Prior to the revolution we purchased phosphoric insulators only from Germany...." Turning to recent events, the academician noted that "it was the CIA, and not just anybody, that became interested in our power engineering for the purposes of political misinformation." Its forecasters told us that as of 1985 we would transform from an exporter into an importer of crude fuel, together with all of the ensuing consequences. This forecast was used as a basis for promoting an entire conception "explaining" our country's foreign policy course. But now another book has been published in the United States which demonstrates the complete groundlessness of the CIA's conclusions and then turns around to paint a quite favorable picture of our energy base.

A. P. Aleksandrov spoke of the advantages of building atomic electric power plants in the European part of our country. The economy of atomic power is rising.

"We are making an effort to see that atomic energy would be utilized in all energy consuming areas.... Atomic energy will make its way into both metallurgy and chemistry." In the future, the president of the USSR Academy of Sciences said, wider use of fast-neutron reactors and utilization of uranium-238 will make it economically feasible to use even uranium from ocean waters.

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CSO: 1841/103

GOLDANSKIY PHILOSOPHIZES ON CHEMISTRY, SCIENCE

Moscow ZNANIYE -SILA in Russian No 11, Nov 84 pp 7-9

[Interview with Academician V. I. Gol'danskiy by Correspondent M. Kuryacha; date and place not specified: "Chemistry and More"]

[Text] The past and future of chemistry, its theoretical and applied problems, and the place it occupies today among other disciplines--essentially its role in our life: This was the topic of an interview of Academician V. I. Gol'danskiy, director of the Structure of Matter Sector, Institute of Chemical Physics, USSR Academy of Sciences, deputy chairman of the Board of Directors of the All-Union Znaniye Society and Lenin Prize laureate, by our correspondent M. Kuryacha.

[Question] Vitaliy Iosifovich, I would like to devote today's interview not only to the modern problems of chemistry but also to its past. Interesting mutual relationships with other areas of knowledge, particularly physics and biology, can be seen in the history of this science and in its present state. On one hand today's specialists note that the ideas of chemistry are penetrating into medicine, into biology and into other sciences--a unique sort of "chemicalization of thinking" can be observed in them. On the other hand--primarily among physicists--chemistry is believed to be a subject that is not independent, one which does not possess its own theory. In their opinion chemistry is a summary of empirical rules which only physics can support with theoretical grounds. Who in your opinion is correct in this debate?

[Answer] First of all I would like to say a few words in defense of empirical rules. Very often they are a necessary stage in the creation of theory. Mendeleev's periodic system was also empirical, but very many valuable physical discoveries were made on its basis. Together with radioactivity, the periodic law became the basis for the birth of modern ideas about the structure of matter.

Now about independence. It is true that chemistry does not possess its own fundamental, "primal theory." And of course, the theory which it will obtain in the final analysis will come from theoretical physics--a science applicable to all natural phenomena. The structure of matter, and in general the entire

nature of the microworld, is essentially described in the language of quantum mechanics. But to say that because of this chemistry is not independent would be a clear insult to it.

Were we to follow this road, then we could also reproach physics itself for the fact that it is not an independent science, because the relationships between physical characteristics of matter are written in the language of mathematics. Moreover chemists do have their own language, by the way: the symbols representing chemical elements. And the relationships between chemical characteristics--reaction equations--are written in chemical language. Such that in this sense chemistry is in even a better position than physics.

But there is another aspect of the problem concealed in your question. I cannot come up with the exact name for it.... Let me conditionally refer to it as the degree of fundamentalness. Let us consider the following hierarchy--elementary particles, the nucleus, the atom, the molecule and all the possible supramolecular structures. Strictly speaking, chemistry deals only with the level of molecules in this hierarchy. This is because the levels preceding it are the property of physics, and those that come after, the supramolecular levels, belong either to biology or once again to physics. It might be suggested that chemistry is rather constrained here.

But in fact the world of molecules is so great that chemistry enjoys a rather enormous share of the reserve of knowledge.

However, were we to characterize the degree of fundamentalness of a given science by a certain fraction in which its theoretical principles are in the numerator and its applications are in the denominator, then it would in fact appear that chemistry today is a less-fundamental science than biology and physics. But this is because of not the smallness of the numerator but the enormous size of the denominator, because of the enormous applied aspect of chemistry. This circumstance should not be ignored.

Clearly even from a purely fundamental standpoint chemistry still can expect a very long and, might I say, a great future.

[Question] Can the absence of "primal theory" be explained by the fact that chemical objects are more complex than physical ones, and consequently the tasks facing the theorists are more complex?

[Answer] Well, no, I do not think that the situation is all that simple.... Judge for yourself, what is more complex, a solid or a single molecule considered on its own? A solid contains many molecules. But can we really assert that the level of its structure is much more complex? In a certain sense, yes. But its phenomenology, its description is simpler precisely because it consists of many molecules: We can ignore certain details here and at the same time introduce some new concepts into our examination.

Therefore it cannot be said that the theory of molecules, for example, is more complex than the theory of atoms, or that the theory of solids is more complex than the theory of molecules. As we make a transition to each new level,



we acquire some new possibilities for describing phenomena, and we lose something. We in a sense simultaneously increase complexity and surmount it.

For example it would seem that the forward edge of science is now at the simplest objects--elementary particles. But they have still not been understood as fully as they should be. Both absolutely new ideas and new quantum characteristics of matter are coming into being here--I am referring to a so-called unified field theory in which elementary particles should exist as different manifestations of a single field. This theory brings together interactions of different types--electromagnetic, weak and strong and, in the future, perhaps even gravitational interaction may be included. But for the moment the theory is not conclusively constructed.

And of course, it cannot be said that physics operates with simpler objects, chemistry operates with more-complex ones and biology does so with even more complex objects, or that physics is simpler than chemistry and chemistry is simpler than biology....

[Question] You mentioned the discovery of the periodic law. This is a clear example of how solution of a key problem in its time imparted considerable momentum to new ideas, to new directions in science. But what about today? In your opinion what area of chemistry is the most important today from the standpoint of new, productive ideas and experiments, from the point of view of their influence upon scientific thought?

[Answer] To answer this question I would have to consider science in general, all of the natural sciences as a whole. Three very important points of growth are quite clearly evident here. Two of them are physical and one is biological. In physics we have the world of elementary particles and astrophysics--that is, questions pertaining to the origin and development of the Universe. And in biology the most important problem if you will, is the origin of life and its evolution. But it seems to me that the most important thing in the future of chemistry is associated with chemical bionics, with chemical modeling of systems created by living nature. Let me explain my thoughts.

You see, biological systems are essentially record-holders of a unique sort. First of all they are characterized by the highest information capacity--the human brain for example. Second there is the flow of matter: Production of matter in the living cell is greater than in any plant (per unit of working weight). And finally there is the flow of energy: Productivity is higher in bioenergetics than in any other systems; it is in biology--in photosynthesis for example--that we find the highest efficiency. Moreover it is very important that conversion of chemical into mechanical energy proceeds at practically constant temperature.

This is what nature offers us today. But what if we were able to artificially create a system possessing the three listed parameters existing at the level of biological systems? To come to understand the principle of operation of living systems and learn to reproduce the same by chemical means is the objective of chemical bionics. This is such a fundamental task that in the future it may provide chemistry with a very important role--I wish to say a very important role and not a dominant one--in both applied and theoretical problems.

Take for example creation of artificial enzymes--catalysts which would possess the same level of selectivity and activity as do biological ones. Or take artificial membranes, which could work like biological ones: passing certain ions and blocking others, and possessing one-sided permeability.

Creation of such chemical models would be interesting from more than just a practical point of view. It might shed light on our understanding of the way processes occur in the living cell.

[Question] In other words, would this allow us to get any closer to the problem of the origin of life?

[Answer] This is a special question.\* But inasmuch as the approach here is physical--that is, the appearance of life is viewed as a physical problem which does not reduce to chemistry alone, I do not wish to entertain it here.

[Question] But is this problem not in general one of the natural sciences? Moreover it is such an unusually interesting one. Therefore please discuss it at least briefly.

[Answer] The question is posed as follows: Can the origin of life be reduced to evolution? Or is it not a smooth evolutionary process but something resembling a "catastrophe," a phase transition?

For example cosmology possesses a well known theory of the origin of the Universe called the Big Bang theory. Did something resembling such a "bang" occur in the development of organic nature in its transition to biorganic nature, to the appearance of life? We know that in nature, only left-sided amino acids and only right-sided sugars exist, and this is one of the most important properties of living systems distinguishing them from nonliving ones. How did such a violation of mirror symmetry occur?

We essentially need to consider the play of three factors.

In the first place there are pure fluctuations, the statistical factor: Suddenly in some place within a uniform mixture, chance brought a larger quantity of left-sided molecules into being (in comparison with right-sided ones).

Second there is the advantage factor, which operates in such a way that this inequality no longer arises by chance. What is known in the physics of elementary particles as neutral currents--one of the manifestations of so-called weak interactions--can serve precisely as such a factor. It is precisely owing to these neutral currents that the following pattern arises: The energies

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\* In recent years I have had the fortune of thinking and working long on this question jointly with an extremely talented scientist, Doctor of Physico-mathematical Sciences Leonid Leonidovich Morozov. I am firmly convinced that this person was destined to have a great future in science, but his unexpected death took him away from us on 9 June of this year, 2 days before his 38th birthday.

of levorotatory and dextrorotatory molecules differ, albeit quite negligibly. Of course, the advantage factor must operate over a long period of time. As an example a trial or an experiment may be repeated over and over again over the course of billions of years, and each time a tiny advantage might be gained. But could this lead gradually, by evolution, to a situation where left-sided amino acids survive while right-sided ones gradually transform into left-sided ones? And in the end, would this mean that the mirror symmetry of the world would be violated?

And finally the third factor. It operates in the reverse direction--the factor of racemization. Its essence is that when the left and right forms interact, they in a sense cancel each other out, transforming into a neutral mixture; they undergo a unique sort of annihilation.

It may be possible that the play of these three factors led to a situation where one mirror form began to dominate over the other in nature. But can this sort of process be explained as evolution, as gradual change? Or must we look at it as a "bang," as a transition through a critical state? Certain changes come into being, they gradually accumulate, and then, in one explosive instant, the system becomes unstable. It transforms from an almost symmetrical one immediately into a purely asymmetrical one.

Evolution versus a unique phase transition, clarification of what role neutral currents played here, and attempts to observe their contribution to chemical processes are enticing problems. And were I to speak of my own personal interests, I would say that the origin of life is to me the most interesting problem.

[Question] You opened the topic of personal interests. I would like to ask this question in this regard: You have managed to do a great deal in science, but what area are you especially fond of, and why?

[Answer] You know, I would have posed the question somewhat differently. Whenever I turn to that which had been done, whenever I look into the past and remember, I begin to think: Which years were the most successful? Which stage of my work seems the most fruitful to me now? Then the impression comes to my mind that the years from 1959 to about 1961 were such years. It was in these 2 or 3 years that all of the basic directions of the research which I was to conduct in the future and which later became especially close and precious, producing important results, essentially materialized.

In 1959 we conducted experiments with a synchrotron of the FIAN [Physics Institute imeni P. N. Lebedev]. It was found that the characteristics we obtained for scattering of gamma-quanta by a proton would not allow its interpretation as a point particle. Our experiments established that the proton is a complex particle having the capability of polarization. Moreover the constant of electric polarizability was numerically determined. In the future our work (it entered the textbooks and the encyclopedia "Physics of the Microworld") was officially recognized as a discovery. Lengthy laborious experiments came to a satisfying conclusion. The results were reported in that year in Kiev,

at a conference on high-energy physics. Such was the first result of the year.

I should perhaps offer an explanation here: In 1952 I transferred from the Institute of Chemical Physics to the FIAN, I worked there for 7 years, and in 1959 I began gradually preparing to return to chemical physics, in order to combine the experience that I accumulated in both chemistry and nuclear physics. This transition did not formally occur until 1961. In fact, however, beginning in 1959 I combined my work in the FIAN with work in the Institute of Chemical Physics.

While experimental research was progressing according to plan at the FIAN, I became interested in what contribution tunnel junctions make to the rate of chemical reactions. I made a few theoretical calculations "for my own amusement," and as a result I came to the conclusion that at low temperatures the rate of a reaction should reach a plateau, at least in a number of the simplest systems.

I reported these results in 1959 as well, at a Mendeleev congress in Moscow. There I met the Englishman Ronald Bell, one of the pioneers in research on the tunnel effect in chemistry. He showed great interest in my work. Thus in that same year, 1959, the second direction of my interests materialized. Research in this area became fundamental to me later on--in the late 1960s and in the 1970s.\*

I am now making an effort to calculate the properties of nuclei far from the range of beta-stability--particularly nuclei with a severe shortage of neutrons. I began this work in 1959 as well, and also "for my own amusement." I discovered a method of predicting the properties of such nuclei. I derived the formulas, I used them to calculate the expected mass of many unknown isotopes, and I came to realize that two-proton radioactivity should exist. Thus the result, which is just now being confirmed experimentally after a rather long interval of time, was arrived at in 1960. Without a doubt this was one of my favorite projects.

And then, in connection with my move from the FIAN to the Institute of Chemical Physics, in 1960 I did my first research on reactions of the positronium in aqueous solutions. This was the first experimental study in a series of a very wide range of research on the chemistry of the positron and the positronium.

And finally, in 1961 we began working in the area of chemical Mossbauer spectroscopy. Our first experiments were conducted jointly with colleagues of the Scientific Research Institute of Nuclear Physics of Moscow State University. The Mossbauer effect was discovered in 1958, and in 1961 we discovered the existence of the Mossbauer effect in polymers. In 1962 we also found an explanation for the asymmetry of Mossbauer spectrums--that which later came to be called the Gol'danskiy-Karyagin effect.

\* For greater detail on this work, see the article "Chemistry: Contrary to the Usual," ZNANIYE-SILA, No 2, 1977.

In a word, this period was the most fruitful. I recall it with tremendous satisfaction. Not to mention the fact that I was 25 years younger--an advantage of no small importance.

[Question] Vitaliy Iosifovich, sometimes not only the achievements of science but also its mistakes have a great influence upon the development of science. In a vain search for the philosopher's stone and an elixer of youth, alchemists accumulated an enormous quantity of useful information that served as the foundation for chemistry of the future. Attempting to isolate nonexistent phlogiston, chemists uncovered the secret of combustion and discovered oxygen. In short, despite the wrong roads deliberately taken in the search, major discoveries were made and fruitful ideas came into being. Are there examples of this sort today?

[Answer] An example of a mistake that is great in its consequences? In my opinion as a rule great mistakes are made by great people. What unavoidably comes to mind here is the erroneous discovery of transuranium elements by Enrico Fermi.

As we know, he was studying interaction of slow neutrons with various nuclei. And he discovered that neutrons are absorbed and nuclear transformations occur with enormous effectiveness. When Fermi got to uranium, he began obtaining various new isotopes. At first it was hypothesized that elements representing uranium-93, -94, -95, -96 and, in my opinion, -97 were discovered. And this was announced. Later it turned out that transuranium elements were not what Fermi had observed. This was a mistake which tortured him to the end of his days.

However, not less than 10 years after research of major proportions was started in this direction, it was found that capture of a neutron by uranium does in fact lead to formation of neptunium. And then neptunium transforms into plutonium, and so on--that is, transuranium elements are the results. But this happened later on.

Thus in the final analysis a mistake by a great person became a source of a great discovery. It marked the beginning of the atomic era. Many researchers rushed to follow Fermi's footsteps, and they began to try to determine what it was that he had observed. And soon after Pavel Savich and Irene Curie completed their famous work, Otto Hahn and Fritz Strassman discovered fission.

And in general, turning the discussion to mistakes, you have touched upon a very serious topic. I would like to digress at this point somewhat and emphasize another important thought.

Every scientist has the right to make a mistake. And I think that deriding a person for that is not the proper path of scientific development.

Derision may be appropriate and even necessary if an attempt is made to conceal a mistake rather than recognizing and correcting it. And on the other hand, be it the grossest error or be it the subtlest, if it is admitted, this would be equivalent to stopping after chancing upon a dangerous chuckhole

in the highway and warning others away from it. That would be good. But what if--let me continue the comparison--this person tries to camouflage the chuckhole and ride on, such that others would subsequently be in danger of chancing upon it as well? Now this is something entirely impermissible from the standpoint of morality, scientific ethics or whatever.

It is very important for the public to be made aware of mistakes, for the author of the mistake himself and other scientists to work persistently on their correction and their explanation. I would like to see a book published with the title "History of Great Mistakes." It seems to me that this might be a very interesting task to the Institute of the History of the Natural Sciences and Technology of the USSR Academy of Sciences and to authors involved with popular science literature.

There is one other thing I would like to mention: We should not be afraid of mistakes. Apprehensions of this sort, a fear of ridicule may bring very important research to a halt. Sometimes we must have great courage to go on. But this is necessary.

I was once told how much people laughed at Pavel Alekseyevich Cherenkov in his time: He was catching phantoms, they said, and he could see some sort of rays in the darkness which no one but he could see. And despite the ridicule, Cherenkov proceeded toward his goal stubbornly and persistently. He was not only able to observe this radiation with the unaided eye, but he also managed to somehow document its properties. Cherenkov's work later became an object of quantitative analysis, and it transformed into one of the most important achievements of both Soviet and world science, winning the Nobel Prize.

It would perhaps make sense to lay special emphasis on this, because Pavel Alekseyevich Cherenkov turned 80 years old in 1984. Moreover it is now 50 years since the moment of first publication of his discovery, which subsequently came to be called the "Cherenkov-Vavilov effect."

[Question] To have no fear of errors and ridicule, to march assuredly toward one's goal--are these apparently the qualities a pioneer must always possess, and are they perhaps especially necessary in the defense of unaccustomed, "crazy" ideas?

[Answer] You know, it sometimes seems to me that a unique sort of turn is occurring today in human consciousness. It is very important to emphasize here that in the overwhelming majority of cases, "crazy ideas" are in fact crazy, without quotation marks. The well-known notion of "crazy ideas" is often used by people as a way to say: "Well, why not?" Einstein succeeded, they say, so why shouldn't we succeed as well? This is in a sense *a priori* justification of totally mindless inventions, ones which do nothing but require the wasting of precious time for their examination, even though they are doubtlessly unscientific.

It must be kept clearly in mind that as a rule a new theory widens the range of explanations for phenomena in application to some new area, while concurrently meshing with the old in the knowledge it embraces. But if the

proposed idea is in conflict with the established facts, then it is truly crazy. This must be understood well, so that we could avoid unfair speculation and assertion of identity between crazy work and good work.

[Question] Vitaliy Iosifovich, our interview is coming to an end. I would like to conclude with a question that has become rather traditional: Where do you think chemistry will be in the year 2000?

[Answer] It has now become fashionable in our country to make predictions, and of course the year 2000 is the most enticing date. Before answering, I would advise looking through old journals today and seeing how much forecasts made in the 1950s, 1960s and 1970s have proven true. You would then see how thankless a task it is to predict something.

It seems to me that it would be very nice to publish an analysis of the cases in which forecasts have been found to be too modest and cases where they have been unrealistic. This is very important, from the standpoint of both analyzing the past and extrapolating into the future. In my opinion this would be a very instructive project.

And so it is with this reservation that I will answer your question.

Chemistry in the year 2000.... We would of course be talking about the creation of artificial enzymes, artificial membranes, artificial energy converters and artificial information devices. I talked about the theoretical aspect of this question earlier. Now I would like to talk about the applied aspect, though of course the definition of "applied" is rather conditional.

We could recall here the work of USSR Academy of Sciences Corresponding Member M. Ye. Vol'pin and USSR Academy of Sciences Corresponding Member A. Ye. Shilov on nitrogen fixation with the help of a unique sort of artificial enzymes. Development of such mild catalytic methods will make it possible to utilize the enormous reserve of nitrogen surrounding us, and to create various sorts of valuable products. Membranes are essentially unique chemical semi-conductors. Moreover they are even capable of causing transmission against the gradient--that is, causing an agent to pass from an area of lower concentration to an area in which its concentration is greater. In other words active transport of matter is possible.

Energy converters.... An example would be artificial muscles in which chemical energy could be transformed into mechanical energy with high efficiency.

Information devices.... What comes to mind is creation of artificial neurons--chemical models of those elements of information which in the final analysis make the enormous information capacity of our brain possible. Were we to compare the brain with a modern integrated circuit, we would find that the limit of its information capacity, its smallest element, is the molecule. Imagine a molecule performing the functions of a transistor. This is a "transistor" of exceptionally small size, and correspondingly it contains an extremely large volume of information per unit volume. The idea of creating such molecular circuits in modern electronics--essentially molecular electronics--is already being discussed in print.

Now briefly on chemistry in application to the problems of genetic engineering. We have the famous work of USSR Academy of Sciences Corresponding Member I. A. Rapoport, which was awarded the 1984 Lenin Prize--the cycle of studies "The Phenomenon of Chemical Mutagenesis and Its Genetic Study." His basic idea is that chemical substances elicit mutations that are extremely important to selection and to development of new breeds. And it is very interesting to progress from the discovered chemical mutagenesis to its study at the molecular level. To learn how to affect a molecule in a particular way, to elicit a previously determined mutation, is an unusually interesting task.

And now in application to medicine: Here as well chemistry faces an enormous assortment of tasks. There is the creation of synthetic fabrics and organs, utilization of which would not be complicated by tissue incompatibility and would not elicit thrombus formation. Very promising in this area is the work of USSR Academy of Sciences Corresponding Member N. A. Plate.\* Then there are the problems of immunology and artificial vaccines--the work of USSR Academy of Medical Sciences Academician R. V. Petrov and USSR Academy of Sciences Corresponding Member V. A. Kabanov. Or for example there is chemotherapy of cancer, which is of course a very serious problem. You might find it interesting to talk to Academician N. M. Emanuel' concerning the successes in this area.

Now a few more words about the tasks of chemistry as a science. It is very important to study ever-faster chemical processes: There are many new things to be discovered here in order to improve our understanding of the elementary acts of chemical conversions.

Without a doubt chemistry should play an important role in solving many physical problems. For example there is the search for superconductors to work at high temperatures. Today this task is to a significant extent a chemical and not a physical one. Or consider creation of a large number of new materials, for example polymer films based on polyacetylene, exhibiting electric conductivity.

Chemical methods are also being employed in fundamental physics. The problem of transforming one element into another by means of the neutrino effect is an example. The task here is to radiochemically isolate the products of these reactions and determine the neutrino flux.

But now if we return to chemical problems *per se*, I would mention one intensively developing area--laser chemistry, and namely the task of selective influence upon chemical bonds. What this means is learning to control highly intricate chemical processes using a laser beam with a wavelength capable of extremely fine tuning. This may have theoretical significance, and it may have significance to chemical production, to chemical mutagenesis, and in the final analysis to genetic engineering....

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\* See the article "Living Water for Polymers," ZNANIYE-SILA, No 2, 1983.



It may seem that I have said a great deal, but there is even more that I have not yet said. One cannot embrace the unembraceable, but neither can one remain silent about the exceptionally important role which chemistry is called upon to play in implementing the food and energy programs.

In terms of the Food Program we are concerned with artificial food, fertilizers (once again we are talking about nitrogen fixation), herbicides and pesticides, and the search for optimum ways to process dietary raw materials. And in relation to the energy program, we need to find the most effective methods of fixing solar energy,\* acquisition of energy carriers such as hydrogen and carbon monoxide, and gasification and liquefaction of coal (integrated use of radiation and high-temperature heat from atomic power plant reactors may turn out to be highly promising for these purposes). Secondary raw materials are a very important problem; if we could learn to recycle various materials, this would produce a colossal energy savings.

I can see that it is time to sum up, to make some sort of conclusions. But my conclusions are very simple here. Chemical experimentation is of interest today not only to chemistry but also to physics, to biology and to other fields of knowledge. Chemistry, together with its methods and the range of problems which it studies, still has a great future in modern natural sciences.

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\* For more information see the article "We Are Only Just Beginning to Find That Which Has Always Existed..." ZNANIYE-SILA, No 2, 1982.

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**BELORUSSIA SEEKS WAYS TO RAISE FERTILIZER, CHEMICAL PRODUCTION**

Minsk PROMYSHLENNOST' BYELORUSSII in Russian No 6, Jun 84 pp 34-37

[Article by G. Tsivinskiy, chief, Chemical and Petroleum Industry Department, Belorussian SSR Gosplan: "The Republic's Chemists in Behalf of Rural Laborers"]

[Text] Our republic is the largest supplier of the most important forms of chemical and petrochemical products, and in relation to some of the most progressive ones, it is tenaciously holding on to a leading place in the world. Thus its enterprises are responsible for 19 percent of the Soviet Union's total production of mineral fertilizers, 24.4 percent of its chemical fibers and filaments and 12.5 percent of its plastics and synthetic resins.

The republic's share in national production of potassium fertilizers, which is 53.6 percent today, is especially great. This is a great contribution to chemicalization of agriculture, and consequently to implementation of the USSR Food Program.

Let us begin with raising the yield of agricultural crops. About half of the yield is formed today due to application of mineral fertilizers to soil. The same can also be said for raising the productivity of hayfields and pastures. It would be pertinent to recall that in the conditions of our republic, the return from 1 kg of active ingredient in nitrogen-phosphorus-potassium fertilizer averages 6 kg of grain, which is the reason why the calculated demand for mineral fertilizers is so great. Our republic receives a significant part of the mineral fertilizers it consumes from the Grodno Azot Production Association, the Beloruskaliy Production Association and from the Gomel Chemical Plant. Last year for example about a fourth of the nitrogen fertilizers, half of the phosphorus fertilizers and practically the entire volume of potassium fertilizers received by the republic's kolkhozes and sovkhoses were produced by Belorussian chemists.

Extremely important tasks have been posed before the republic's chemists this five-year plan associated with raising production capacities and increasing the output of various chemical products, including ones delivered to agriculture. In particular the plans foresee producing 6,442,000 tons of mineral

fertilizers in 1985--almost a third more than in 1980. In 2 years of the 11th Five-Year Plan the collectives of the Grodno Azot Production Association, the Gomel Chemical Plant and the Polimir Production Association produced 56,700 tons of nitrogen fertilizers and 7,900 tons of phosphorus fertilizers above and beyond the established quotas. As far as the collective of the Beloruskaliy Production Association is concerned, to our great disappointment it fell short in this period by 753,000 tons of potassium fertilizers (8 percent of the quota). What is the problem here?

The quotas set in the republic for the five-year plan foresee increasing production of potassium fertilizers by a factor of 1.4, which may be achieved only through the full use of all existing production capacities and timely introduction and assimilation of new ones. Their unsatisfactory assimilation and insufficient utilization were precisely the reasons why the collective of the Beloruskaliy association was unable to reach its goals. Unfortunately Soligorsk miners and chemists have now been behind for 5 years. But as before, experimental industrial production equipment of the ore dressing factory of Mine Administration No 4, which was placed into operation in 1979-1980, is still not ready for work. The problem is that equipment and procedures for halurgical enrichment of potassium salts were found to contain significant design shortcomings and planning deficiencies, correction of which is requiring a large volume of additional work. It would be sufficient to say that over 18 million rubles have already been spent to redo the production systems and modernize the equipment. But complete correction of planning and design mistakes will require about another 20 million rubles more. This is why the large new output capacities are presently working at only half their load.

Under these conditions all of the efforts and attention of the collective of the Beloruskaliy association are directed at insuring stable operation of the ore dressing factory of Mine Administration No 4. Solving this problem, Soligorsk chemists are colliding with a number of other no less complex problems which are retarding further growth of potassium fertilizer production. Today for example the association does not have the needed quantity of mining equipment for ore extraction by progressive methods, machinery and tractors for transporting people and cargo in the course of underground operations, or a standard reserve of cabling, electrical equipment, conveyer belts, spare parts and other material resources. As a result in recent years the return from output capacities already assimilated at mines and flotation ore dressing factories of mine administrations No 1, 2 and 3 have been decreasing somewhat rather than increasing. Thus 1982 production of potassium fertilizers by these mine administrations was 99.9 percent of the 1981 level. In this case the output capacities of mine administrations No 1 and 3 were only 95-96 percent loaded.

Systematic interruptions in dispatch of finished products by rail transportation are having a negative effect upon the use of the association's production capacities. Just last year alone the administration of the Belorussian Railroad furnished almost 13,500 rail cars less than required for transportation of potassium fertilizers. For this reason the plan for their delivery to agriculture was not completed. At the same time 139,000 tons of potassium fertilizers were left undelivered at the warehouses of the mine administrations at the beginning of this year.

The Beloruskaliy Production Association is presently producing and supplying agriculture with potassium fertilizers in the form of concentrated potassium chloride (89 percent of its total production), to include fine-grain (63 percent), fine-crystal (11 percent) and granulated (15 percent), as well as in the form of mixed potassium salt (11 percent). This year production of new forms of potassium fertilizers is foreseen--potassium sulfate and fertilizers with copper additives. Introduction of chlorine-free potassium fertilizers (potassium sulfate) into the soil will make it possible to significantly increase the starch content of potato tubers, improve their taste qualities and raise their resistance to disease. Copper-potassium fertilizers are being applied to all crops on moor peat soil; in this case the yield increment, especially on newly assimilated soils having a low concentration of mobile copper, is extremely significant--20-30 percent and more.

Production of granulated potassium chloride will also increase. The association has already created capacities producing not less than 30 percent fertilizers in granules. By the middle of the 12th Five-Year Plan agriculture will begin receiving these fertilizers only in granulated and crystalline form.

This year Grodno chemists will reach the nitrogen fertilizer production level planned for the end of the five-year plan. They will provide agriculture with carbamide, ammonium nitrate, ammonium sulfate, liquid ammonia and ammonium hydroxide. Over 85 percent of the nitrogen fertilizers produced here bear the State Seal of Quality. About 80 percent of the solid fertilizers are produced in granules. This year the Azot association will begin producing zinc-containing carbamide, application of which is effective in relation to the cultivation of flax, corn, vegetables and perennial grasses for seed. A new ammonia production facility of considerable unit output capacity is also under construction. Its introduction will mean creation of a firm foundation for further growth in nitrogen fertilizer production. In order to achieve sensible use of ammonia resources, plans have been made to expand existing carbamide production capacities and create new ones, as well as to build several dozen large and small warehouses for the storage of ammonia at the places of its consumption and use in liquid form.

As we know, most of the republic's rayons have soil with a small phosphorus concentration, which is why phosphorus fertilizers, the bulk of which are produced by Gomel chemists, play such a decisive role in raising their fertility. The Gomel Chemical Plant produces and provides agriculture with granulated and concentrated double superphosphate (43 percent of total phosphorus fertilizer production), ammophos (49 percent) and compound-mixed nitrogen-phosphorus-potassium fertilizers (about 8 percent). A fraction of the double superphosphate is produced with boron additive, application of which to soddy-podzolic soil increases the yield of sugar beets, food roots, flax and legumes by 5-15 percent.

Despite fulfillment of the planned quotas for mineral fertilizer production, the level of its production dropped by almost 15 percent in comparison with 1980 because production of simple superphosphate was stopped, and because of a shortage of wet-process phosphoric acid. Moreover imperfect procedures and obsolete equipment in the double superphosphate shop make it impossible to produce finished products of contemporary quality, which compels us to seek new

ways of raising the stability of the work and the effectiveness of this production operation. However, the plans for rebuilding and reequipping the phosphoric acid and double superphosphate shops at the enterprise are still not being implemented. The plant's board of directors is being impermissibly slow in solving the problems of coordinating the preplanning and planning decisions, and thus it is hindering further development of phosphorus fertilizer production.

The contribution of Belorussian chemists to the USSR Food Program is not limited to just deliveries of mineral fertilizers alone. Use of various plastic articles and provision of tires, industrial rubber articles, fuel, lubricants and other materials for agricultural equipment have important significance to strengthening the material-technical base of agriculture.

Polymer tubing, production of which has been organized at the Borisov Plastic Articles Plant, has enjoyed wide use in land reclamation operations. This plant also produces polyethylene film used to build hothouses and forcing beds, to store away silage and hay and to protect agricultural products from precipitation. A significant quantity of such film is also produced by the Polimir Production Association and by the republic's local industry. Back in 1972 the Vitebsk Khimplast Production Association was the first in the country to begin producing secondary polyethylene film, which made it possible to significantly widen the raw material base owing to recycling of film that had outlived its usefulness.

The Borisov Polimir Plant produces film wrap for foodstuffs, milk cartons, containers for sour cream and soft cheeses and other polymer packaging. The Mogilev Synthetic Fiber Plant produces double-thickness film for wrapping meats and fish products, and synthetic sausage casing. The articles of these enterprises enjoy the widest use in food and in meat and dairy industry.

Polyethylene produced by Novopolotsk chemists is the raw material for production of polymer tubing and films, as well as a wide assortment of plastic articles. Despite the fact that the Polimir Production Association is one of the country's largest producers of this form of plastic, the republic's capacities for processing it are only 50-85 percent loaded, because the bulk of the polyethylene is now being used to produce other forms of products. Under these conditions the work of the association's collective must be directed at insuring production of more polyethylene than planned through economic expenditure of raw materials, reduction of planned and unplanned idleness of production equipment and improvement of equipment and production processes, which will insure fuller utilization of the output capacities of enterprises producing plastic articles. The association collective is not yet making full use of its possibilities for increasing polyethylene production in excess of the plan owing to a shortage of spare parts for compressors.

In cooperation with scientists, Novopolotsk chemists have developed and begun production of a photodegradable compound based on polyethylene with a controllable life; it is used in production of sensitized polyethylene film. This film is then used in mechanized soil mulching of grape seedlings. In this case the yield of standard seedlings per hectare increases by 10,000. After 2 or 3

months in the ground, the film breaks down, mixes with the soil and is completely destroyed by microorganisms. These properties preclude the need for removing material that has outlived its usefulness.

With every year the kolkhozes and sovkhoses are increasing their fleet of machinery, tractors, combines and other agricultural equipment which cannot go far without "footwear." Such "footwear" is manufactured by Bobruysk tire-makers. The Bobruyskshina Production Association produces tires for Kirov brand vehicles, Belarus' tractors, Niva and Kolos grain harvesting combines, agricultural trailers, trucks and passenger cars. Today over half of the tires produced for agricultural machinery are in the top quality category, and 38 percent of them possess the progressive radial design. The association's laborers are constantly improving the quality of their products and delivering them promptly to their consumers. Just in 1982 alone they surpassed the plan by over 13,000 high-quality tires for agriculture equipment. A large assortment of industrial rubber articles is also supplied by the collective of the Belarus' rezinotekhnika Production Association.

But at the same time the Bobruysk Tire Repair Plant is still not making an adequate effort to restore tires for agricultural equipment. The preplanning work of improving and developing tire repair production must be accelerated.

Provision of rubber footwear to rural laborers remains an acute and timely problem. Laborers cannot do without such footwear in rainy weather and it is required in field work and at animal farms. The Krichev Rubber Articles Plant and local industry enterprises manufacture such footwear in a wide assortment, but only half of the demand is being satisfied. This is not because the producers are working poorly--quite the reverse. The collective of the Krichev plant more than quadrupled its output of rubber footwear and completely exhausted the possibilities for its development at the existing output capacities. It must be said frankly that the equipment they use and the buildings and structures had worn out long ago, and they do not correspond to any degree to a modern technical level. The enterprise is undergoing reconstruction today. Its output capacity is to be raised enough to fully satisfy the demand of the republic's population for rubber footwear. This would seem to be the right tack to take. But reconstruction has dragged on unjustifiably. It began as long ago as in 1968, and not even half of the foreseen jobs have yet been completed. At the same time this work should have been completed in 3 years according to the construction norms. The client was compelled to rework the planning estimates several times, new equipment had to be installed in old, maximally overloaded production areas, while Construction Trust No 12 of the Belorussian SSR Ministry of Industrial Construction systematically failed to complete its planned quotas for construction of facilities for the enterprise. I would like to believe that the Belorussian SSR Ministry of Industrial Construction will finally condemn this case of ultraslow construction, and take steps to see that reconstruction of the Krichev Rubber Articles Plant will be completed in the current five-year plan.

Prompt repair of agricultural equipment depends in many ways on availability of oxygen gas for gas welding at the repair enterprises. Over 80 percent of the oxygen gas used in the republic is produced by the Minsk Chemical Plant,

the equipment of which has been working for over 25 years at maximum load. Oxygen gas is supplied today to agriculture only in bottles. This is convenient to the consumer, but it means too much overhead for the state (the transportation outlays are all too great). It would be sufficient to point out that when oxygen gas is delivered in bottles, the weight of the containers is eight times the weight of the product. This is why the Belorussian SSR State Committee for the Agriculture Equipment Association must immediately introduce progressive methods for transporting oxygen--in tank trucks and in liquid form, with its subsequent gasification and bottling occurring at the places of consumption. This would make it possible to completely satisfy agriculture's demand for oxygen gas and preclude irrational shipments by motor transportation, and it will free thousands of vehicles and drivers for other purposes.

Chemical preservatives and table salt, the entire quantities of which are now imported into our republic from other regions of the country in extremely limited quantities, have great significance to the procurement and production of feed. The demand for preservatives is less than half satisfied today, and nutrient salt is used to feed cattle and in combined feed industry.

At the request of the Belorussian SSR Ministry of Agriculture the Grodno Azot Production Association, the Mogilev Khimvolokno Production Association and the Gomel Chemical Plant are studying the possibilities of using a number of chemicals as preservatives, and they are organizing their production. In particular Grodno chemists have already created an experimental facility for production of Neman-1 preservative, which is a mixture of 40 percent ammonium sulfate-bisulfate solution and 24 percent sodium bisulfate solution. Mogilev chemists have produced several experimental industrial lots of 30 percent sodium benzoate solution, while Gomel chemists have submitted samples of sulfite-bisulfite solutions for testing. The Belorussian Ministry of Agriculture should hasten the testing of the usefulness of these additives. Tests on the use of halite wastes from Mining Administration No 4 of the Beloruskaliy Production Association as fodder salt should be hastened as well. These wastes contain 90-93 percent table salt, about 4 percent potassium chloride and up to 5 percent insoluble residues. Their use to feed cattle and to produce combined feeds would make it possible to reduce importation of dietary table salt into the republic by 120,000-150,000 tons. The decision on this issue must be made by the Belorussian Ministry of Agriculture.

Freeing the dietary raw materials used in industry is a most important reserve for increasing food reserves. It would be sufficient to say that each year 25,000-30,000 tons of vegetable oils are used to produce paints and varnishes in our republic. In the last few years the country's and republic's paint and varnish enterprises implemented a number of measures to replace dietary raw materials by synthetic ones. Utilizing the wastes of chemical and petrochemical production operations, we have been able to create effective substitutes for vegetable oils of no worse quality. Thus just last year alone the Lida Paint and Varnish Plant saved 1,775 tons of vegetable oils by using substitutes. The Belorussian SSR Ministry of Local Industry is now implementing specific measures to utilize by-products from pyrolysis of directly-distilled gasolines of the Polimir Production Association to organize production of up to 15,000 tons of petroleum polymer resins per year. This will make it possible to

economize on vegetable oils, production of which requires the processing of sunflowers from an area of over 25,000 hectares.

As is evident from the above the republic possesses great possibilities for chemicalizing agriculture. The task is to utilize these possibilities more fully. This task must be completed quickly, in close interaction with industry and agriculture.

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11004

CSO: 1841/101



UDC 62-784.222:3:677.4

DEVELOPMENT OF WASTE-FREE TECHNOLOGY FOR TREATING VENTILATION AIR OF CHEMICAL  
FIBER PRODUCTION ENTERPRISES FOR HYDROGEN SULFIDE

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 12-14

RYBAKOV, L. A., AFANAS'YEV, Yu. M., SHIMKO, I. G. and CHINENNAYA, S. K.

[Abstract] A waste-free process was developed for treating the ventilation air of chemical fiber enterprises to remove hydrogen sulfide by absorption. The hydrogen sulfide is absorbed in a solution containing hydroquinone. Finely divided elemental sulfur is recovered and used to make acarofungicide for use in the Food Program. Sodium thiosulfate is also recovered. Technical-economic indices of the process are presented. Figures 2; references 3 (Russian). [119-12765]

COAL GASIFICATION

MOSCOW COAL LIQUEFACTION PLANT PREPARES FOR OPERATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Dec 84 p 1

[Article: "Mine Serves as a Laboratory"]

[Text] The first liters of petroleum have been obtained from the Bel'kovskaya mine in Tula Oblast. And it was obtained not from a traditional well but rather from ordinary coal. Here, near Novomoskovsk, an experimental coal liquefaction facility is now being prepared for operation.

The authors of the development are colleagues of the Institute of Fossil Fuels, where this TASS correspondent acquainted himself with the complex's principle of operation. The entire process of obtaining synthetic fuel was modeled in a small laboratory in a quiet Moscow lane.

Chunks of coal are loaded into a hopper after first being pulverized in a ball mill; then it is transformed into a pasty mass. It is from this paste that petroleum is distilled at high pressure.

Institute director A. Krichko opens a valve, and there it flows as a viscous stream into a flask, a dark brown smoking liquid.

"There is still more to the process," Andrey Anatol'yevich explained. "Next we separate the so-called light products from the petroleum by conventional procedures, and the small quantity of fuel oil and wastes that are formed are used for industrial purposes--heating the facility itself."

It will not be long before huge quarry dump trucks and equipment will be able to work on quite economical synthetic fuel. It would be sufficient to point out that technical documents are now being prepared for construction of a liquefied coal complex with a planned capacity of 3 million tons per year.

11004  
CSO: 1841/101

UDC 662.741.3.022:553.94.001.33/477.61/62)

EVALUATION OF COAL RESOURCES IN SOUTH-WESTERN PORTION OF DONBASS

Moscow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 6-9

OCHKUR, N. P., PG [expansion unknown] Association "Donbassgeologiya"

[Abstract] South-western region of Donbass contains about 35% of all coal resources of that basin including coal with a spectrum of properties. The unique industrial-genetic classification of coals (60ST 25543-82) was used to estimate the coal reserves of Donbass. To improve this method even more, to make it more rapid and more easily acceptable, the following measures were recommended: development of additional, more refined codes, review of codes with impractical classification to eliminate them if possible, to redistribute the source codes between the KS and OS brands, to introduce an additional index covering maximum moisture content for the separation of brown and black coal and to keep the separation between T brand coal and anthracite on the basis of 8% yield of volatile compounds rather than currently used 9%. The use of this unique classification will increase the estimates of costs involved in the exploitation of the mines due to new indices and possible requirement for recoding, expenditures for new equipment of geological laboratories, etc. Figure 1; references 3 (Russian).  
[84-7813]

UDC 662.741.3:662.6:543.878.001.52

TEMPERATURE SELECTION FOR ISOTHERMAL GASIFICATION WHILE EVALUATING CHEMICAL ACTIVITY OF COKE

Moscow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 17-19

SKLYAR, M. G., SOLDATENKO, Ye. M., DANG, V. Kh. and KASHIRSKAYA, L. P.,  
Scientific Research Institute of Coal Chemistry

[Abstract] To evaluate chemical activity of coke, various methods are used based on coke gasification with CO<sub>2</sub>, O<sub>2</sub>, steam, etc. The evaluation is usually done at isothermal conditions at some selected temperature used for

all coke types. Selection of this temperature is very crucial especially in evaluating coke with different chemical activity. To assure that the  $C + CO_2 = 2 CO$  reaction occurred in kinetic area, the evaluation of coke should be carried out at various temperatures of isothermal gasification depending on their reactivity. With proper selection of gasification temperature, a thermogravimetric method discussed made it possible to determine coke reactivity even of cokes with coking temperature  $\leq 1000^\circ C$ .

Figure 1; references 2 (Russian).

[84-7813]

UDC 662.764:662.749.312

#### PURIFICATION OF COKE GAS FROM TAR AND NAPHTHALENE AEROSOLS

Moscow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 22-27

VSHIVTSEV, V. G. and NAZAROV, V. G., Eastern Scientific Research Institute of Coal Chemistry

[Abstract] Increased demands placed on the technology of coke-chemical industry necessitate fine purification of coke-gas to remove tar and naphthalene particulates. A review of various methods currently used worldwide in coke gas purification is presented covering electrostatic precipitation, wet filtration, application of ultrasound, the use of Venturi scrubbers, gradual cooling process etc. The most effective approaches to the purification of coke gas use equipment based on air cooling of the gas coupled with Venturi scrubbers. Figures 3; references 25: 20 Russian (4 by Western authors), 5 Western.

[84-7813]

UDC 662.749.33

#### ANALYSIS OF CURRENT STATUS AND DEVELOPMENTAL TENDENCIES IN PROCESSING COAL TAR

Moscow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 27-31

GOGOLEVA, T. Ya. and ZAYCHENKO, V. M., Scientific Research Institute of Coal Chemistry

[Abstract] Products obtained from reprocessing of coal tar are valuable sources for aromatic compounds used in many industries. In the Soviet Union, reprocessing of coal tar is being centralized enlarging the scale of operations and improving the quality of end products, and yet the proportion of the reprocessed coal tar shows a decreasing trend, the volume of unprocessed tar increasing gradually. Some plants reprocess naphthalene containing oils, solvent-naphtha and various residual polymers along with coal tar. Coal

tar reprocessing operations abroad were also analyzed in this publication. It was noted that none of the tar rectification methods make it possible to improve the quality and to enlarge the production of the end products while decreasing the consumption of the energy required for the operations and simplifying the reprocessing methods and decreasing the initial financial outlay. References 9: 6 Russian, 3 Western.

[84-7813]

UDC 662.764.074.371:66.061.3

ACTIVATION OF ARSENIC-SODIUM CARBONATE SOLUTION BY EXTRACTION OF ORGANIC IMPURITIES

Moscow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 35-36

FOMIN, B. M., TIKHONOV, V. S., ANIPKO, S. N. and PUPKOVA, T. P.,  
INUS [expansion unknown]

[Abstract] In absence of a prepurification step in processing industrial gas obtained during gasification of semi-coke, it is advisable to activate the arsenic-sodium carbonate solution. A method for such an activation was developed. The impure solution was mixed with extracting solvent (butyl acetate appeared to be the best solvent for this purpose) and then the layers were separated, the solvent returned to the mixing container for reuse and the purified arsenic-sodium carbonate solution was passed into a regenerator. As needed, fresh extracting solvent has to be added into the system. Figure 1.

[84-7813]

UDC 662.764.002.5

IMPROVEMENTS SUGGESTIONS FOR MAIN TECHNOLOGICAL EQUIPMENT FOR COKE GAS PURIFICATION PROCEDURES

Moŝcow KOKS I KHIMIYA in Russian No 11, Nov 84 pp 41-43

GRABKO, V. V., GIPROKOKS

[Abstract] Principal technological methods for purification of coke gas work on the basis of continuous operation. During purification of coke gas, many tarry substances are deposited in the apparatus. To assure the flow of this process, some units may have to be shut for purification and some sort of a back-up must be provided for them. Another solution may be to purify the gas thoroughly at an early stage of the process. Three solutions for this problem were proposed: creation of larger capacity equipment, development of highly effective equipment and unification of various equipment components. Selection of any one of these systems must consider the

aspect of heating. Steam heating should be avoided if possible; heat obtained by combusting coke gas should be used instead.  
[84-7813]

UDC 677.463:628.784.22+543.272.57

SPONTANEOUS COMBUSTION OF ACTIVATED CHARCOALS DURING RECOVERY OF CARBON DISULFIDE FROM VENTILATION AIR OF VISCOSE PRODUCTION

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 11-12

RYBAKOV, L. A., PUSHKOVA, I. N. and AFANAS'YEV, Yu. M.

[Abstract] Spontaneous combustion capability is an important and often basic characteristic of activated charcoal when used to recover carbon disulfide from ventilation air of viscose production facilities. An investigation of its causes shows that the spontaneous combustion temperature of industrial grades of activated charcoals is a function of the alkali metal content. Overheating is the result of the exothermal oxidation of carbon to carbon monoxide. Incidents of spontaneous combustion of activated charcoals in carbon disulfide recovery from the vent air of viscose production are due to alkaline salt impregnation of the dust catchers, which are over-dried as a rule. Figure 1; references 6 (Russian).  
[119-12765]

UDC 662.74.013.8:662.764.074.39

CYANOHYDROGENATION IN REMOVAL OF HYDROGEN CYANIDE FROM AIR

Moscow KOKS I KHIMIYA in Russian No 12, Dec 84 pp 49-50

SHTEYN, A. L. and DURNOVA, M. S., Kemerovo Coal Chemistry Plant

[Abstract] A successful technique has been developed for the removal of HCN from air with carbonyl agents, without pollution of the air with the reagents themselves. Cyclohexanone or acetone is introduced into an air stream containing HCN, and the resultant mixture is subsequently passed over activated charcoal. With acetone (50 mg/m<sup>3</sup>), the concentration of HCN was reduced from 15.1 to 0.40 mg/m<sup>3</sup>; with cyclohexanone (61 mg/m<sup>3</sup>), a comparative reduction was obtained (15.0 to 0.39 mg/m<sup>3</sup>). Regeneration of activated charcoal was effected by desorption with steam at 105°C. References 4 (Russian).  
[120-12172]

UDC 662.62:541.138.2

ELECTROCHEMICAL BASIS OF SELF-COMBUSTION OF COMBUSTIBLE SOLID COMBUSTIBLE DEPOSITS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 4 Oct 83) pp 45-49

ALEKSANDROV, I. V., Moscow Institute of Chemical Technology  
imeni D. I. Mendeleev

[Abstract] Studies were conducted on the basic redox transformations in the organic and mineral components of solid combustible deposits during self-combustion. The experimental and theoretical data demonstrated that radical-oxidation of such combustible solids in water can be initiated by a redox system, in which the product of cathodal reduction of one of the components reacts with another product with the formation of the initiating radicals. However, such a mechanism presupposes sufficient quantities of oxygen in the region of intensive autooxidation, such as prevails generally on well-aerated surfaces. At depths of 0.5-1.5 m from the surface low redox potentials are the rule within 10-20 h, with cathodal reduction of oxygen becoming quite improbable. Field measurements of redox potentials at depths of 1-3 m have revealed redox potentials of -100 to -200 mV on the hydrogen scale at pH 2-5. The rapid increase in the potentials on cracking the surface by 300-500 mV and the presence of 0.5-1.5% hydrogen gas indicates that under such deaerated conditions autooxidation can be explained by the cathodal reaction of hydrogen depolarization. Figures 3; references 9 (Russian).

[104-12172]

UDC 662.642:541.135.5

ELECTROCHEMICAL PREREQUISITES FOR COAL AUTOOXIDATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 13 Nov 83) pp 50-53

SPITSYNA, N. G., NIKTIN, K. N. and KAMNEVA, A. I., Moscow Institute of  
Chemical Technology imeni D. I. Mendeleev

[Abstract] Various samples of coal obtained from the Moscow Coal Basin were tested for their catalytic potential in hydrogen peroxide decomposition. Results obtained by traditional methods for such studies were compared with determinations of the electrochemical activity of coals during oxygen ionization and hydrogen peroxide decomposition, with the result that the agreement between the two approaches was acceptable. The different samples of brown coal exhibited quite different catalytic potentials, with the greatest activity shown by coal mined from Shchekinskaya-21 mine, followed by coal samples from the Plekhanovskaya 78-bis, Plekhanovskaya 74-bis, Borodinskaya and the Kimovskiy mines. These findings illustrate the fact that electrochemical methods can be employed for determining the potential of coals to undergo autooxidation. Figures 2; references 6 (Russian).

[104-12172]

UDC 620.181.4

THERMAL AND OXIDATIVE STABILITY OF NATIVE AND HEAT-TREATED ANTHRACITES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 10 Aug 83) pp 59-63

GREBENSHCHIKOVA, G. V., IVANOV, V. P., KOVALEVSKIY, N. N.,  
ROGAYLIN, M. I. and SKRIPCHENKO, G. B., Institute of Combustible Mineral  
Deposits

[Abstract] Comparative studies were conducted on thermal destruction and oxidative stability of Gorlov and Donetsk anthracites, which are similar in the degree of metamorphism but quite different in petrographic composition. The derivatographic studies were performed at 20-2700 °C, 10 °C/min heating, under an inert gas and in air. As the firing temperature increases in the 1000-2000 °C interval, the rate of anthracite oxidation decreases and the quantity of solid residue increases. Subsequently, the rate of oxidation shows a moderate increase. The Gorlov anthracite possesses high thermal stability, and shows considerable resistance to oxidation at 1500-1800 °C, which renders it suitable for electrode production. In the case of both anthracites, heat treatment increased the oxidative stability when firing was conducted at 1100-1300 °C. A further increase in the temperature shifted the temperature of intensive oxidation to higher temperature ranges, and diminished the extent of the exothermic effect and maximum rate of mass loss. Figures 4; references 8 (Russian).  
[104-12172]

UDC 662.73:543.062

TRACE ELEMENTS AS PROBLEM IN COAL COMBUSTION, GASIFICATION AND HYDROGENATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 30 Apr 84) pp 126-131

YEGOROV, A. P., Institute of Combustible Mineral Deposits

[Abstract] A summary is presented of the problem that trace elements in coal involve in large-scale coal utilization as a fuel, and in gasification and hydrogenation on industrial scales. The analysis of the problem is conducted from the viewpoint of environmental hazard and human toxicity. Use of coal in various industrial processes may result in environmental pollution with Be, B, Ph and other elements and compounds in levels that exceed their soil concentrations. In general, the hazard of atmospheric pollution is less of a risk with gasification and hydrogenation than in combustion. Comparison of coal samples from Donetsk, Kuznetsk, Ekibastuzskiy and Kans-Arachinsk basins showed the latter samples to be least objectionable in ecological terms. In terms of catalytic activity of the elements during coal



gasification, the ranking was determined to follow the ensuing sequence: Mn>Ba>>B,Pb,Be>>Y>Co>Ga>Cr>V>Cu. The corresponding order applicable to hydrogenation is : Ni>Co>Cu>Y>>B,Pb,Cr>>V>Ba>Mn>Ga. On the basis of such data, coals can be evaluated for their suitability for hydrogenation. Figure 1; references 17: 1 Slovak, 13 Russian, 3 Western.  
[104-12172]

UDC 662.67

#### INTERRELATIONSHIP OF ORGANIC AND MINERAL COMPONENTS OF BELORUSSIAN SHALE

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 84  
(manuscript received 1 Dec 83) pp 132-136

GOR'KIY, Yu. I., LUK'YANOVA, Z. K., YURKEVICH, Ye. A., ZEN'KOV, V. S. and STRIGUTSKIY, V. P., Peat Institute, Belorussian SSR Academy of Sciences

[Abstract] Thermal analysis and Ir and ESR spectroscopies were employed in an analysis of the interrelationship between the organic and mineral components of combustible shale samples derived from the Turov deposits in the Belorussian SSR. In general, the samples showed three broad stages of thermal decomposition: 100-110 to 250 °C, 250 to 500-550 °C, and 500-550 to 980 °C. The organic matter was found to be firmly bound to the clayey mineral components via a variety of bonding mechanisms, with a predominant position held by oxygen-containing functional groups. Such factors have to be considered in enrichment and thermal processes. Figures 2; references 9 (Russian).  
[104-12172]

UDC 662.74:662.67

#### THERMAL DESTRUCTION OF ORGANIC MATTER IN FUEL SHALES DURING RAPID HEATING

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian No 5, Sep-Oct 84 (manuscript received 3 Apr 84) pp 93-97

LISHTVAN, I. I., ZEN'KOV, V. S. and GOR'KIY, Yu. I., Institute of Peat, Belorussian SSR Academy of Sciences

[Abstract] A study is presented of the influence of the initial organic matter composition on the process of high speed pyrolysis of fuel shales. The temperature potentials selected for study were temperatures corresponding to characteristic points on the DTA curve of fuel shales in the 150-550°C interval. The fuel shales studied contained 18.2% organic matter, 3.7% carbonates, heat of combustion 5360 kJ/kg. In the temperature interval studied the organic matter, concentrated in the 0.2 and 0.1 mm fractions,

experiences deep intramolecular transformations accompanied by a greater yield of resin and gas than in the smaller fraction. A change in temperature potential in the semicoking temperature interval changes the yield of pyrolysis products for large fractions only slightly in comparison to the -0.063 mm fraction, in which the yield of resin increases by almost 100%. Figures 3; references 4 (Russian).  
[66-6508]

COMBUSTION

UDC 541.126

MECHANISM OF COMBUSTION AND THERMAL DESTRUCTION OF BAGASSE

Kiev KHMICHESKAYA TEKHOLOGIYA in Russian No 6, Nov-Dec 84  
(manuscript received 18 May 84) pp 32-35

SHEMET, V. Zh., ROKE-DIAS, P., LAVRENKO, V. A. and KHRISTICH, V. A., Kiev  
Polytechnic Institute

[Abstract] Bagasse, the remains of sugar cane after the sugar has been extracted, is widely used in tropical countries as a fuel. In Cuba alone, it provides over one third of the energy needs. It can also be used as a source for cellulose, paper and artificial wood panels. For these reasons the efficiency of combustion and drying of bagasse is of great economic significance to these countries. The present work was undertaken to obtain data on the mechanism of combustion of Cuban bagasse both in an oxidizing (air) medium and in an inert (helium) medium. Kinetic parameters were obtained for six temperature intervals (20°-380° in helium, 20°-380° in air) in each mode. Analysis of the oxidation and combustion dynamics of the bagasse particles shows that the basic long-term stages are predetermined by diffusion processes even at the lower temperatures. Oxygen facilitates intensive disruption of the peripheral parts of the macromolecules which then determines the yield of volatile matter without oxidation. Figures 3; references 4: 2 Russian, 2 Western.  
[113-12765]

UDC 614.841.41

EXTINGUISHING PROPYLENE OXIDE

Kiev KHMICHESKAYA TEKHOLOGIYA in Russian No 6, Nov-Dec 84 pp 55-57

DENISENKO, I. S., VOLOSHANENKO, A. I., PODGAYNYY, V. P., GUBKA, P. I.,  
MALKOVA, I. V. and KOKTA, O. D.

[Abstract] Propylene oxide has a flash point of 37°C and a very rapid flame propagation rate owing to its high vapor pressure. The currently recommended

fire extinguishing agents, carbon dioxide and atomized water (GOST 23001-78) are not very effective. Thus, 11 volumes of  $\text{CO}_2$  are required for one volume of propylene oxide, necessitating a high inventory of storage bottles. Tests using water spray revealed a tendency of the burning material to "scatter about", while compact water and air-mechanized foam do not extinguish propylene oxide. Research shows that the most effective fire extinguishing agents are powdered "PSB-3" and "Pirant-A". Field tests (polygon) show that the maximum propylene oxide fire extinguishing capability of "Pirant-A" is  $0.351 \text{ m}^2/\text{kg}$ , corresponding to  $2.85 \text{ kg/m}^2/\text{sec}$ . feed rate. The extinguishing time at this rate was 2.5-5 sec. References 6 (Russian).  
[113-12765]

UDC: 536.46:662.613

STUDY OF CHEMOIONIZATION PHENOMENA IN HYDROCARBON FLAMES AND INFLUENCE ON BURNING OF EXTERNAL ELECTRIC FIELDS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 12 Jul 83) pp 1249-1252

FIALKOV, B. S., SHCHERBAKOV, N. D., BOTOVA, V. I., FIALKOV, A. B. and MURAYLEV, V. K., Chemical-Metallurgical Institute, Kazakh SSR Academy of Sciences, Karaganda

[Abstract] The purpose of this study was to determine the nature and significance of charged particles in the process of burning. Laminar propane-butane plus air flames were studied at pressures from atmospheric to 30 mmHg with variation in oxidizer content from 0 to stoichiometric and with the introduction of various inhibitors. During the course of the study the complex structure of the electric field of the flame was determined, with localization of areas of positive and negative potential on both sides of the flame front. The value of the potential and its gradient increase with increasing complexity of the fuel molecule and depend on the composition of the mixture. The location of the maximum potential and maximum concentration of charged particles is displaced relative to the maximum temperature into the preparation zone. Electric field parameters vary greatly with pressure. The area of positive flame potential increases with decreasing pressure. The ions identified are divided into two groups: those in the preparation zone where the potential is positive, primarily hydrocarbons, and those outside the combustion front in the area of negative potential, oxygen-containing ions. There are two maxima in the distribution of atomic hydrogen, near the outer boundary of the flame front. The  $\text{HO}_2$  radical has three maxima in the external areas of the flame. Introduction of  $\text{C}_2\text{F}_4\text{Br}_2$  and  $\text{NH}_3$  inhibitors leads to significant changes in potential, concentration of charged particles, individual ions and radicals. An external electric field is most effective in acting on the combustion process when it agrees with the natural field of the flame. The experiments indicate active participation of charged particles in the mechanism of the combustion process. Figures 3; references 8 (Russian).  
[78-6508]

ELECTROCHEMISTRY

UDC 541.64:537.311:532.77

STABILIZATION AND CONTROL OF RHEOLOGIC CHARACTERISTICS OF CONDUCTIVE  
POLYVINYL ALCOHOL SOLUTIONS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 11, Nov 84  
(manuscript received 16 Mar 83) pp 2259-2264

KIREYEVA, N. K., SEMCHIKOV, Yu. D. and YEMEL'YANOV, D. N., Scientific  
Research Institute of Chemistry, Gorkiy State University imeni N. I. Lobachevskiy

[Abstract] Aging of polyvinyl alcohol (PVA) solutions was evaluated in terms of viscosity, elasticity and electrical conductivity, employing PVA-H<sub>2</sub>O-NaCl solutions with the PVA component ranging from 5 to 15%. The results showed that in distinction to electric properties, the salt-water solutions of PVA can undergo significant changes in viscosity and elasticity on prolonged aging. Structure formation in the PVA-H<sub>2</sub>O-NaCl systems can be controlled by the addition of isopropyl alcohol or isobutyric acid, with best results obtained with the 12% PVA systems and 15% isobutyric acid or 10% isopropyl alcohol. In general, in terms of rheologic properties the thermodynamic instability of the PVA-H<sub>2</sub>O-NaCl systems can be analyzed in terms of the critical concentration ( $c_{cr}$ ) of the polymer, and the critical equilibrium concentration ( $c_{ecr}$ ). In situations with  $c_{cr} > c > c_{ecr}$  the system is metastable and may exist without noticeable changes in the rheologic properties. Solutions with  $c > c_{cr}$  are unstable and undergo structure formation until a gel is formed. Figures 7; references 21: 18 Russian, 3 Western.  
[94-12172]

UDC 541.135.4:541.14

ELECTROCHROMIC EFFECT IN AMORPHOUS WO<sub>3-x</sub> FILMS

Moscow ELECTROKHIMIYA in Russian Vol 20, No 11, Nov 84  
(manuscript received 5 Apr 83) pp 1470-1475

KRASNOV, Yu. S., PATSYUK, F. N., SANDROVSKIY, A. K. and VAS'KO, A. T.,  
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[Abstract] Detailed studies were conducted on the electrochromic effect of thin, amorphous WO<sub>3-x</sub> films supported on SnO<sub>2</sub> to further define the usefulness

of this system as an indicator in electrochromic displays. Studies on the reversible change in color were conducted in 1 N  $H_2SO_4$  at 0.5 to -0.5 V potential, using 0.01-1  $\mu m$  films. Changes in the optical density of the film during cathodal reduction revealed a broad band with a maximum at 1000 nm, with a second maximum at 600 nm. A diminution in the optical density was also evident at wavelengths below 400 nm (due to absorption of the colorless  $WO_{3-x}$ ). Changes in the optical density of the film in the region of maximum absorption are proportional to the area under the volt-ampere plot (or excess electrons) within the corresponding reducing wave. Formation of the colored centers with a maximum absorption at 1000 nm is accompanied by a gradual shift into the UV region, which is characteristic of amorphous  $WO_{3-x}$ . Combined analysis of the electrochemical and optical data demonstrates that individual reduction waves correspond to the formation of colored sites with different optical characteristics, and that the process follows the well-defined redox equation expressed as  $WO_{3-x}$  (colorless) +  $ye^- + yH^+ = H_yWO_{3-x}$  (blue). Figures 4; references 11: 7 Russian, 4 Western.  
[86-12172]

UDC 541.135.5:541.14

ELECTROCHEMICAL CHARACTERISTICS OF ANODAL BISMUTH OXIDE FILMS: SPECTRAL FEATURES OF PHOTOCURRENTS

Moscow ELECTROKIMIYA in Russian Vol 20, No 11, Nov 84  
(manuscript received 24 Jun 83) pp 1531-1534

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[Abstract] The relationship between spectral characteristics and photocurrents was studied on anodal  $Bi_2O_3$  films under fixed-voltage conditions in 0.5 N  $K_2SO_4$ . Studies on the spectra of photocurrents in  $Bi_2O_3$  electrodes at a potential of +1 V, either at 200°C in argon or unheated, demonstrated that, at the more anodal potentials, the spectral features are unaffected, but the absolute value of the xenon lamp-induced photocurrents increases. At electrode potentials below +1 V the general spectral pattern is likewise retained, but the absolute value of the photocurrents diminishes. Heating results in a sharp drop in photocurrents with time on illumination, and a cathodal switch after extinction of light. At a wavelength of 350 nm such changes in the photocurrent occur at potentials more cathodal than +0.8 V, while at 270 nm they become evident at +0.4 V. Such changes are less pronounced with unheated bismuth oxide films on illumination and extinction; furthermore, at potentials below 0 V, cathodal photocurrents are generated. The data were interpreted to indicate that the spectral features and absolute value of photocurrents are dependent on the thickness of the oxide film and its thermal status. Figures 3; references 9: 3 Russian, 6 Western.  
[86-12172]

UDC: 541.128.024

CHANGE IN ELECTROPHYSICAL CHARACTERISTICS OF HYDRATED TITANIUM DIOXIDE UPON HEATING

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 10, Oct 84  
(manuscript received 21 Jul 83) pp 1060-1062

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[Abstract] Some electrophysical and physical-chemical characteristics of dispersed hydrated titanium dioxide (HTD) in various stages of heat treatment were compared. DC conductivity, dielectric permeability and dielectric losses were determined and EPR spectra measured in the 3 cm band at room temperature. A number of typical changes in dielectric characteristics were observed in the process of formation of the crystalline phase. Dielectric permeability changed in a complex manner upon heating, with maximum values of permeability and dielectric losses at 673 K, conductivity at 623 K. The EPR spectrum also changed, indicating significant distortions in the octahedral lattice of anatase caused by removal of coordination-bonded water molecules and subsequent crystalline structure growth. The processes resulted from this crystalline phase growth, transition of anatase to rutile and the complex chemical composition of the specimen, particularly the sulfogroups included in the solid particles of the specimen. Figures 3; references 6 (Russian). [67-6508]

UDC: 543.257.1

ION-SELECTIVE PROPERTIES OF MEMBRANES PREPARED FROM ALKALI METAL PICRATES

Kiev UKRAINASKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 10, Oct 84  
(manuscript received 23 Mar 83) pp 1088-1091

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Kiev State University imeni T. G. Shevchenko

[Abstract] The purpose of this work was to create a solid phase electrode based on alkali metal picrates and study its physical-chemical properties. An ion-active membrane electrode developed based on potassium picrate had the required anion selectivity and would be used as an indicator for direct picrate ion potentiometry in the presence of other nitrophenols, their salts and a number of inorganic anions. Figure 1; references 5: 3 Russian, 2 Western. [67-6508]

UDC 543.257.1.62-492.2

POTENTIOMETRIC TITRATION OF NATURAL DIAMOND MICROPOWDER

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 46, No 6, Nov-Dec 84  
(manuscript received 30 Jun 83) pp 1129-1135

KUCHUK, V. I., GOLIKOVA, Ye. V. and CHERNOBEREZHSKIY, Yu. M., Leningrad University

[Abstract] When a diamond crystal is split, various covalent unsaturated bonds are formed on its surface. Their number differs from one crystallographic plane to another. During oxidation, various oxygenated groups form on the surface of such a diamond: carboxyl, carbonyl, hydroxyl and ether groups. In this work ionization constants of the surface acid groups and surface complex formation were determined by potentiometric titration of natural diamond micropowder in LiCl, LCl, CsCl, KNO<sub>3</sub> and BaCl<sub>2</sub> solutions under nitrogen atmosphere. It was established that the surface of natural diamond possesses considerable acidic properties ( $pK_a^{int}$  about 2.5) and a distinct ability to bind and form complexes with the cations of alkaline and alkaline-earth metals ( $p^*K_{Me}^{int}$  from -0.6 to 0.9). Figures 2; references 10: 3 Russian, 7 Western.  
[110-7813]

UDC 541.128:542.71:546.11

CATALYTIC GENERATION OF OXYGEN FROM ACID (VII) (aq) SOLUTIONS BY THIOCAPSA ROSEOPERSICINA HYDROGENASES AND METHYL VIIOLOGEN

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11, Nov 84 (manuscript received 16 Aug 83) pp 2454-2456

SAVINOVA, Ye. R., ZORIN, N. A., GOGOTOV, I. N. and PARMON, V. N., Institute of Catalysis, Siberian Department, USSR Academy of Sciences (AS), Novosibirsk; Institute of Soil Science and Photosynthesis, USSR AS, Pushchino

[Abstract]  $V^{2+}(aq)$  was assessed for its suitability as an electron donor for Thiocapsa roseopersicina hydrogenase in a system using methyl viologen as an intermediate electron carrier. Evaluation of the hydrogen evolution kinetics showed that the hydrogenase preparation accepted electrons from the inorganic reducing agent ( $V^{2+}(aq)$ ) via methyl viologen at 303°K, pH 4.5. The study also demonstrated that T. roseopersicina hydrogenase preparations retained full activity for more than 0.5 h at pH 4.1 in biphthalate buffer. This communication represents the first reported use of an inorganic reducing agent as an electron donor for a bacterial hydrogenase. Figures 2; references 2 (Russian).  
[108-12172]



UDC 541.8

CONDUCTIVITY OF NaCl SOLUTIONS IN WATER-GLYCOL SOLVENTS IN RELATION TO  
TEMPERATURE

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 58, No 11, Nov 84  
(manuscript received 1 Feb 83) pp 2757-2761

SAFONOVA, L. P., YEGOROVA, I. V., KATKOV, V. F. and KRESTOV, G. A.,  
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[Abstract] Conductometric studies were conducted on NaCl in water-glycol solutions in the temperature range of 288-328°C as a means of assessing ionic mobility in such a systems. Maximum equivalent conductivity was found to decrease as the mole fraction of the glycols increased and the temperature decreased in the following sequence: >1,3-propylene glycol>1,4-butylene glycol, i.e., with an increase in viscosity of the solutions. Determinations of the NaCl association constants in the different water-glycol mixtures showed that the constant increased with temperature and the mole fraction of the glycol. The Gibb's free energy values were negative, and the positive enthalpy values of association indicated that formation of free ion pairs was largely due to ion desolvation. Figures 4; references 10: 1 Russian, 9 Western.  
[106-12172]

FERTILIZERS

UDC: 631.82

PORE STRUCTURE AND PERMEABILITY OF PHOSPHATE COATINGS ON CARBAMIDE GRANULES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 28 Feb 84) pp 2342-2344

KRAVETS, G. V., PRAVDIN, N. N. and POZIN, M. Ye.

[Abstract] The total porosity and air porosity of capsules were measured to establish the interrelationship of pore structure of difficulty-soluble phosphate envelopes containing 0 to 33.7%  $P_2O_{5aq}$  to the effectiveness of their prolonging action. The coating consisted on a number of products of decomposition of phosphorite by phosphoric acid and double superphosphate, and were applied to industrial granules of carbamide 2 to 3 mm in diameter. The structural characteristics of the coatings were compared to the time of dissolution of the encapsulated carbamide. It was found that the prolonging effect resulting from the formation of a difficulty-soluble capsule on carbamide granules depends linearly on the total porosity of the phosphate envelope which is determined by the dispersion of the encapsulating material and its content of water-soluble phosphates. Dissolution time can be increased by a factor of 8 or 9 by a content of  $P_2O_{5aq}$  in the encapsulating material of 5 to 13 weight%. Specific porosity and air permeability factor of the coatings are 0.5-0.17  $cm^3/g$  and 0.09-0.015 $\cdot 10^{-3}$  benzene units, respectively. Figure 1; references 5 (Russian).  
[75-6508]

UDC 661.635.223.002.237

PRODUCTION OF FEED-GRADE DIAMMONIUM PHOSPHATE FROM WET PROCESS PHOSPHORIC ACID

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 662-663

KUPRIYANOV, Yu. N., ROZVADOVSKIY, Sh. M., KROTKOV, V. V., SMIRNOV, I. P.,  
KHIMCHENKO, V. N., MIMONOV, A. V. and ZHIGARNOVSKIY, B. M.

[Abstract] The USSR Food Program foresees supplying agriculture with the necessary quantity of phosphorus-containing animal feed supplements, including

ammonium phosphates. Production of the latter is based on using yellow phosphorus which makes it costly. A process was developed for producing feed-grade diammonium phosphate from wet process phosphoric acid obtained from apatite ore flotation. According to GOST 19651-74, fluorine is the basic limiting contaminant in animal feed. In the first stage of the process, calcium, iron, aluminum, heavy metals and rare-earth elements are precipitated and 50-60% of the fluorine is removed. The remaining fluorine, sulfates and chlorides are removed in the second stage by crystallization of triammonium phosphate, which is less soluble than the diammonium phosphate. Phosphoric acid containing 20-30%  $P_2O_5$  and 1.2-2.0% fluorine is treated with ammonia in three stages. Tests show that costs for raw material, ancillary materials and energy are 25% less than those of using the yellow phosphorus process.

Figure 1.

[114-12765]

FREE RADICALS

UDC: 541.128

FORMATION OF RADICALS BY REACTION OF  $\alpha$ -PHENYLETHYLHYDROPEROXIDE WITH AMINE SALTS AND HALOGEN HYDROGEN ACIDS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 4, Sep-Oct 84  
(manuscript received 15 Jul 83) pp 1059-1063

SMULOVICH, V. G., YURCHENKO, N. I., GOL'DENBERG, V. I., DENISOV, Ye. T. and PIRUZYAN, L. A., Scientific Research Institute for Biological Testing of Chemical Compounds, Kupavna

[Abstract] A study was made of the reaction of hydroperoxides with aliphatic amine salts and halogen-hydrogen acids at moderate temperatures, 50-70°C. Halogen-hydrogen amine salts greatly accelerate decomposition of hydroperoxides into radicals. The initiation rate in the presence of amine salts is proportional to hydroperoxide concentration and increases nonlinearly with salt concentration. A mechanism is suggested for decomposition of the complexes into radicals:  $ROOH \dots X^- NR'_3 H^+ \rightarrow RO' + HO^- + X' + HNR'^+$ . The decomposition of ROOH is catalytic. Figures 3; references 7: 6 Russian, 1 Western.  
[78-6508]

UDC: 532.783:541.127.515

KINETICS OF REACTION OF NITROXYL RADICALS WITH DIPHENYL CARBAZONE IN LIQUID CRYSTAL SOLVENT IN THE PRESENCE OF OXYGEN

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 29 Jun 83) pp 1053-1058

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[Abstract] EPR was used to study the kinetics of the interaction of 2,2,6,6-tetramethyl-4-piperidol-1-oxyl (TEMPOL) and 2,2,6,6-tetramethyl-4-piperidone-1-oxyl (TEMPO) with diphenyl carbazone (DPC) in a neumatic liquid crystal (NLC) solvent, p-methoxybenzylidene-p'-butylaniline (MBBA). It is shown that, in contrast to the reaction of TEMPOL with other hydrazo-compounds,

upon interaction of nitroxyl radicals with DPC the reverse reaction, oxidation of the hydroxylamine formed by the oxygen of the air to the initial radical, is significant. An automated system based on a minicomputer allowed accumulation and primary processing of data from the EPR spectrometer. Subsequent analysis of experimental results was performed on a YeS-1022 computer. Figure 1; references 11: 6 Russian, 5 Western.  
[78-6508]

UDC 541.14:541.515

#### PHOTOIONIZATION OF ORGANIC RADICALS AND ANION RADICALS AT 77°K

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 1 Feb 84) pp 532-534

MEL'NIKOV, M. Ya., SEROPEGINA, Ye. N. and FOK, N. V., Moscow State University imeni M. V. Lomonosov

[Abstract] Measurements were made of the quantum yields of radicals at 77°K in solid phase with H<sub>2</sub>O<sub>2</sub>-initiated photolysis, and the photoionization of radicals, anion radicals and ionic products of gamma-radiolysis of isopropyl alcohol, di-isopropyl ether, ethyl alcohol, polyacrylic acid, polyacrylamide and propylene carbonate. The experimental data demonstrated that in the case of some free radicals (aliphatic alcohols, ethers) photoionization is possible, but that the efficiency of photoionization is less efficient than photodissociation by two or more orders of magnitude. The low quantum yield of free radical photoionization in solid phase, and the dependence of the yield on photon energy, are probably due to hindered charge separation in the solid phase. However, photoionization of acid and amide ion radicals proceeds with greater efficiency. Figure 1; references 13: 7 Russian, 6 Western.  
[95-12172]

UDC: 541.515+542.942.6

#### STABLE CATION RADICALS--ACTIVATORS AND CATALYSTS OF OXIDATION OF SO<sub>2</sub> UNDER MILD CONDITIONS

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 5, Sep-Oct 84  
(manuscript received 27 Jun 83) pp 1074-1079

TITOV, V. Ye., KOSHECHKO, V. G. and POKHODENKO, V. D., Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A study is made of the possibility of activating SO<sub>2</sub> molecules by stable cation radicals. Cation radicals were obtained by mono-electron oxidation of amines. The interaction of four cation radicals with SO<sub>2</sub> was studied in aqueous acetonitrile solutions. Three of the radicals, when

interacted with  $\text{SO}_2$ , are reduced to electroneutral molecules while the  $\text{SO}_2$  is oxidized to the sulfate anion. The rate of the process increases significantly with an increase in electron acceptor capacity of the radical and an increase in  $\text{H}_2\text{O}$  content in the  $\text{CH}_3\text{CN}$ . The cation radicals can act as homogeneous catalysts, carrying electrons in the process of oxidation of  $\text{SO}_2$  to  $\text{SO}_4^{2-}$  by molecular oxygen in acid media. Figures 2; references 17: 11 Russian, 6 Western.  
[78-6508]

INORGANIC COMPOUNDS

UDC: 546.19:546.171.1'161

STUDY OF CHEMICAL FORMS AND BEHAVIOR OF ARSENIC IMPURITIES IN PROCESS OF  
EVAPORATION OF AMMONIUM FLUORIDE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 15 Mar 83) pp 2186-2189

NAUMOVA, T. N., YEFIMOV, V. M., POPONOVA, R. V. and STROGANOVA, L. A.

[Abstract] The study is made of the chemical forms of arsenic present as impurity in ammonium fluoride as well as the behavior of the arsenic impurity upon evaporation of the ammonium fluoride. As(III) and As(V) were introduced to hydrofluoric acid before synthesis of ammonium fluoride as arsenic trioxide and sodium arsenate. The ammonium fluoride produced was studied to determine the content of arsenic and used for comparative description of arsenic in ammonium fluoride produced in the gas phase from technical hydrofluoric acid, as well as the same acid after treatment with potassium permanganate or ozone. The state of the arsenic impurity in ammonium fluoride was also studied after addition of sodium arsenate with or without silicon dioxide to the solution before crystallization. The data produced indicate that in specimens of technical hydrofluoric acid produced with oxidation by potassium permanganate and ozone the state of the arsenic impurity is a derivative of the fluoridated and oxide forms. The volatility of the arsenic is minimal in specimens of ammonium fluoride with sodium arsenate impurity in the presence of hydrated silicon dioxide, and also in specimens with arsenic trioxide after oxidation by ozone. The volatility of arsenic in the case of sodium arsenate impurity increases upon transition from the individual compound to a medium of hydrofluoric acid and an ammonium fluoride solution - its state in the vapor is apparently related to the fluoridated and oxoforms. References 3 (Western), [75-6508]

UDC: 539.23

BASIC PROCESSES OF FORMATION AND CHARACTERISTICS OF PORE STRUCTURE OF  
CONDENSED FILMS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 4 May 83) pp 2189-2192

ORLOV, Yu. F.

[Abstract] A study was performed of the pore structure of crystalline PbO, PbTe, KCl and amorphous Sb<sub>2</sub>S<sub>3</sub>, As<sub>2</sub>Se<sub>3</sub> and AsSbS<sub>3</sub> films formed in transition and viscous modes of vapor movement. It was found that, in transition modes, formation of films occurs with condensation of the vapor on the substrate, while in viscous modes the vapor condenses on the substrate or in the gas medium, depending on the substrate temperature. The variation of dispersion and the porosity of condensed films as a function of conditions of their production in the transition and viscous modes of movement is, in principle, identical for substrates with different types of condensation, both vapor to liquid or amorphous and vapor to crystal. References 13 (Russian).  
[75-6508]

UDC:

COMPOSITION OF CONDENSATE FORMED UPON EVAPORATION IN VACUO OF VISCOUS  
SELENIUM-BASED MELTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 5 Oct 83) pp 2192-2195

ORLOV, Yu. F., KURCHEVSKAYA, Ye. O. and KARPOVA, L. N.

[Abstract] Results are presented from studies of the distribution of components in films obtained upon evaporation of viscous melts of selenium with the addition of arsenic and phosphorus, which is important due to the use of such films as photoconductor elements. The measure, describing the composition of the films, was the molar ratio of selenium concentration to phosphorus or arsenic selenide concentrations. It is established that the distribution of the component in the films is significantly influenced by melt viscosity. With melt viscosity 10 Pa·s or higher the composition of the condensed films changes little upon evaporation and is similar to the composition of the initial melt in spite of the difference in volatility of melt components. This is due to hindered conduction movement of the melt in the evaporator, Figures 3; references 12 (Russian).  
[75-6508]



UDC: 621.793.3

IMPROVEMENT OF SOLDERABILITY OF CHEMICALLY PRECIPITATED NICKEL-PHOSPHORUS COATINGS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 25 Feb 83) pp 2369-2370.

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[Abstract] A study is presented of the possibility of precipitating solderable chemical nickel coatings preserving the property of solderability after storage and heat treatment. Coatings were precipitated onto steel specimens from a solution containing (g/l):  $20\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $25\text{NaH}_2\text{PO}_2 \cdot \text{H}_2\text{O}$ ,  $10\text{CH}_3\text{COONa}$ ,  $7\text{CH}_3\text{COOH}$ , 0,003 thiourea,  $\text{pH}=4.0-4.2$ , temperature  $90^\circ\text{C}$ , precipitation time 1 hour. Solderability of nickel-phosphorus coatings containing 7 weight % phosphorus was low. As the content of phosphorus increased, microroughness of the surface decreased, the capillary forces acting on it decreased, resulting in further deterioration in solderability. The contact wetting angle of the solder with a coating containing 6.7% phosphorus was less than  $10^\circ$ , 11% phosphorus--approximately  $90^\circ$ . Heat treatment at  $300^\circ\text{C}$  for 2 hours resulted in complete loss of solderability even for coatings containing 4.5% phosphorus. Introduction of salts of such metals as lead, tin and cadmium to the chemical nickeling solution facilitates the precipitation of the more stable, phosphorus-poor chemical nickel coatings with significantly better solderability. Coatings containing cadmium retain solderability after heat treatment, regardless of heat treatment time. The solderability of heat-treated coatings decreases with the passage of time. A hypophosphite solution containing  $(1-4) \cdot 10^{-5}$  mol/l  $\text{Cd}^{2+}$  is recommended. Figures 2; references 6 (Russian).  
[75-6508]

UDC 548.32:549.617

SYNTHESIS OF NEW CALCIUM AND GADOLINIUM DOUBLE GALLATE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 27, No 10, Oct 84 (manuscript received 31 Jan 83).  
pp 1135-1137

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[Abstract] Synthesis of a double gallate of calcium and gadolinium-- $\text{CaGdGa}_3\text{O}_7$   
(I) with  $\text{CaO}$  content of 10.82,  $\text{Gd}_2\text{O}_3$ : 34.95 and  $\text{Ga}_2\text{O}_3$ : 54.23% was carried out  
under conditions identical to those used in preparation of double gallates  
of lanthanum and neodymium except that the temperature was somewhat lower

(1573 K). On the basis of x-ray analysis and thermal treatment at 1573 K it was concluded that I is monophasic. On the basis of x-ray structure analysis and IR spectra it was shown that I has identical structure to  $\text{Ca}_2\text{Al}_2\text{SiO}_7$  gellenite. Figure 1; references 7: 6 Russian (1 by a Western author), 1 Western.  
[93-7813]

UDC 666.798.2

#### STRENGTH OF BAKED COMPOSITION MATERIALS NbC-NbB<sub>2</sub>

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 27, No 10, Oct 84 (manuscript received 13 May 83) pp 1201-1203

ORDAN'YAN, S. S., STEPANENKO, Ye. K. and SOKOLOV, I. V., Department of Chemistry and Technology of Fine Technical Ceramics, Leningrad Technologic Institute imeni Lensovet

[Abstract] Mechanical bending strength of baked compositions NbC-NbB<sub>2</sub> was studied as a function of concentration and temperature. The experimental samples were prepared by methods of ceramic technology. Due to their structural characteristics, e.g., low porosity and fine granularity, the compositions with 30-50% of niobium diboride exhibited high strength characteristics in the 300-2000 K range. The fine granular structure of these materials is responsible for the "structural plasticity" effect particular to the "rough conglomerate" eutectic models. The samples containing 40-50% of NbB<sub>2</sub> are the most "plastic" ones in the entire temperature range. Figures 2; references 4 (Russian).  
[93-7813]

UDC: 546.791.4

#### SELENOCYANATE COMPOUNDS OF U(IV)

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 10, Oct 84 (manuscript received 16 Feb 83) pp 1011-1014

SKOPENKO, V. V., ZUB, Yu. L., YANKOVICH, V. N., SHCHELOKOV, R. N., ROTOV, A. V. and BOLOTOVA, G. T., Kiev State University imeni T. G. Shevchenko; Institute of General and Inorganic Chemistry, USSR Academy of Sciences, Moscow

[Abstract] An attempt was made to synthesize selenocyanate compounds of U(IV) containing phosphinoxides:  $\text{OP}(\text{C}_6\text{H}_5)_3\text{-TPPO}$ ,  $\text{OP}(\text{n-C}_4\text{H}_9)_3\text{-TBPO}$ ,

OP[N(CN)<sub>2</sub>]<sub>3</sub>-TDMPO. Initial substances used were Cs<sub>2</sub>UCl<sub>6</sub> and KSeCN, obtained by melting selenium with potassium cyanide. The magnetic properties of the uranium compounds synthesized were studied. Magnetic susceptibility varied significantly with temperature. Compounds produced were U(NCSe)<sub>4</sub>(TDMPO)<sub>4</sub> and U(NCSe)<sub>4</sub>(TBPO)<sub>4</sub>. The compound U(NCSe)<sub>4</sub>·4TPPO could be produced similarly--by mixing, then allowing the mixture to stand--with a purity of about 90%. References 14: 8 Russian, 6 Western.  
[67-6508]

ION EXCHANGE PHENOMENA

UDC: 541.6:543.227:678.54

THERMAL PROPERTIES OF POLYPROPYLENE FIBERS WITH GRAFT POLYSTYRENE AND STRONGLY BASIC ANIONITES BASED ON THEM

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 17 Jan 83) pp 2306-2310

SHUNKEVICH, A. A., PROKOPCHUK, N. R. and POPOVA, O. P., Institute of Physical-Organic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] A study is presented of the thermal properties of strongly basic fibers produced from polypropylene (PP) with graft polystyrene (PS), as well as PP-gr-PS graft fibers. The thermal properties were studied using air dry Cl-form anionites. Thermal properties were studied on a derivatograph type OD-103 in air or argon with linear temperature rise rate 5°C/min. Activation energy of destruction was calculated and the content of highly basic and slightly basic groups determined in a sample heated to 160, 200 and 240°. Two processes were found to occur upon heating: desorption of water at 40 to 150°C and decomposition of functional groups by deamination and degradation at 170-250°C. PP retains its crystalline structure in the graft and ion exchange fibers studied. However, PP crystals interact with graft PS in the graft fibers, changing the melting point of the matrix. The introduction of benzyltrimethylammonium groups to the graft PS greatly decreases thermal stability of the PP matrix, indicating thermal oxidative destruction of PP macromolecules. Figure 1; references 10 (Russian).  
[75-6508]

UDC: 536.7+541.183.12

THERMODYNAMIC CHARACTERISTICS OF INTERACTION OF CATIONITE SG-1 WITH WATER

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 20 Dec 83) pp 2176-2181

KRYLOV, Ye, A., RABINOVICH, I. B., TSVETKOV, V. G. and SHVAREVA, G. N.,  
Scientific Research Institute of Chemistry, Gor'kiy State University  
imeni N. I. Lobachevskiy

[Abstract] A study is made of the influence of temperature and cross linking of ionites on thermodynamic characteristics of the interaction of the carboxyl cationite SG-1 with water, on the quantity of free and bonded water. The data obtained indicate that the process is exothermic, the enthalpy and Gibbs energy of the interaction of SG-1 with water of hydration depending little on the degree of cross linking of the cationite. The quantity of bonded water averages  $3.1 \pm 0.1$  kg-mol/standard kg-eq of cationite. At 298 to 333 K, the quantity of bonded water decreases by a few percent. The content of free water in the cationite varies greatly with temperature and degree of cross linking. The thermodynamic characteristics of the interaction with bonded water change by a few percent with a change in content of cross linking agent at constant temperature or with a change in temperature with the same degree of cross linking. Figures 3; references 8: 5 Russian, 3 Western,  
[74-6508]

NITROGEN COMPOUNDS

UDC: 547.785.677

SYNTHESIS AND SPECTROPHOMETRIC STUDY OF ACID-BASE PROPERTIES OF NEW  
IMITRIN CLASS COMPOUNDS

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 10, Oct 84  
(manuscript received 21 Jul 83) pp 1111-1114

KOBETS, N. N., KRUGLENKO, V. P., KABLOVA, M. S. and TIMOSHIN, A. A.,  
Kherson Industrial Institute

[Abstract] Synthesis is described of two isomer compounds in the imidazo (1,2-b)-1,2,4-triazine series with the identical composition  $C_{29}H_{20}N_4$  but different substituents at the carbon atoms in positions 3 and 7. Results are also presented from spectrophotometric determination of stability constants of protonated forms of these compounds in aqueous solutions. These constants, which represent the basicity of the compounds, reflect the electron-donor properties of the molecules and thus can be used to predict other physical-chemical properties of various representatives of this class of compounds. It is found that with an increase in the length of the conjugation chain, there is an increase in the basicity, coloration intensity and a simultaneous decrease in capability for luminescence and generation of laser radiation. Compounds synthesized were 2,3-diphenyl-6-(4-biphenyl)-imidazo(1,2-b)-1,2,4-triazine and 2,7-diphenyl-6-(4-biphenyl)-imidazo(1,2-b)-1,2,4-triazine. Figures 2; references 5 (Russian).  
[67-6508]

ORGANOMETALLIC COMPOUNDS

UDC: 547.242

SYNTHESIS AND PROPERTIES OF ETHYLARYLCARBOXYPHENYLARSINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 2 Jan 84) pp 2247-2249

YAMBUSHEV, F. D. and KOKOREV, G. I., Kazan' State Pedagogic Institute

[Abstract] Results are presented from the synthesis and study of the acid properties of ethylaryl-p-carboxyphenylarsines. Oxidation of ethylaryl-p-tolylarsines with an aqueous solution of potassium permanganate and subsequent treatment of the product of the reaction with sulfur dioxide in a medium of hydrochloride was used to obtain a number of compounds. However, this method is not suitable for the production of carboxy derivatives with constituent X=o-m-p-CH<sub>3</sub>, OCH<sub>3</sub>. This is because permanganate oxidation of the initial ethylditolylarsines and ethyltolylanisylarsines leads to simultaneous oxidation of substituents in both aromatic fragments. Two new, effective methods were developed to solve this problem. The first is action of equimolar quantities of ethyl-p-carboxyphenylarsine chloride and the corresponding aryl bromide on finely dispersed sodium in absolute toluene. The second method is to pass dry carbon dioxide gas through the ethylarylarsine-p-phenylmagnesium bromide in tetrahydrofurane at -30 to -40°C. It was found that, in the ethylarylcarboxyphenylarsines, an increase in electron acceptor properties of substituents in the benzene ring leads to an increase in their acidic properties. Figure 1; references 10 (Russian).

[74-6508]

UDC: 547.1'13+661.719.3

KINETICS OF GAS PHASE PYROLYSIS OF DIMETHYLSELENIUM

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 10 Jan 84) pp 2288-2290

DIDENKULOVA, I. I., DYAGILEVA, L. M., TSYGANOVA, Ye. I. and ALEKSANDROV, Yu. A.,  
Scientific Research Institute of Chemistry, Gor'kiy State University  
imeni N. I. Lobachevskiy

[Abstract] The kinetic regularities of gas-phase pyrolysis of dimethylselenium in static and flow-through systems were studied for the first time by manometric and pulsed gas chromatographic methods. The study involved dimethylselenium 98.7%, impurities being alkyl halogens and higher alcohols. In the static system, the reaction was performed in glass cylindrical reactors which were used once, the process rate measured manometrically. The influence of hydrogen on the rate of thermal decomposition of the dimethylselenium at low temperatures was studied. Dimethylselenium under these conditions decomposed at a high rate. According to mass spectrometric analysis, the gaseous products of full decomposition of dimethylselenium in clean glass vessels at 405°C include (in mol.%): methane 62.1, ethylene 1.4, ethane 13.8, propene 0.4, propane 5.4, butene 4.6 and butane 11.3. Pentane, pentene, hexane, hexene and higher alkanes and alkenes were also detected in very small quantities. References 3: 1 Russian, 2 Western.  
[74-6508]

UDC 547.254.7:541.127.3

KINETICS AND MECHANISM OF DIMETHYLZINC THERMAL DECOMPOSITION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 31 Oct 83) pp 2559-2566

SOKOLOVSKIY, A. Ye. and BAYEV, A. K., Belorussian Technologic Institute  
imeni S. M. Kirov, Minsk

[Abstract] Thermal decomposition under vacuum of dimethylzinc was studied at 554-611K and 0.0027-0.0188 mole/liter concentration using a statistical method employing a null-type manometer, thereby making it possible to measure pressure directly in the reaction zone without contacting the dimethylzinc with air or mercury. The thermal decomposition was found to follow a radical-chain mechanism with autodeceleration. The autodeceleration coefficient is independent of pressure and temperature. Effective activation energy decreases with increasing dimethylzinc concentration, and the composition of gaseous decomposition products is independent of temperature. Figures 3; references 13: 5 Russian, 8 Western.  
[115-12765]



UDC 547.245'246'258.11'81'491.8

SYNTHESIS OF VANADIUM-ORGANIC DERIVATIVES OF ISOCYANURIC ACID

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 1 Dec 83) pp 2566-2570

GORDETSOV, A. S., LATYAYEVA, V. N., PERESHEIN, V. V., ALFEROV, V. A.  
and KONKINA, T. N., Gorkiy Medical Institute imeni S. M. Kirov

[Abstract] Two new vanadium-containing sym-triazines were synthesized for the first time in a previous work. Continuing this research for the purpose of preparing new derivatives of sym-triazine having a  $Cp_2V$  group (bis(eta<sup>5</sup>-cyclopentadienyl)vanadium) bound to the ring through a nitrogen atom, a study was made of the interaction between organo-tin and acylated isocyanurates with  $Cp_2V$  and  $Cp_2VCl$ . The latter reacts with tris(tributylstannyl)-isocyanurate and the former with tris(acetyl)isocyanurate under mild conditions (toluene, room temperature) to form tris( $Cp_2V$ )-substituted oxy-derivatives of isocyanuric acid (at the V-O bond). Under similar conditions, and regardless of the reagent ratio,  $Cp_2V$  displaces only one benzoyl group of tris(benzoyl)isocyanurate to give the corresponding oxo-structured sym-triazine (at the V-N bond). References 10: 9 Russian, 1 Western.  
[115-12765]

UDC 547.469+639.953

SYNTHESIS OF TRIALKYLSTANNYLALLYLMALEATES AND INVESTIGATION OF THEIR ANTIVIRAL PROPERTIES

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
pp 76-80

GURVANOV, K. I., SADYKOVA, F. E., MAMEDOVA, S. G., MAMEDOVA, V. A.,  
BABAYEV, A. A. and RZAYEV, Z. M., Institute of Chloroorganic Synthesis

[Abstract] An attempt was made to synthesize new tin-organic compounds with antiviral activity which would be soluble in physiological solutions: trialkylstannylallylmaleates (I). The products obtained were either low melting or liquid compounds, soluble in organic solvents with no specific odor. Physical-chemical characteristics of a series of these compounds are reported. It was shown that I exhibited considerable antiviral and partially therapeutic activity against the virus of influenza A. I could be used as the starting point in synthesis of medicinal antiviral preparations.  
References 7 (Russian).  
[91-7813]

UDC 678.664:541.49:541.67

MAGNETIC PROPERTIES OF POLYMETHANESMICARBAZIDE COMPLEXES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 10, Oct 84  
(manuscript received 1 Mar 83) pp 1218-1221

BABCHENKO, N. F., LOMAKO, L. A. and TOLMACHEV, V. N., Department of  
Industrial Chemistry, Khar'kov State University imeni A. M. Gorki

[Abstract] Polyurethanesemicarbazide complexes with copper, nickel and cobalt ions were synthesized on the basis of adipic (PUS-1) and isophthalic acid (PUS-2, PUS-3) dihydrazides with molecular weight 9700, 8400 and 30700 respectively. Macrocomplexes were obtained by mixing DMFA solution of polymers with metal acetates. Depending on conditions used, the following macrocomplexes could be obtained:  $P(L_2M)_2$  or  $P(LMA)_n$  where  $P(L)_n$  was the polymer. All of these macrocomplexes are paramagnetic, primarily due to the nature and condition of the central metal ions which in these complexes are in a high spin state. References 8: 7 Russian (1 by a Western author), 1 Western.  
[93-7813]

ORGANOPHOSPHORUS COMPOUNDS

UDC: 547.241:541.442

$\sigma_p$  ANALYSIS OF CH ACIDITY OF ORGANOPHOSPHORUS COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 13 Feb 84) pp 2161-2169

KABACHNIK, M. I. and MASTRYUKOVA, T. A., Institute of Heteroorganic  
Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] A report is presented on results of  $\sigma_p$  analysis of organophosphorus compounds for CH acidity. Using previously determined  $\sigma_{CH_2}^-$  and  $\sigma_{CH}^-$

constants, the authors statistically processed data for 39 reaction series containing a total of 320 CH acids. This allowed the constants  $\sigma_C^-$  to be determined for phosphonium and phosphoryl groups as well as a number of other groups. It is shown that, when these constants are used, correlation of  $pK_a$  of phosphonium, ammonium, arsonium and sulfonium and phosphoryl CH acids is achieved. CH acids of the same chemical type should be placed in a single reaction series. The modified  $\sigma_C^-$  constants are suitable for  $\sigma_p$  correlation of Wittig reaction rate constants. Figure 1; references 28: 13 Russian, 15 Western.

[74-6508]

UDC: 547.26'118

INTERACTION OF ISOCYANATE AND SUBSTITUTED DIMETHYLPHOSPHOROUS ACID  
METHYLENE AMIDES WITH CHLORAL AND CHLOROACETOACETIC ESTER

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 11 Jul 83) pp 2203-2206

KONOVALOVA, I. V., BURNAYEVA, L. A., GAREYEV, R. D., MOSHKINA, T. M. and  
PUDOVNIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Continuing previous studies, the authors studied the reaction of N-(phenylmethoxy-, phenylethoxymethylene)dimethylamidophosphites with chloral. Substituted methylamidophosphites form, with chloral, only the product of

Perkov regrouping - O-methyl-O-( $\beta$ , $\beta$ -dichlorovinyl)-N-(phenylalkoxymethylene)-amidophosphates (I,II). Reactions were performed in anhydrous ether and were exothermic. Compounds (I) and (II) are thick liquids which distill without decomposition under a vacuum. Dimethyl isocyanatophosphite forms, with  $\alpha$ -chloroacetoacetic ester, a product of cycloattachment - 2,4-dimethyl-3,5-dioxy-3-methoxy-2-chloroethoxy-carbonylmethyl-1,4,3-oxazaphospholane as a mixture of diastereomers. The product of hydrolysis of the intermediate azaphospholene is also isolated: 3,5-dioxo-2-methyl-3-methoxy-2-chloroethoxycarbonylmethyl-1,4,3-oxazaphospholane. References 5 (Russian).  
[74-6508]

UDC: 535.34+542.91:547.56

SYNTHESIS AND  $P^{VI} \rightarrow P^V$  CHLOROTROPIC CONVERSION OF N,N-DISUBSTITUTED AMIDINIUM CHLOROPHOSPHATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 13 Jul 83) pp 2207-2217

KAL'CHENKO, V. I., RUDYY, R. B., NEGREBETSKIY, V. V., POVOLOTSKIY, M. I. and MARKOVSKIY, L. N., Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev; All-Union Scientific Research Institute of Chemical Means of Plant Protection, Moscow

[Abstract]  $N^1, N^2$ -disubstituted amidinium chlorophosphates (I) were synthesized, containing 4-n chlorine atoms and n different substituents at the phosphorus, and the influence of the nature of bidentate amidinium ligand substituent--as well as substituents at the phosphorus on stability of the compounds obtained--was studied. Chlorotropic migrations in the C-N-P triad of amidinium chlorophosphates was studied, accompanied by a change in coordination of the phosphorus atom. Electron acceptor substituents at the carbon atom and volumetric substituents at the nitrogen of the amide triad, electron donor substituents at the phosphorus atom and polar solvents destabilize the hexacoordination state of the phosphorus and shift the chlorotropic equilibrium in the direction of diazaphosphetidine with pentacoordination phosphorus atom. References 13: 8 Russian, 5 Western.  
[74-6508]

UDC: 547.468

PHOSGENATION OF  $\alpha$ -AMINOPHOSPHONOACETATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 10 Jan 84) pp 2237-2241

KHOKHLOV, P. S., KASHEMIROV, B. A., MIKITYUK, A. D., CHIMISHKYAN, A. L.  
and STREPIKHEYEV, Yu. A., All-Union Scientific Research Institute of  
Phytopathology, Golitsyno, Moscow Oblast

[Abstract]  $\alpha$ -Aminoalkylphosphonates are phosgenated in the presence of HCl acceptors. A study was made of the reaction of phosgenation of  $\alpha$ -aminophosphonoacetates which were previously synthesized. It is found that when amines interact with phosgenes in boiling toluene without the HCl acceptor, phosphorylated isocyanates (II) are formed. These are very reactive compounds which can be used as intermediates in the synthesis of new organic compounds of phosphorus. When exposed to the moisture of the air they are slowly converted to bisphosphorylated ureas (III), when interacted with amines and hydrazines they form the corresponding ureas (IV) and semicarbazides (V). Compounds (IV) in alcohol solutions of sodium alcoholate are cyclized to 5-phosphorylated hydantoins (VI). References 2 (Russian).  
[74-6508]

UDC: 547.341

PHOSPHORUS-CONTAINING ENAMINES. REPORT 3. PHOSPHORYLATION OF N-VINYLSUBSTITUTED TRIFLUOROACETILPYRROLES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 1 Dec 83) pp 2241-2246

ROZINOV, V. G., PENSIONEROVA, G. A., DONSKIKH, V. I., SERGIYENKO, L. M.,  
PETROVA, O. V., KALABINA, A. V. and MIKHALEVA, A. I., Irkutsk State  
University imeni A. A. Zhdanov; Irkutsk Institute of Organic Chemistry,  
Siberian Department, USSR Academy of Sciences

[Abstract] Results are presented from phosphorylation of N-vinyl-2-methyl-5-trifluoroacetylpyrrole (I) and N-vinyl-2-trifluoroacetyl-4,5,6,7-tetrahydroindol (II) with phosphorus pentachloride. N-vinylpyrroles with trifluoroacetyl substituents at position 5 of the ring are easily phosphorylated at the vinyl group with phosphorus pentachloride to form hexafluorophosphates of 5-trifluoroacetylpyrrolelyl-1-ethenyl trichlorophosphonium, which are convenient starter substances for synthesis of new groups of pyrroles with functional organophosphorus substituents. References 8 (Russian).  
[74-6508]

UDC: 547.79:546.18:541.124

KINETICS AND MECHANISM OF ALCOHOLYSIS OF AMIDOCYCLOPHOSPHITE. REPORT 2.  
STUDY OF KINETICS AND STEREOCHEMISTRY OF REACTION OF DIPHENYLMETHYLENEAMINO-  
4 METHYL-1,3,2-DIOXAPHOSPHORINANE AND N<sup>6</sup>-(4-METHYL-1,3,2-DIOXAPHOSPHORINANE-  
2-YL)-3- $\beta$ -PHENYLISOPROPYLSIDONONIMINE WITH HYDROXYL-CONTAINING COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 18 Jul 83) pp 2345-2349

BORISOV, Ye. V., AKHLEBININ, A. K. and NIFANT'YEV, E. Ye., Moscow State  
Pedagogic Institute imeni V. I. Lenin

[Abstract] The influence of reaction products on the kinetics of alcoholysis, discovered earlier on the example of amidophosphites, would be expected to appear to a lesser extent on the example of amidophosphites, would be expected to appear to a lesser extent in the case of sidnonimine amide. Considering the complexity of the mechanism of such reactions, the difficulty of purification and the fact of increased reactivity of the amides involved, the authors studied the basic regularities of this process. Particular attention was given to the stereochemical aspect of the reactions. It was found that the reactions of 2-diphenylmethyleamino-4-methyl-1,3,2-dioxaphosphorinane and N<sup>6</sup>-(4-methyl-1,3,2-dioxaphosphorinane-2-yl)-3- $\beta$ -phenylisopropylsidnonimine with hydroxyl-containing compounds is characterized by a complex variation of specific reaction rate and isomer composition of phosphites formed as a function of the structure of the reagents and products, temperature and the addition of amine hydrochlorides. Figures 3; references 17: 9 Russian, 8 Western.  
[74-6508]

UDC: 247.341

UNUSUAL ISOMERIZATION OF ALKOXYETHINYLDIALKYLPHOSPHINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 23 Jan 84) pp 2391-2393

LUKASHEV, N. V., ARTYUSHIN, O. I., KAZANKOVA, M. A. and KUTSENKO, I. F.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] An unusual isomerization of recently synthesized alkoxyethinyl-dialkylphosphines (I) has been observed--migration of alkyl from the alkoxy group to the phosphorus atom with an increase in its coordination number and formation of heterocumulenes - ketenylidene trialkylphosphorinanes (II). The rate of isomerization of compounds (I) drops greatly on transition from methoxy- to ethoxy- and butoxyethinylphosphines. The rate of isomerization of compounds (I) decreases greatly with a decrease in their concentration in the solution. The motive force of isomerization of compounds (I) is apparently the energetically-favorable tendency of the phosphorus atom

to increase its coordination number and form a polar double bond  $P=X(X=C)$ .  
References 4: 1 Russian, 3 Western.  
[74-6508]

UDC: 547.341

#### USE OF QUATERNARY AMMONIUM BASES FOR SYNTHESIS OF DIALKYL-1-PHENYLETHENE PHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 13 Oct 83) pp 2393-2394

KARIMOV, K. R., SHAKHIDOV, Kh. M., ALOVITDINOV, A. B. and KUCHKAROV, A. B.,  
Tashkent Polytechnic Institute imeni A. R. Beruni

[Abstract] It is established that dialkyl-1-phenylethene phosphonates can be synthesized by direct interaction of 1-phenylethene phosphonic acid with alkyl halides in the presence of quaternary ammonium bases. Alkyl halides used included methyl iodide, ethyl iodide, propyl bromide and butyl iodide, bromide and chloride. Quaternary salts used for production of ammonium bases included tetramethylammonium iodide, tetraethylammonium bromide and triethylbenzylammonium chloride. Dialkyl-1-phenylethene phosphonates are, oily weak-yellow substances which distill well under a vacuum. The IR spectra do not have the absorption bands in the  $2600-2700\text{ cm}^{-1}$  area characteristic for the P-OH bond of the initial substance, but do have a band at  $1050\text{ cm}^{-1}$  for the ether group. References 2: 1 Russian, 1 Western.  
[74-6508]

UDC: 547.314.26.118+546.18

#### SIMPLE METHOD OF PRODUCING ACETYLENE IMIDOPHOSPHATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 5 Dec 83) pp 2394-2395

KALITOV, K. K. and POLYAK, L. Sh., Institute of Chemical Sciences,  
Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract] A new approach is described for production of acetylene imidophosphates by the interaction of aminoacetylenes with phosphorus pentachloride in the presence of triethylamine hydrochloride. The reaction occurs in chlorobenzene in 10 minutes at  $140^{\circ}\text{C}$ . The yield of the end product depends on temperature and time of the reaction. The reaction does not occur without catalysts. Previously unknown acetylene imidophosphates are produced: N-(propinyl)imidophosphorus trichloride, N-(1,1-dimethylpropinyl)imidophosphorus trichloride and N-(1-methyl-1-ethylpropinyl)imidophosphorus trichloride, all yellowish liquids, easily soluble in ordinary organic solvents, stable upon long-term storage. References 2 (Russian).  
[74-6508]

UDC: 547.26'118

INTERACTION OF DIALKYLDITHIOPHOSPHORIC ACIDS WITH FORMALDEHYDE AND 2-AMINOPYRIDINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 15 Dec 83) pp 2396-2397

PROKOF'YEVA, A. F., GRAPOV, A. F., NEGREBETSKIY, V. V. and MEL'NIKOV, N. N.,  
All-Union Scientific Research Institute of Chemical Means of Plant  
Protection, Moscow

[Abstract] It is shown that when diethyl- and dipropyldithiophosphoric acids interact with formaldehyde and 2-aminopyridine at 70-80°C, cyclic products of condensation of 2-aminopyridine with formaldehyde and hydrogen sulfide are formed - pyridino[1,2:1,2]-5,7-dithia-1,3-diazocine-2-ene (I) and bis-pyridino[1,2:1,2;1,2:7,8]-5,11-dithia-1,3,7,9-tetraazacyclododecane-2,8-diene (II). Apparently, initially, the 2-aminopyridine base causes self-alkylation of two molecules of dithiophosphoric acid with the formation of O, O, S-triesters of dithiophosphoric acid, while the hydrogen sulfide liberated is condensed with the 2-aminopyridine and formaldehyde. The structure of the compounds was proven by spectral methods.

References 1 (Western):

[74-6508]

UDC: 542.91+661.718.1

SIMPLE METHOD OF PRODUCING O,O-DIGLYCIDYLALKYL(ARYL)PHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 10, Oct 84  
(manuscript received 26 Mar 84) pp 2404-2405

BAYANDINA, Ye. V., SADKOVA, D. N., RIZPOLOZHENSKIY, N. I. and  
NURETDINOV, I. A., Institute of Organic and Physical Chemistry  
imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] It is established that dichlorophosphonates react with the products of interaction of glycidol and sodium hydride under mild conditions, and that after removal of NaCl and the solvent they yield practically pure O,O-diglycidylalkyl (aryl)phosphonates. Elemental analysis of the products obtained is satisfactory, their physical and chemical constants correspond to those described in the literature. Sodium hydride can thus be used in the production of phosphorus acid esters from alcohols containing reactive functional groups. References 3 (Russian).

[74-6508]



UDC 547.1'118+543.422.25

SYNTHESIS, STRUCTURE AND PROPERTIES OF BICYCLOAMIDOPHOSPHORANES HAVING  
P-H BOND

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 29 Nov 83) pp 2448-2454

PUDOVIK, M. A., TERENT'YEVA, S. A., PL'YASOV, A. V., CHERNOV, A. N.,  
NAFIKOVA, A. A. and PUDOVIK, A. N., Institute of Organic and Physical  
Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] Examples of monocyclic phosphoranes having a P-H bond were  
previously found by reaction of 1,3,2-diheterophospholanes with proton donor  
reagents. The products were unstable, however, and could not be isolated  
in pure form. Study of these compounds is being continued in the present  
work where 7,8-benzo-3-methyl-4,6-dioxa-1-aza-5-lambda<sup>3</sup>-phosphobicyclo-  
[3,3,0]octane was treated with alcohols, mercaptans, phenols and amines  
to form condensed bicyclic phosphoranes having a P-H bond as addition  
products. NMR spectra confirmed the structure as being bicyclic with tri-  
and penta-coordinated phosphorus atoms. References 15: 7 Russian,  
8 Western.

[115-12765]

UDC 547.26'118

REACTION OF DITHIOPHOSPHORIC ACIDS AND O,O-DIMETHYL-S-TRIMETHYLSILYDITHIO-  
PHOSPHATE WITH PROPIOLYL ALDEHYDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 6 Dec 83) pp 2454-2458

KUTYREV, G. A., KOROLEV, O. S., CHERKASOV, R. A. and PUDOVIK, A. N.,  
Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] The reactions of dithiophosphates with propiolyl aldehyde were  
studied in an effort to uncover the reaction and synthesis capabilities  
of the dithio-derivatives of phosphorus. Equimolar quantities of O,O-dimethyl-  
dithiophosphoric acid reacted with propiolyl aldehyde to form E-3(O,O-dimethyl-  
dithiophosphoryl)propenal in quantitative yield. O,O-Diisopropyldithio-  
phosphoric acid reacts analogously with propiolyl aldehyde. Thus, dithio  
acids of phosphorus react both at the triple and at the double bond of  
propiolyl aldehyde to form dithiophosphorylated unsaturated and saturated  
aldehydes, carbonyls and alkanes. Silyldithiophosphates react with propiolyl  
aldehyde only at the C≡C-C=O system of bonds. References 10: 8 Russian,  
2 Western.

[115-12765]

UDC 547.26'118

REACTIONS OF COMPLETE THIOESTERS OF PHOSPHOROUS ACID WITH HALOGENS AND PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 14 Dec 83) pp 2458-2463

SINYASHIN, O. G., KARIMULLIN, Sh. A., PUDOVNIK, D. A., BATYEVA, E. S. and PUDOVNIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbusov, Kazan Branch, USSR Academy of Sciences

[Abstract] In an on-going study of reactions of trialkyltrithiophosphites with halogens, complete thioesters of phosphorous acid were treated with chlorine and bromine in 2:1 ratio to form dithiolphosphorous acid halides, tetrathio phosphates and alkyl halides. The latter three products and  $PCl_3$  can also be formed by reaction of trialkyltrithiophosphites with phosphorus pentachloride. References 25: 13 Russian, 12 Western.  
[115-12765]

UDC 547.26'118

REACTIONS OF THIOESTERS OF TRIVALENT PHOSPHORUS ACIDS WITH SULFENE CHLORIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 14 Dec 83) pp 2463-2468

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[Abstract] A study of the reactions of trivalent phosphorus acid thioesters with aliphatic and aromatic sulfene chlorides shows that thioesters of phosphorus acid and ethylphenylphosphonous acids react with ethyl- and 2,4-dinitrophenylsulfene chlorides in two directions. Either the Arbusov rearrangement takes place to form the corresponding tetrathio phosphate and dithiophosphonate, or the thioalkyl group at the trivalent phosphorus atom is substituted with a chlorine atom to form the acid chloride of the corresponding P(III) acid and disulfides. The course of the reaction of trivalent phosphorus acid thioesters with sulfene chlorides is determined by temperature, the use of solvents, nature of the sulfene chloride and the presence of acid catalysts. References 19: 13 Russian, 6 Western.  
[115-12765]

UDC 547.56+535.34+542.91

N,N-DIALKYLAMIDINIUM FLUOROPHOSPHORATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 2 Jan 84) pp 2477-2485

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Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev; All-  
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[Abstract] The synthesis and properties of little-known amidinium chloro-  
phosphorates were described previously. In the present work synthesis  
methods were developed for N,N-dialkylamidinium fluorophosphorates, and it  
was established that selective substitution of the fluorine atom at the  
hexacoordinated phosphorus atom with a less electron-accepting substituent  
causes destabilization resulting either in disproportionation, with in-  
creasing symmetry of the molecule, or in isomerization and a lowering of  
phosphorus coordination from 6 to 5. References 7: 5 Russian, 2 Western.  
[115-12765]

UDC 547.245

CONDENSATION OF 3-CHLORO-4,4-DIMETHYL-2-PENTENAL AND ITS SILICON-CONTAINING  
ANALOG WITH RESONANCE-STABILIZED PHOSPHORANES AND PHOSPHONATE ANIONS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 11, Nov 84  
(manuscript received 15 Mar 84) pp 2582-2590

BELYAYEV, N. N., VOROPAYEVA, T. I., MINGALEVA, K. S. and STAKNICHUK, M. D.,  
Leningrad Technologic Institute imeni Lensovet

[Abstract] To obtain new data on the effects of the unsaturated radical on  
the stereo-direction of condensation in Wittig and Horner-Emmons reactions,  
a study was made of the reactions of certain stabilized phosphoranes and  
phosphonate anions with the chlorine-containing aldehydes 3-chloro-4,4-  
dimethyl-2-pentenal and 3-chloro-3-trimethylsilyl-2-propenal. It was ob-  
served that substitution of the hydrogen atom in the beta-position of  
alpha,beta-unsaturated aldehydes for chlorine has no effect on the stereo-  
chemical result of condensation with resonance-stabilized phosphoranes and  
phosphonate anions, but it markedly reduces their reactivity. A number of  
1,3-diene ethers, ketones and nitriles, containing a chlorine atom in the  
position delta to the functional group were synthesized. References 19:  
14 Russian, 5 Western.  
[115-12765]

UDC 547.8:542.9 + 541.63:547.241.284

SYNTHESIS OF 1-PHENYL-3-METHYLPHOSPHORINAN-4-ONE AND ITS DERIVATIVES WITH  
TETRACOORDINATED PHOSPHORUS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 5, Sep-Oct 84 (manuscript received 16 Dec 82) pp 55-59

SHISHKIN, S. K. and BOSYAKOV, Yu. G.; Order of Red Banner of Labor  
Institute of Chemical Sciences, Kazakh SSR Academy of Science, Alma-Ata

[Abstract] Cycloaddition of phenylphosphine to the double bonds of vinyl isopropenyl ketone in an argon atmosphere was used to synthesize 1-phenyl-3-methylphosphorinan-4-one. A mixture of the two stereoisomers was obtained. This compound was reacted with sulfur, selenium or potassium permanganate to give the corresponding 1-thio, 1-seleno and 1-oxo derivatives. The isomers of these derivatives were separated by fractional crystallization and column chromatography, and the alpha isomer was found to predominate. The yield of the beta-oxo isomer could be increased by using oxygen and UV irradiation in its production. In the presence of alcohol solutions of base, the derivatives readily undergo isomerization at the 3-carbon. They also form semicarbazones with semicarbazide. An alcohol condensation was conducted with the thio derivative and acetone. References 6: 5 Russian, 1 Western. [43-12126]

UDC 547.8:542.9 + 541.63:547.241:284

SPATIAL STRUCTURE OF 1-PHENYL-1-OXO-(THIO-, SELENO-)-3-METHYLPHOSPHORINAN-4-ONE STEREOISOMERS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA  
in Russian No 5, Sep-Oct 84 (manuscript received 16 Dec 82) pp 60-65

KRASNOMOLOVA, L. P., SHISHKIN, S. K., AGASHKIN, O. V. and BOSYAKOV, Yu. G.,  
Order of the Red Banner of Labor Institute of Chemical Sciences,  
Kazakh SSR Academy of Sciences, Alma-Ata

[Abstract]  $^1\text{H}$ - and  $^{13}\text{C}$ -NMR were used to elucidate the structure of 1-phenyl-1-oxo-, -thio- or -seleno-3-methylphosphorinan-4-one. The phenyl protons gave two signals in the 7 ppm area, the strong field signal for the meta and para protons and the weak, for the ortho. The alpha isomers had the weakest methylene or methine signal at 3.5 ppm, while the beta had it at 2.7 ppm, as determined by decoupling. In both cases the methyl group signal was a doublet of doublets at about 1.15 ppm with splitting values of 2 and 6 Hz. Complete interpretation of PMR spectra was accomplished using the paramagnetic shift reagent  $\text{Eu}(\text{fod})_3$ , spin decoupling and selective degredation under keto-enol isomerization conditions. The data indicate that both alpha and beta isomers are most stable in a chair conformation with an equatorial methyl group in the  $\text{C}_3$  position. In the alpha isomers, the phenyl on the phosphorus is in an equatorial position, while in the beta isomers it is in an axial position. References 7: 6 Russian, 1 Western. [43-12126]

PETROLEUM PROCESSING TECHNOLOGY

UDC: 665.61.033:542.61:546.3

EXTRACTION OF TRACE ELEMENTS BY PETROLEUM FROM MODEL STRATAL WATERS

Moscow NEFTEKHIMIYA in Russian Vol 24, No 5, Sep-Oct 84 pp 579-582

ALESHIN, G. N., GLUKHOV, G. G., KOICHEVA, I. I., and KAM'YANOV, V. F.,  
Institute of Petrochemistry, Siberian Department, USSR Academy of Sciences;  
Institute of Nuclear Physics at the Tomsk Polytechnic Institute  
imeni S. M. Kirov, Tomsk .

[Abstract] A series of experiments was performed in which aqueous solutions of chlorides of Na, K and Ca of various concentrations--as models of stratal water with varying degrees of mineralization, containing about 0.5g/l of radioactive isotopes of V, Ba, Sb, Zn, As, Mo, W, Li, Sc, Se, Hf, Rb, Cd, Re, Cr, Au, Na, Co and Br--were mixed for two hours with petroleum at room temperature with an oil water ratio of 1:5 in order to test the reverse extraction of metals by petroleum from the aqueous phase and thus estimate the complex-forming capability of petroleum for the elements tested. Na, Rb, Ba, Hf, As, Se, V, Cr and Br were not extracted at all by the petroleum from the water. Sb and Zn bonded little with the petroleum components. Mo, W and Re were extracted by 50% or more from acid aqueous solutions, not at all from neutral or weakly alkaline solutions. Cadmium was 60% extracted by petroleum from a neutral medium but remained entirely in the water in both acid and basic media. Lanthanum and scandium were practically not extracted from acid solutions, but were greatly concentrated in petroleum in contact with neutral or alkaline media. Gold was 100% extracted by petroleum from acid and neutral media, 30% extracted even at pH 9. Figure 1; references 5 (Russian).  
[69-6508]

UDC: 665.61.033:543.51

SAKHALIN PETROLEUM DIESEL FUEL BENZOQUINOLINES

Moscow NEFTEKHIMIYA in Russian Vol 24, No 5, Sep-Oct 84  
(manuscript received 26 Apr 83) pp 605-609

RAPOPORT, V. L. and RAZUMOV, N. V., Khabarovsk Polytechnic Institute

[Abstract] A detailed study is presented of the structure of benzoquinolines by means of proton magnetic resonance. UV spectra were also measured. It is found that the benzoquinolines are homologs of benzo(h)quinoline and phenanthridine, which is present in smaller quantities. Most of the benzoquinolines are methyl derivatives having 2-to-5 methyl groups. The PMR spectra have low intensity signals, indicating the presence of small quantities of benzoquinolines containing the isopropyl group. Figures 2; references 4: 2 Russian, 2 Western.  
[69-6508]

UDC: [661.7:547.532].002.645

PRODUCTION OF HIGH PURITY BENZENE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 10, Oct 84 pp 586-589.

EL'BERT, E. I., DOPSHAK, V. N. and TRYASUNOV, B. G.

[Abstract] A new process conducted on commercial aluminomolybdenum catalyst at 480-530°C, hydrogen pressure 0.7-1 MPa, velocity 0.15-0.45 hr<sup>-1</sup>, has been developed for conversion of benzene-toluene-xylene on commercial aluminomolybdenum catalyst. The results obtained in catalytic conversion of this fraction have shown that the degree of conversion of impurities accompanying benzene is quite high, but the residual content of n-heptane in the benzene is 0.1%, preventing its use as a high grade product. The initial properties of the catalyst were restored by regenerating it with an oxygen-containing gas at 500-550°C and an experiment was performed on the regenerated catalyst for 100 hours, yielding benzene of 99.95% purity. Under pilot plant conditions the total yield of pure benzene in a production run was 88-92% of its content in the catalysate. References 9 (Russian).  
[80-6508]

UDC: 66.095.253.73.001:[661.7:547.532]

STUDY OF CARRIERS FOR CATALYST FOR ALKYLATION OF BENZENE WITH ETHYLENE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 10, Oct 84 pp 591-592

KOZOREZOV, Yu. I. and LISIN, V. I.

[Abstract] A study was made of various models of aluminum oxide as a boron fluoride carrier for catalysis for liquid-phase alkylation of benzene with ethylene. The selectivity of the process of alkylation, performed in a 300 cm<sup>3</sup> reactor, was evaluated based on the quantity of ethyl groups converted to ethyl benzene as a percentage of the total quantity in the ethylation products. Catalysts, based on carriers type A-64M, A-64K and experimental models of aluminum oxide, were equal in activity to the imported spherical gamma aluminum oxide catalyst previously used. A-64M and A-64K carriers are not as mechanically strong as the imported catalyst, but are still suitable for use in the process, which is conducted on a stationary catalyst layer.

[80-6508]

UDC 66.022.37:678.763.43(047)

EFFECTS OF SYNTHESIS METHOD ON POUR-POINT DEPRESSION OF DIESEL FUELS BY POLYALKYLMETHACRYLATE ADDITIVES

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 84 pp 10-12

BASHKATOVA, S. T., IVANOV, V. I., ZADOROZHNYAYA, G. N., and PASTUKHOVA, I. N.,  
All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] An analysis was conducted on the effects of synthesis methods on pour-point depression exhibited by additives to summer diesel fuel. The copolymerization studies were conducted with the higher alcohol (C<sub>12</sub>-C<sub>14</sub>) alkyl methacrylate mixtures and acrylonitrile or vinyl acetate, with the results analyzed in terms of pour-point depression (T<sub>p</sub>) and filterability (CFPP) of summer diesel fuels. The quantitative data showed that optimum results were obtained in both cases with a copolymerization time of 1.5 h at 85°C in AND [sic] solvent, and an initial ratio of alkyl methacrylate:vinyl acetate (or acrylonitrile) = 5:1. Addition of 0.1 wt% of the additive to the fuel lowered the CFPP by 10-15°C, and the T<sub>p</sub> by 22-27°C. Figures 3; references 3: 2 Russian, 1 Western.

[96-12172]

UDC 620.197.3

EFFECTIVENESS OF CORROSION INHIBITOR NG-110M IN MOTOR OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 84  
pp 20-21

ENGLIN, A. B., KOZHEKIN, A. V., IVANOVA, T. N. and PARON'KINA, Ye. A.

[Abstract] Standard procedures described in GOST 9,054-75 were followed in assessing the usefulness of motor oil additive NG-110M, designed to serve as a universal corrosion inhibitor. Preliminary trials with motor oil M-11 showed that, in a concentration of 5%, NG-110M was twice as effective as standard inhibitors (AKOR-1 and KP) used in 10 or 15% concentrations. Tested in a variety of motor oils, NG-110M reduced metal wear two- to ten-fold. On the basis of extrapolation to the effects of inhibitors in common use, NG-110M should extend the usable lifetime of internal combustion engines up to 10 years when used in a concentration of 5%. References 4 (Russian). [96-12172]

UDC 662.75:621.45(088.8)

EFFECTS OF ESTERS ON ANTIWEAR PROPERTIES OF HYDROFINED JET FUEL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 84  
pp 27-29

KISLENKO, A. S., KRYLOV, I. F., VISHNYAKOVA, T. P. and SOKOLOVA, G. I.,  
MINKh i GP [expansion unknown] imeni I. M. Gubkin

[Abstract] Trials were conducted on the effectiveness of the ester bond in improving the antiwear properties of jet fuel, using esters formed by the reaction of stearic acid with ethylene glycol, diethylene glycol, or glycerol. Using KIIGA-2 apparatus, the experiments showed that only esters with unsubstituted hydroxyl groups improved the antiwear properties of jet fuel; aliphatic alcohols are virtually devoid of such activity. Factors important in improving antiwear properties were close proximity of hydroxyl and ester bonds on the molecule, which resulted in an increase in the polarity of the esters and enhanced the rate of adsorption to metal surface and binding strength. Figures 2; references 9: 5 Russian, 4 Western. [96-12172]



UDC 622.692.4:665.7-483:66.067.3-278

ANALYTIC MEMBRANE FILTRATION OF PETROLEUM AND SYNTHETIC PRODUCTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 84  
pp 32-34

ZRELOV, V. N., POSTNIKOVA, N. G. and KRASNAYA, L. V.

[Abstract] Comparative studies were conducted on filtration of motor fuels through nitrocellulose filters and various, less expansive membranous filters (acetate cellulose, capron (nylon), lavyan (dacron)). On the nitrocellulose filters, jet and diesel fuels underwent two-stage filtration, consisting initially of adsorption of tarry residues and subsequent retention of particulate matter. However, filtration of automobile and aviation gasolines represented a single-step process. Stability tests on the membranous filters showed all filters to be unaffected by petroleum products, but that nitrocellulose and acetate cellulose filters decomposed in aromatic and acidic solvents. Capron and lavyan filters did not require hydrothermal treatment and were unaffected by the solvents tested. In addition, the acetate cellulose filters exhibited two-stage characteristics as did nitrocellulose filters, and were shown to be applicable to the same processes as nitrocellulose filters. Capron and lavyan filters exhibit single-stage filtration parameters and do not absorb tarry products. Figures 4; references 6 (Russian).  
[96-12172]

PHARMACOLOGY AND TOXICOLOGY

UDC: 615.2:547.856

SYNTHESIS AND BIOLOGICAL ACTIVITY OF NEW DERIVATIVES OF 1,2,3,4-TETRAHYDRO-  
QUINAZOLINE-4-ONE

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 18, No 10, Oct 84  
(manuscript received 14 Nov 83) pp 1208-1210

SATTAROVA, O. Ye., KOZHEVNIKOV, Yu. V., ZALESOV, V. S. and NIKULINA, S. N.,  
Perm' Pharmaceutical Institute

[Abstract] Interaction of anthranilic acid arylamides with p-oxybenzoic, salicylic, veratric and cinnamic aldehydes and vanillin yields 2,3-disubstituted 1,2,3,4-tetrahydroquinazoline-4-ones (II-VI). Acylation of one of these compounds with acetic anhydride produces compound acetyl derivatives (VII). Compounds II-VI are crystalline substances with slightly basic reaction, insoluble in water, soluble in ethanol, acetone and dioxane. The composition and structure of the compounds are confirmed by UV and IR spectra as well as elemental analysis. The antimicrobial activity, anticonvulsive activity and acute toxicity of the compounds were studied. The compounds have antimicrobial activity at concentrations of 250 to 1000 µg/ml for staph. aureus 209P and from 500 to 1000 µg/ml for intestinal bacillus. The compounds are low in toxicity, a dose of 1000 mg/kg body weight causing death of 15% of experimental animals. References 6 (Russian). [76-6508]

UDC: 615.332:547.241].012.1

SYNTHESIS AND BIOLOGICAL ACTIVITY OF 1,2-ALKADIENEPHOSPHINATES OF RIFAMYCIN-SV

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 18, No 10, Oct 84 (manuscript received 21 Dec 83) pp 1210-1214

YUDELEVICH, V. I., BELAKHOV, V. V., KOMAROV, Ye. V., IONIN, B. I., MYASNIKOVA, L. G., POLYAK, M. S., SHNEYDER, M. A. and RACHKOVSKAYA, L. A., All Union Scientific Research and Technologic Institute of Antibiotics and Enzymes for Medical Use, Leningrad

[Abstract] The purpose of this work was to determine the relationship between structure and activity of 1,2-alkadienephosphinates of rifamycin SV, which can be synthesized by interacting 3-formyl rifamycin SV with allenophosphonous acids. It was found that the interaction of 1,2-alkadienephosphonous acids with 3-formyl rifamycin leads to the formation of phosphinates by attachment of the PH bond to the formyl group. The interaction was performed in THF at 55-60°C, 10-20 hours depending on the length and branching of the hydrocarbon chain of the acids. The antibacterial properties of the phosphinates and 1,2-oxaphospholenes formed were determined in experiments in vitro by double series dilutions in liquid nutrient medium using aerobic, facultative anaerobic and obligate anaerobic microorganisms. The water-soluble compounds formed by interacting unsaturated organophosphorous derivatives of rifamycin SV with the phosphoryl acid group were found to have low antibacterial and moderate antiviral activity. References 12: 6 Russian, 6 Western. [76-6508]

UDC: 615.31:547.562.2].015.25.012,1

SYNTHESIS AND PHARMACOLOGIC STUDY OF POLYFUNCTIONAL MACROHETEROCYCLES. PART 1. SYNTHESIS AND ANTIDOTE PROPERTIES OF 1,8-BIS (2-CARBOMETHOXYETHYLAMINO)-, 1,8-BIS(2-CYANOETHYLAMINO)3,6-DITHIAOCTANES AND DERIVATIVES OF 1,4,12,15-TETRATHIA-7,9,18,20-TETRAAZACYCLODOCOZANE

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 18, No 10, Oct 84 (manuscript received 26 Dec 83) pp 1224-1226

VORONKOV, M. G., KUZNETSOV, I. G., TIZENBERG, G. M., SUSLOVA, S. K., KNUTOV, V. I. and BUTIN, M. K., Irkutsk Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences

[Abstract] The ability of macroheterocyclic compounds to form stable complexes with heavy metal ions allows them to be used as antidotes in cases of poisoning with metal-containing toxic substances. To seek out antidotes of this type and determine their acyclic analogs, the authors synthesized 1,8-bis(2-carbomethoxyethylamino)- and 1,8-bis(2-cyanoethylamino)-3,6-dithiaoctanes (I and II), as well as derivatives of 1,4,12,15-tetrathia-7,9,18,20-tetraazacyclodocozone (III and IV) and studied their antidote

properties for mercuric chloride poisoning. Synthesis of open-chain derivatives of I and II was performed by interacting N-(carbomethoxyethyl) and N-(cyanoethyl) aziridines with 1,2-ethanedithiol. Their structure was confirmed by IR and PMR spectroscopy. Pharmacologic studies indicated that the open chain I and II diamines had 50 mg/kg high antidote activity, yielding 83.3% protective effect. Macroheterocycles III have 66.7% protective effect, whereas compound IV has no antidote activity. Antidote activity of I and II decreased significantly after six months of storage, whereas compound III retained an antidote activity of 33%. References 5 (Russian).  
[76-6508]

UDC: 615.322:582.866].07

CONTENT OF BIOLOGICALLY ACTIVE SUBSTANCES IN HIPPOPHEA RHAMNOIDES L. FRUITS IN NATURAL POPULATIONS OF ISSYK-KUL

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 18, No 10, Oct 84 (manuscript received 15 Nov 83) pp 1226-1228

MALENA, T. V., LYKOVA, R. V. and CHIGREVA, Ye. A., Przheval Zonal Experimental Station, All Union Institute of Medicinal Plants, Issyk-Kul Oblast, Kirghiz SSR

[Abstract] Studies of wild populations of *H. rhamnoides* L. were undertaken in 1977-1982 to determine forms of interest for cultivation. This work studied accumulation of biologically-active substances in the plants as a function of growing-location in the area. Significant variability in biological indices was observed in all groups of specimens taken. There are forms containing over 7% oil, particularly among those collected along the south shore of Issyk-Kul lake. This is an area of warm, dry climate, which has a favorable influence on accumulation of oil in the fruit. Particularly high contents of vitamin C are found in this area. References 12 (Russian).  
[76-6508]

POLYMERS AND POLYMERIZATION

UDC 541.64:532,72

ADSORPTION AND DIFFUSION IN SEMIINTERDIGITATING NETWORKS OF THREE-DIMENSIONAL  
POLYURETHANE AND LINEAR IONOMER

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 11, Nov 84  
(manuscript received 21 Mar 83) pp 2265-2271

LIPATOV, Yu. S., KARABANOVA, L. V., SERGEYEVA, L. M., GORICHKO, E. Ya,  
and SKIBA, S. I., Institute of Macromolecular Chemistry, Ukrainian SSR  
Academy of Sciences

[Abstract] Studies were conducted on the thermodynamic stability and benzene adsorption of a semiinterdigitating system of three-dimensional polyurethane and a linear ionomer (toluylenediisocyanate:polyhydroxytetramethylene = 3:2). Benzene adsorption isotherms for the linear ionomer were higher than for the polyurethane, and those for the mixed systems with different concentrations of the two components were higher still. The relative positions of the isotherms was indicative of the incompatibility of polyurethane and the ionomer. While the affinity of benzene for either component was quite similar on the basis of plot examination, the affinity of the semiinterdigitating networks for benzene was greater than of either component alone. Determinations of the free energy of mixing of polyurethane and the ionomer yielded positive values for all compositions, indicating that the system was thermodynamically incompatible. The addition of even small quantities of polyurethane facilitated association of the ionic centers in the inomer, with polyurethane behaving as a dispersed phase rather than forming a continuum. Phase dissociation of the mixed system leads to a transitional region with an excess of free volume. Figures 6; references 19: 11 Russian, 8 Western.  
[94-12172]

UDC 541.64:536.4

EFFECTS OF END GROUPS ON THERMAL DESTRUCTION OF AROMATIC POLYAMIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 11, Nov 84  
(manuscript received 27 Mar 83) pp 2279-2285

BOLDUZEV, A. I., KURGANOVA, M. N. and TEREKHINA, L. A., All-Union  
Scientific Research Institute of Synthetic Resins

[Abstract] A quantum chemical evaluation was conducted on the influence of end groups on the thermal destruction of various polyamides conducted at 300-380°C. Studies on poly-m-phenyl isophthalamide and its analogs, subjected to destruction under argon, indicated the importance of the end groups: they determine the bond strength of the nearest amide group (and, therefore, the rate of homolytic destruction), and are involved in water formation and accelerate destruction by hydrolysis. Analysis of volatile products of destruction (CO, CO<sub>2</sub>, H<sub>2</sub>O) showed that within the tested temperature interval much more water was produced than CO, indicating that destruction was largely heterolytic. As the temperature increases from ca. 320 to 370°C homolytic destruction gains in importance. In view of this, polyamides with blocked end groups should exhibit the greatest thermal stability within the range of temperatures tested. Under temperatures which favor a predominantly homolytic mechanism of polyamide destruction, polymers with end amino groups should prove more stable. Figure 1; references 15: 7 Russian, 8 Western. [94-12172]

UDC 541.64:539.3

INITIAL STAGES OF MECHANICAL DESTRUCTION OF AROMATIC POLYAMIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 11, Nov 84  
(manuscript received 8 Apr 83) pp 2326-2331

GAL', A. E., ZAKREVSKIY, V. A. and PEREPEL'KIN, K. Ye., Leningrad Branch,  
KHIMVOLOKNO Scientific Research Association

[Abstract] Detailed studies were conducted on the factors responsible for the initial stages of mechanical breakdown of aromatic polyamide fibers, with the stretching studies conducted at 300-500°K. Breakdown of the fibers was observed to follow kinetic parameters described by the Zhurkov equation. ESR studies on the free macroradicals produced by mechanical destruction indicated that the spectra obtained at 77°K under helium were consonant with disruption of the Ph-CO bond as the initial event in breakdown. Figures 3; references 15: 12 Russian, 3 Western. [94-12172]

UDC 541.64:542.952

IN SITU POLYMERIZATION IN HIGH-DENSITY POLYETHYLENE: POLYMER SYNTHESIS  
AND

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 11, Nov 84  
(manuscript received 3 Jun 83) pp 2374-2379

VOLYNSKIY, A. L., SHTANCHAYEV, A. Sh. and BAKYEYEV, N. F., Moscow State  
University imeni M. V. Lomonosov

[Abstract] In situ polymerization was employed with high-density polyethylene (HDPE) to study the suitability of this approach for the preparation of novel composite polymers. The composites were prepared by stretch deformation (100-400%) of HDPE films in selected monomers (styrene, n-butylmethacrylate, methyl methacrylate), followed by radical polymerization of the monomers. In this manner, HDPE-based compositions were obtained accommodating 20-50% of the second component. The content of the second component showed a gradual increase with the degree of stretching up to a stretch limit of ca. 200-250%. Low-angle x-ray diffraction and electron microscopy of the samples indicated that the synthesis of the compositions in question involved formation of structures with distinct chemical two-phase continuums. Wash-out of any component in a selective manner leads to the formation of a continuous, porous skeleton, but not to structural breakdown. Such compositions consist of three different phases: crystalline HDPE, amorphous HDPE and amorphous secondary component. Figures 3; references 24: 1 Polish, 12 Russian, 10 Western.  
[94-12172]

UDC 678.017

PHYSICAL-MECHANICAL PROPERTIES OF POLYMER MIXTURES PREPARED FROM HIGH  
DENSITY POLYETHYLENE

Baku AZERBAYDZHANSKIY KHMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
pp 81-85

KAKHRAMANOV, N. T., BURDZHALIYEV, D. A., ZAIDOVA, R. R. and ALIYEVA, A. R.,  
Azerbaijan Institute of National Economy imeni D. Buniatzade

[Abstract] Physical-mechanical properties of polymer mixtures of high density polyethylene (HDPE) with low density polyethylene (LDPE) or with ethylene propylene rubbers (EPR) were studied. HDPE with melting fluidity index of 2.2 g/10 min was used as well as EPR with M.W. 180,000 and LDPE with melting fluidity index 0.2 g/10 min. At a 30% concentration of EPR in HDPE a change in plastic deformation occurs to that of a highly elastic one. With a 50% content of LDPE in HDPE the force of impact and resistance to splitting of the polymer composition is increased. It was shown to be possible to improve considerably physical-mechanical properties of HDPE by

mechanical mixing. Figures 5; references 7 (Russian, 4 by Western authors).  
[91-7813]

UDC 677.494.743.41.022.6

EFFECT OF TWISTING ON BREAKING CHARACTERISTICS OF POLYARAMIDE FILAMENTS AND  
ORGANO-PLASTICS MADE FROM THEM

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84  
(manuscript received 6 Feb 84) pp 41-43

PAZHITNOVA, L. V., NETIRO, E. D., SHUSHARIN, L. G., KARCHMARCHIK, O. S.  
and DARVINA, V. V.

[Abstract] Aromatic polyamide filaments are used as reinforcement in composite materials. While it is shown that twisting of chemical fibers alters some of their properties such as increasing the breaking strength with no change in specific weight, no experimental material has yet been published on the effects of twisting filaments used in composite materials. In the present work a study was made of the breaking characteristics of aromatic polyamide filaments as a function of twist. It is shown that below a certain critical point, twisting significantly increases the breaking strength and decreases the coefficient of variation. The observed increase in tensile strength of microplastics based on these filaments is directly proportional to the increase in filament strength. Figures 2; references 8: 7 Russian, 1 Western.  
[119-12765]

UDC 677.494.675.1.017.55

EFFECT OF CERTAIN FACTORS ON CLARITY OF POLYAMIDE MONOFILAMENTS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84  
(manuscript received 21 May 84) pp 43-44

SEMENOVA, T. P., FIL'BERT, D. V., ISAYEVA, V. I. and SOBOLEVA, O. N.

[Abstract] Clear polycapraamide (PKA) monofilaments have been widely used during the past two decades in the textile, knitted wear, leather haberdashery and fishing industries. These filaments are made in the classical manner by cooling the freshly formed polymer stream in water followed by stretching in air. In the present work, the effects of the coolant temperature during the forming stage and the properties of the polymer on the clarity of the modified and unmodified PKA monofilament were studied. It is shown that clarity can be improved by employing a high viscosity polycapraamide with a low content of water-soluble compounds and by lowering the cooling temperature during the forming stage. Among the stabilizers used in the industry, stabilizer N-1



was found to have a negative effect on the clarity of monofilaments.  
Figures 3; references 8: 3 Russian, 4 Western.  
[119-12765]

UDC 677.494.675.017.001.5

#### PREPARATION OF POLYAMIDE MONOFILAMENTS FOR MICROSURGERY AND THEIR PROPERTIES

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 45-46

TIKHOMIROVA, N. V., TRUBITSYNA, N. I., NOVIKOVA, O. I., GAVRILYUK, N. N.,  
SERGEYEV, V. P. and MAL'CHEVSKIY, A. I.

[Abstract] Silk and catgut have numerous deficiencies for use as surgical thread, and synthetic fibers are preferred. The rapid development of microsurgery calls for new requirements such as small thread diameter (15-70  $\mu\text{m}$ ), color that contrasts with blood and resists the action of biological solutions and ease in tying knots. Threads such as these are not yet produced in the Soviet Union, although the technology exists. An analysis of the possible ways for producing and using polycapromide monofilaments in microsurgery is presented. The filaments were formed through spinnerets of one and 39 orifices by extrusion and stretching. Optimal forming conditions and the physical-mechanical properties of the monofilaments are presented. Colored monofilaments must be specially formed from colored bulk polymer. Figure 1; references 5 (Russian).  
[119-12765]

UDC: 541.183+532.783

#### STUDY OF WETTING OF ANISOTROPIC POLYMER SURFACES

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian No 5, Sep-Oct 84 (manuscript received 18 Nov 83) pp 24-27

LARIN, V. B., KOMAROV, V. S. and DANILOVICH, S. V., Institute of General and Inorganic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] A study was made of wetting of polymer surfaces with known surface topography and orientation of molecular chains of polyvinyl alcohol and tetrapolyfluoroethylene in the surface layer. PVA films were applied to substrates by pouring aqueous solutions and subsequent drying as the temperature rose from room temperature to 100°C in 1.5 hours. The polytetrafluoroethylene coatings were created by pouring an aqueous suspension of fluoroplast under a substrate with subsequent drying over 30 to 50 minutes at room temperature. The films were then heat treated at 270°C for 15 to 20 minutes. Substrates were polished quartz plates. The results of the study

indicate that anisotropy observed in contact wetting angle on the surfaces following shear deformation results from elastic deformation of surface layers. The slightly higher anisotropy of contact angles on film surfaces subjected to shear deformation in comparison to a monolayer is a result of differences in the modulus of elasticity resulting from the higher orientation order of molecules in monolayers. Figure 1; references 6: 4 Russian, 2 Western.  
[66-6508]

UDC: 678.676'126-278:66.067

#### PORE STRUCTURE OF POLYAMIDE MEMBRANES AND MECHANISM OF ITS FORMATION

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHTMICHENYKH NAVUK in Russian No 5, Sep-Oct 84 (manuscript received 4 Apr 84) pp 87-90

ARTAMONOV, V. A., KORSHUNOVA, T. A., MOSTOVLYANSKIY, O. A. and SOLDATOV, V. S.,  
Institute of Physical-Organic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] Microporous capron membranes formed from formic acid solutions of capron in aqueous solutions of acetic acid were used as an example to describe the structure of the membranes and present a hypothesis explaining the mechanism of its formation. The mechanism is one of practically simultaneous formation of the pore structure of polyamide membranes throughout the entire volume of the solution. Figures 3; references 14: 6 Russian, 8 Western,  
[66-6508]

UDC 678.744.32:66.095.262

#### SUSPENSION POLYMERIZATION OF ACRYLAMIDE

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 5-6

POLIKARPOV, V. V., SHAPIRO, L. V., LUKHOVITSKIY, V. I., POZDEYEVA, R. M.  
and KRYLOVA, L. A.

[Abstract] A method has been developed for the preparation of polyacrylamides in the form of 0.1-.5 mm granules or powders, with a view toward replacement of present stocks in the USSR shipped in the form of 7-10% aqueous acrylamide solutions. Suspension polymerization commences with a 20-70% aqueous acrylamide solution with NaOH (or Ca salt), which is emulsified with toluene or some other organic solvent containing fatty acid. The emulsion is stabilized with sodium or a calcium fatty acid salt which is formed during phase mixing, and which also serves to prevent aggregation of the granules during subsequent polymerization. Stabilization usually relies on fatty acid fractions with  $C \geq 12$  or higher, or on individual fatty acids (stearic, palmitic, etc.).

At temperatures below the Kraft point, water-in-oil type of emulsions are formed. On polymerization such drops harden and the emulsion becomes transformed into a suspension of polymer granules. Initiation of polymerization can be achieved with water-soluble peroxides (e.g., potassium persulfate) or gamma-irradiation. Polymerization follows S-shaped kinetics, indicating high initial rates of polymerization and subsequent slowdown as the monomer is depleted. The level of transformation reaches 93-95% in 2.5-3 h in this approach, with the production of high MW products. References: 4 Russian, 2 Western.  
[97-12172]

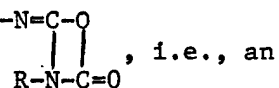
UDC 678,5:546.268.1:547.02

#### STRUCTURE OF PHOSPHOLENE-CATALYZED POLYISOCYANATE POLYMER

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 6-8

LESNEVSKAYA, L. V., LAZAREVA, S. Ya., MAL'KOV, Yu. Ye. and VILESOVA, M. S.

[Abstract] In view of the marked structural differences among polyisocyanate polymers prepared at different temperatures, IR spectroscopy was conducted on such polymers obtained at 30, 76 and 110°C to determine their structural features. Polymerization of methylene-1,1-bisphenyl isocyanate was carried out in  $CCl_4$  and catalyzed by 1-oxo-1,3-dimethylphospholene in an isothermal calorimeter until heat production ceased. The thermal effect of polymerization in all cases was equal to  $13,9 \pm 1.3$  kJ/mole of isocyanate groups. Analysis of the spectroscopic data demonstrated that at temperatures below 76°C groups other than carbodiimide predominate; these oxygen-containing groups are responsible for spectral anomalies at  $1680\text{ cm}^{-1}$ . The data were interpreted to indicate that one transition pathway from isocyanate to carbodiimide involves an asymmetrical dimer intermediate of the type



opening of the -N=C- and -C=O bonds. Figure 1; references 8: 6 Russian, 2 Western.  
[97-12172]

UDC 678.742.2:541.64:547.673

PHOTOSENSITIZED CROSSLINKING OF POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 8-10

ZAMOTAYEV, P. V., LITSOV, N. I., KACHAN, A. A. and PONOMAREVA, Ye. L.

[Abstract] The effectiveness of dyes in promoting crosslinking of polyethylene was tested with 2-ethylanthraquinone, benzophenone, anthrone and xanthone, and assessed in terms of the molar concentration of crosslinks. 2-Ethylanthraquinone and xanthone were the most efficient photosensitizers promoting crosslinking of polyethylene, with the yield of the gel fraction equivalent to that obtained with radiation-mediated crosslinking when the process was conducted in air. The mechanisms of polymer crosslinking involved initial photoreduction with the formation of macroradicals, and subsequent recombination of the latter to form the crosslinked structure. The yield of crosslinking bonds was significantly increased by oxygen, which increased the yield of macromolecules. Figure 1; references 15: 5 Russian, 10 Western.

[97-12172]

UDC 678.5.067.5.01:536

FATIGUE STRESS OF ORIENTED GLASS FIBERS

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 15-16

NATRUSOV, V. I. and BUGLO, S. T.

[Abstract] Tolerance of stress fatigue in glass fibers has been shown to be related to fiber diameter in an inverse manner in the case of stretching. To further define the factors that result in fatigue failure, a stretch-compress method has been devised for testing oriented glass fibers. In the case of a small number of transition cycles (1 to 100) the durability of the fiber increases by 50-60% as the diameter decreases from 24 to 10  $\mu\text{m}$ . When the number of stress cycles is increased to  $10^4$ , a maximum durability is obtained with fibers 16  $\mu\text{m}$  in diameter. These findings were ascribed to the number of defects which arise on the fiber surface and are related to fiber diameter, with the probability of microfissures increasing in direct proportion to the diameter, and the fact that on compression durability of such fibers is enhanced in direct proportion to the diameter. With stretch-compress cycles, durability was directly related to fiber diameter. The maximum durability at 16  $\mu\text{m}$  thus reflected interplay of opposing factors. The durability of such fibers also increased with a decrease in the temperature. These observations underline the fact that it is possible to select glass fibers with properties that will ensure maximum durability under defined fatigue stress conditions and temperatures. Figures 2; references 16: 13 Russian, 3 Western.

[97-12172]

UDC 678.742.2.01

PROPERTIES OF CHLORINATED POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 20-21

RONKIN, G. M.

[Abstract] Currently, some 49 industrial brands of chlorinated polyethylene are being manufactured the world over. The wide variety of properties assured by different degrees of chlorination assure a plethora of uses and applications for products that range from the extremely elastic to rigid and friable. These advantages of the chlorinated polyethylenes are coupled with prices that are 30-40% lower than for polychloroprene and other polymers. The properties and solubilities of the different brands are summarized in a tabular form, and indicate that they can be used in a variety of products currently relying on other plastics. In the USSR, the chlorinated polyethylenes are produced by chlorination of polyethylene with  $CCl_4$  in 3500 liter reactors, while in the USA and Great Britain suspension chlorination is employed. Figure 1; references 8: 6 Russian, 2 Western, [97-12172]

UDC 678.019.32

COLD CLIMATE AGING OF POLYMERS AND COMPOSITES

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 23-25

CHERSKIY, I. N., STARZHENETSKAYA, T. A. and SEMENOV, V. A.

[Abstract] A variety of polymers (polyamides, polyurethanes, etc.) and composites (KPS-30, etc.) were tested for aging under the cold climatic conditions prevailing in Yakutsk, the hot and dry climate of Tashkent, and the hot and humid conditions in Batumi according to GOST 9.703-79 procedures. Analysis of the physical and mechanical changes occurring after a period of 6 months and 1 year demonstrated that polymers deteriorate more significantly under hot and humid or dry conditions. The process of polymer aging involves exacerbation of existing defects and the appearance of new ones, with similar considerations applicable to composite polymers. Detailed studies with polyphenylene oxide reinforced with polystyrene at low temperatures ( $-60^{\circ}C$ ) showed temperature-related deterioration, indicating that prediction of actual performance of manufactured parts will require closer analysis of real working conditions, rather than extrapolations. Figures 2; references 4 (Russian). [97-12172]

UDC 678.019.3:678.742.2-413

CHEMICAL STABILITY OF POLYETHYLENE COATING

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 28-29

FROLOVA, M. K. and SHEVCHENKO, Ye. N.

[Abstract] Trials were conducted with high-density polyethylene (153-14; GOST 11262-80) to determine its suitability as a coating agent resistant to a wide variety of corrosive chemicals (NaOH, H<sub>2</sub>SO<sub>4</sub>, NaCl, cyanides, phenols, etc.). Exposure studies conducted for up to 9 months indicated that coatings made from 153-14 have a theoretical lifetime of 30-50 years at 30°C. The main factor in determining the useful lifetime of 153-14 coatings are the diffusion constants for the different solvents and their combinations. Even under extreme conditions, changes in the mechanical properties of the polyethylene sample under study did not exceed 20%. .References 2 (Russian). [97-12172]

UDC 678.742.2.01:539

CONTROL OF POLYETHYLENE STRUCTURE IN MOLDS BY SMALL THERMOPLASTIC ADDITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 33-36

SOYREF, D. A., AKUTIN, M. S., ABRAMOV, V. V., ZUBOV, Yu. A., CHVALUN, S. N., RYSIN, N. I. and SHIRETS, V. S.

[Abstract] Studies were conducted on the alterations and control of structural characteristics of low-density polyethylene molds by the addition of small quantities (10%) of thermoplastic materials. Analysis of the structural features of such materials and their mechanical properties showed marked improvement in their deformational characteristics, increased resistance to thermooxidative decomposition, and improved tolerance of mechanical stress. X-ray structural analysis has shown that small quantities of the additives diminish the structural gradient along the path of the mold as it is poured and, thereby, the density differences in the different parts of the mold. The effectiveness of the additives in small quantities is evidently due to nonadditive changes in the rheologic and relaxational properties of the polymer. Figures 2; references 31: 15 Russian, 16 Western. [97-12172]

UDC 678.746.22.004.6

COMPOSITE MATERIAL FROM CELLULAR POLYSTYRENE BY-PRODUCTS

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 39-40

BELOTSKAYA, L. M. and YEKIMENKO, N. A.

[Abstract] A novel composite was prepared from the by-products of cellular polystyrene, using polyacrylonitrile fibers as fillers. Structural and physicomaterial analysis of the composite material, containing 30-50% polyacrylonitrile fibers, were most refractory to destruction by mechanical stress (17-47 mPa in different tests), exhibited a thermal conductivity coefficient of 0.05-0.22, and a density of 780-1020 kg/m<sup>3</sup>. The composite was water-stable and deemed suitable for the manufacture of pipes, sheet plates for walls and floors, and various insulating materials, Figure 1; references 9: 8 Russian, 1 Western.

[97-12172]

UDC 678.614.841.12

FLAMMABILITY OF HIGHLY FILLED FURAN POLYMER COMPOSITES

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 51-52

VOGMAN, L. P., NOVIKOV, A. I., FILIN, L. G. and SHVAYKO, T. Yu.

[Abstract] The combustibility and mechanical strength of polimerbeton (PB) [polymer concrete], a composite with furan polymers, was tested to determine its suitability for a wide variety of constructions. Increasing the content of inert materials and the addition of fire retardants lowered the inflammability of the various samples tested, with the addition of 10% 2,4,6-tribromoaniline shown to be the most effective retardant. In addition, the ignition time of PB was delayed three-fold, without a concomitant change in the strength characteristics. Figure 1; references 3 (Russian).

[97-12172]

UDC 678.5:667.621.263.4:63

WATER-SOLUBLE CELLULOSE ETHERS FOR SEED PRETREATMENT

Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 84 pp 53-54

VINOGRADOV, S. V., YURKOVA, A. P., KLIMOVA, V. A., POGOSOV, Yu. L.,  
MALININ, L. N., PROKOF'YEVA, M. V. and SHIROKOV, Ye. P. (deceased)

[Abstract] Various parameters that enter into the production of hydroxypropyl methylcellulose were analyzed, with a view toward the suitability of seed treatment prior to planting. The samples tested were prepared from methylcellulose, employing 1,2-propylene glycol as the plasticizer and dimethylolurea as the crosslinking agent. Studies on the 20-40  $\mu\text{m}$  thick films showed that the physicomachanical properties of hydroxypropyl methylcellulose render themselves to easy manipulation, and that their solubility in water can easily be lowered from 98-99% to 3-6%. Figure 1; references 4: 1 Russian, 3 Western.

[97-12172]



RADIATION CHEMISTRY

UDC 541.15

DOSE EFFECTS IN METHANOL RADIOLYSIS AT 20-300°C

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 11 Feb 83) pp 483-488

KOVALEV, G. V., BATYUK, S. A., KALYAZIN, Ye. P. and BUGAYENKO, L. T., Moscow State University imeni M. V. Lomonosov

[Abstract] Formation of radiolytic products was studied in relation to radiation dose and temperature in the 20-300°C interval during irradiation of methanol with  $5.6-1.12 \times 10^7$  Gy/sec with Co-60 gamma rays or accelerated electrons. Analysis of the first, second and third generation products demonstrated that product yield increased at all doses with an increase in temperature. In terms of the major products--formaldehyde (FA) and ethylene glycol (EG)--only FA accumulation was affected by the increasing irradiation dose at room and elevated temperatures. In addition, lag in FA accumulation was more pronounced at the room temperature. Therefore, the kinetic data indicate that EG is not destroyed by the  $\dot{\text{C}}\text{H}_2\text{OH}$  radicals, but by active radicals, while FA is destroyed to a large extent by the  $\dot{\text{C}}\text{H}_2\text{OH}$  radicals. At room temperature the FA is in the semiacetal form and the presumed reaction is  $\text{CH}_2(\text{OH})\text{CH}_3 + \dot{\text{C}}\text{H}_2\text{OH} \rightarrow \dot{\text{C}}\text{H}(\text{OH})\text{OCH}_3 + \text{CH}_3\text{OH}$ . At elevated temperatures, destruction of the desolvated FA apparently proceeds as follows:  $\text{CH}_2\text{OH} + \text{CH}_2\text{O} \rightarrow \text{CH}_2(\text{OH})\text{CH}_2\text{O}$ . Consequently, variation of the dose at constant temperature leads to effects dependent on the transformation of EG and FA. Figures 3; references 14: 10 Russian, 4 Western.  
[95-12172]

UDC 541.15

RADIOLYTIC OXIDATION OF METHANOL BY  $\text{CCl}_4$ : MOLECULAR AND RADICAL PRODUCT  
YIELDS AND  $\text{CCl}_3/\text{CH}_3\text{OH}$  REACTION RATE CONSTANT

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 14 Feb 83) pp 489-495

KOVALEV, G. V., KARASEV, A. L., BUGAYENKO, L. T. and KALYAZIN, Ye. P.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] Quantitative determinations were made of the course of methanol oxidation by  $\text{CCl}_4$  following gamma irradiation of a  $\text{CH}_3\text{OH}/\text{CCl}_4$  system within the dose range of  $(1.9-40) \times 10^3$  Gy (1.1 Gy/sec). The radiolytic reaction followed the scheme  $\text{CH}_3\text{OH} + \text{CCl}_4 = \text{CH}_2\text{O} + \text{HCl} + \text{CHCl}_3$ , involving the chain reaction mechanisms of  $\dot{\text{C}}\text{H}_2\text{OH} + \dot{\text{C}}\text{Cl}_4 \rightarrow \text{CH}_2\text{O} + \text{CHCl}_3 + \dot{\text{C}}\text{Cl}_3$  and  $\dot{\text{C}}\text{Cl}_3 + \text{CH}_3\text{OH} \rightarrow \text{CHCl}_3 + \dot{\text{C}}\text{H}_2\text{OH}$ . The yield of radicals in the system was determined at  $G = 8.8 \pm 0.8$  particles per 100 eV of absorbed energy. The rate constant for the reaction of  $\dot{\text{C}}\text{Cl}_3$  with  $\text{CH}_3\text{OH}$  was calculated as  $4.8 \pm 1.1$  liters/(mole·sec), with the yield of primary radicals ( $\text{CH}_3\dot{\text{O}}$ ,  $\text{OH}$ ,  $\dot{\text{C}}\text{H}_2\text{OH}$ ) in pure methanol calculated at  $G = 4.5 \pm 0.4$  particles. Figures 2, references 18: 5 Russian, 13 Western.

[95-12172]

UDC 541.15

IMPULSE RADIOLYSIS OF CONCENTRATED HYDROCHLORIC ACID

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 13 Jan 84) pp 496-501

GOGOLEV, A. V., MAKAROV, I. Ye. and PIKAYEV, A. K., Institute of Physical  
Chemistry, USSR Academy of Sciences

[Abstract] Mechanisms of impulse radiolysis of concentrated HCl were investigated by subjecting the solutions (1 to 13 moles/dm<sup>3</sup>) for 2.3 sec to 5 MeV linearly accelerated electrons, for a total dose of 5 to 30 Gy. Within the HCl concentration range of 4-7 moles/dm<sup>3</sup> the  $\text{Cl}_2$  yield ( $G(\text{Cl}_2)$ ) was calculated as 3.4  $G(\text{Cl}_2)$  rose as the concentration of the hydrochloric acid increased as a result of reaction of hydrogen atoms with undissociated HCl. In the presence of chlorine  $G(\text{Cl}_2)$  approached 8.5-9 as a result of the reaction of chlorine with the hydrogen atoms. The rate constants for the  $\text{Cl}_2 + \dot{\text{C}}\text{H}_2$  reaction in 1 and 12 moles/dm<sup>3</sup> HCl were, respectively,  $3.7 \times 10^9$  and  $2.0 \times 10^9$  dm<sup>3</sup>/mole·sec. For the reaction of hydrogen with  $\text{Cl}_2$  ( $\dot{\text{C}}\text{H}_2$ ) in 1 and 2 mole/dm<sup>3</sup> HCl solutions, the respective rate constants were  $6 \times 10^{10}$  and  $2 \times 10^{10}$  dm<sup>3</sup>/mole·sec. Figures 4; references 20: 11 Russian, 9 Western.

[95-12172]

UDC 541.15

RADIOCATALYTIC BEHAVIOR OF  $Me^{2+}$  -  $SiO_3$  SYSTEM IN WATER RADIOLYSIS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 19 Aug 83) pp 502-505

GARIBOV, A. A., BAKIROV, M. Ya., DZHAFAROV, Ya. D. and VELIBEKOVA, G. Z.,  
Radiation Research Section, Azerbaijan SSR Academy of Sciences

[Abstract] The kinetics of gamma radiation (Co-60)-induced radiolysis of water in the presence of  $Me^{2+}$ - $SiO$  catalysts were established to be dependent on the nature of the cation ( $Me^{2+}$ ) in the system. At room temperature, the key factor in radiolysis of water was the force of adsorption of water to the surface of the silicate, which was proportional to the ionic radius of the cation. As the ionic radius of the cation decreases, the catalytic efficiency of the silicate improves. In addition, the acceptor properties of the catalysts were markedly enhanced by incorporation of  $Al^{3+}$ , which facilitated the transfer of the ionizing radiation energy to the water molecules, thereby improving the efficiency of the process as measured by hydrogen production. References 10 (Russian).  
[95-12172]

UDC 541.15

STATUS OF SURFACE WATER ON OXIDES SUBJECTED TO LOW-DOSE RADIATION

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 18, No 6, Nov-Dec 84  
(manuscript received 4 Jan 84) pp 551-552

BAKLACHEV, E. A., BEYLERYAN, N. M. and KAZARYAN, N. M., Yerevan State  
University

[Abstract] Effects of gamma irradiation on oxide surfaces (Aerosil-A-175, silica powder) was evaluated in terms of water desorption at various temperatures, as well as in terms of triethanolamine adsorption. Gamma irradiation from a Co-60 source in doses of 50-500 Gy (1 Gy/sec) enhanced water loss in the temperature ranges of 20-550°C and 350-550°C, with maximum desorption obtained at both temperature intervals with 100 and 150 Gy irradiation. In addition, in the temperature range of 350-550°C maximum water desorption and triethanolamine adsorption per 100 eV of absorbed energy occurred in an oxygen atmosphere. These findings demonstrate that oxide surfaces can readily be altered by low-dose irradiation, and that maximum effects are obtained under oxygen. References 5 (Russian).  
[95-12172]

RUBBER AND ELASTOMERS

UDC: 678.7

ROLE OF WATER IN EPOXIDATION OF ETHYLENE-PROPYLENE RUBBER BY PERFORMIC ACID IN SITU

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 4 May 83) pp 2324-2329

RYABOVA, M. S., VOLIN, Yu. M. and LAZAREV, S. Ya., Leningrad Technologic Institute imeni Lensovet

[Abstract] A study was made to determine the reasons for the low rate of epoxidation of ethylene-propylene raw rubber by performic acid in situ and to seek a method of increasing the effectiveness of the single stage method of epoxidation of unsaturated raw rubber by performic acid. Ethylene-propylene rubber type SKEPT-E was used with 41 mol.% propylene, 55.9 mol.% ethylene and 3.1 mol.% ethylidene norbornene. The molecular weight was 8000, viscosity 360 Pa·s (50°). Epoxidation reagents were formic acid, acetic acid, acetic anhydride and 30% aqueous hydrogen peroxide. Solvents included benzene, toluene and hexane. Epoxidation was performed in a flask equipped with a stirrer and reflux cooler. The water was found to have a retarding effect on the reaction. Epoxidation was significantly accelerated, by up to a factor of 10, decreasing the water concentration by adding acetic anhydride as a dewatering agent. It was found that the presence of water decreases the difference in effects of solvent on the rate of deposit. The maximum reaction rates were obtained by the use of CCl<sub>4</sub> as a solvent, in a number of the nonpolar solvents studied. Figures 4; references 21: 12 Russian, 9 Western.  
[75-6508]

UDC: 678.7

INFLUENCE OF ACETIC ANHYDRIDE AS DEWATERING AGENT ON EPOXIDATION OF UNSATURATED RAW RUBBER BY PERFORMIC ACID IN SITU

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 1 Jul 83) pp 2329-2334

RYABOVA, M. S., VOLIN, Yu. M., and LAZAREV, S. Ya., Leningrad Technologic Institute imeni Lensovet

[Abstract] The purpose of this work was to demonstrate the advantages of using acetic anhydride for in situ epoxidation of unsaturated raw rubbers by performic acid. Liquid cis-1,4-polybutadiene with a viscosity of 0.7-0.8 Pa's and initial unsaturation level 40.6 weight % was used for epoxidation, as was ethylene-propylene raw rubber type SKEPT-E with initial unsaturation 2.4 weight %. Acetic anhydride introduced in large quantities to dewater the system is not only a reagent but also the reaction medium. Experiments showed that the use of acetic anhydride increases the rate of the process by a factor of 5 to 10 in comparison to the standard formula with acetic acid. The accelerating effect of acetic anhydride results from a decrease in the content of the water in the system and an increase in the concentration of peracid molecules with the intramolecular hydrogen bond. Introduction of large quantities of acetic anhydride allows single stage epoxidation by peracid under mild conditions without decreasing selectivity. Figures 2; references 10: 6 Russian, 4 Western.  
[75-6508]

UDC 678.742-945.245.32

UTILIZATION POTENTIAL OF CHLORINATED POLYETHYLENE IN PRODUCTION OF RT1

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 4-7

SHUGAYEVA, I. V., SOROKIN, G. A., DONTISOV, A. A., and TEREENT'YEVA, O. G., Scientific Research Institute of Rubber Industry

[Abstract] Chlorinated polyethylene (CPE) has properties similar to polychloroprene (PC) and could be considered as a possible substitute for it. An attempt was made to develop more complete data on rubbers containing CPE, on its vulcanization and covulcanization with other rubbers. It was difficult to find an optimal vulcanizing system for CPE. Hard vulcanizates with high resistance to tearing could be obtained with nonperoxy systems: salt of hexamethylenediamine and sebacic acid (SH), SH-sulfur, thiate-H, thiate-H-sulfur, etc. but already at -20°C they were not capable of performing. Peroxide system yielded vulcanizates with good strength, resistance to thermal aging but poor elasticity, especially below -15°C, while RTI require that elasticity be maintained to -45°C. Addition of plasticizers like dioxysebacinate did not improve their elasticity. Analysis of laboratory and

industrial data showed that CPE cannot replace fully the PC in production of RTI; it can only be used as partial substituent up to about 5% level. Figures 2; references 2: 1 Russian, 1 Western.  
[92-7813]

UDC 678.684.82:542.91

INVESTIGATION OF VULCANIZATION KINETICS OF LIQUID THIOCOLS BY NUCLEAR MAGNETIC RESONANCE METHOD

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 9-11

MINKIN, V. S., AVERKO-ANTONOVICH, L. A., SAFINA, N. P. and SUKHANOV, P. P.

[Abstract] On the basis of impulse NMR technology, an accurate method was developed for evaluation of the activity of vulcanizing pastes and for estimation of life expectancy of compositions as well as the time of their solidification reaction completion. The method was based on determining nuclear spin-spin relaxation  $T_2$  during vulcanization. Life expectancy and physical-mechanical properties of the vulcanizates determined by industrially accepted methods were analyzed, showing that various batches containing different levels of  $MnO_2$  had different properties related evidently to the content of  $MnO_2$ . It was also shown that gel formation point could be accepted as an objective measure of life expectancy of the hermetic seals and, furthermore, that this point could be accurately and objectively determined from the  $T_2$  spin-spin relaxation time. Figures 2; references 2 (Russian).  
[92-7813]

UDC 678:063.678.01:537.311

EFFECT OF FILLER CONTENT ON ELECTRIC RESISTANCE CHANGES DURING DEFORMATION OF ELECTROCONDUCTING SILICONORGANIC ELASTICS

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 16-18

ANELI, D. N., PAGAVA, D. G., TOPCHIASHVILI, M. I. and KHUBAYEVA, E. D., Georgian Scientific Research Institute of EGS [expansion unknown]

[Abstract] The title problem has been studied inadequately until now. Samples in form of spatulas were prepared from electroconducting silicon-organic elastic based on polydimethylvinylsiloxane (SKTV) filled with technical carbon. The samples were tested on a breaking machine registering mechanical load during deformation under various stretching rates. It was shown that during the stretching of rubber two competing processes occur in it: breakdown and formation of conducting chains. Changes in  $p_v$  of the material tested depend on which of these processes predominates. Deformation

rate of the material also exhibited an effect on  $p_v$  either during the stretching or during the contracting process. Thus, it was concluded that the dependence of  $p_v$  in electroconducting elastics on the content of a filler is due to the effect of the latter on the structure formation of the material tested. Figures 4; references 5: 4 Russian, 1 Western.  
[92-7813]

UDC (628.511:577.511).004.82:578.067.4

INFLUENCE OF ASBESTOS DUST ON PROCESSING EFFECTIVENESS AND PROPERTIES OF POWDERY ASBOMIXTURE COMPOSITIONS

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 20-22

LAVROVA, L. M. and BORODULIN, M. M.; All Union Scientific Research Institute of Asbestos Technical Products

[Abstract] Currently the replacement of the starting material for asbestos technical products, which is in short supply, creates an everyincreasing problem. This study was designed to evaluate the potential of replacing this short-supply commodity with asbestos dust, to study its effect on physical-mechanical properties of the end product and to evaluate the processing characteristics. Asbestos dust was the material passing through a 0.25 mm sieve. Analysis of the experimental data showed that replacement of asbestos with asbestos dust is practical in that a deficit crude is being saved, and also in that the preparation of mixtures is shortened while maintaining the quality of asbovulcanizates on the level comparable to that obtained by standard processes. Figures 3; references 6 (Russian).  
[92-7813]

UDC 678.4.067.4:678.031:678.023.3

PREPARATION OF ASBOMIXTURES FOR PRODUCTION OF FRICTION MATERIALS USING LATEX BINDER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 22-23

LAVROVA, L. M., BORODULIN, M. M., STAZHKOVA, Ye. P. and ZASOVA, V. A., All Union Scientific Research Institute of Asbestos Technical Products

[Abstract] It was of interest to study the preparation of asbomixtures based on a latex binder. A serially-produced mixture composition was selected, developed for break linings. Butadiene-nitrile latex was used as the binder. The mixtures were prepared using powder technology and laboratory mixers. The density of powdery compositions based on the latex was greater than that of the compositions containing ground rubber, hence more of the material could be loaded into the mixers thus adding to the efficiency of

the process. The end products prepared from the latex containing mix had similar physical-chemical and frictional properties in comparison to the controls except that they were more stable. Thus it was shown that latex binder could be used in preparation of asbopolymer mixtures with frictional utilization. Figures 4; references 3 (Russian).  
[92-7813]

UDC 678,06/677:546.212:536.423.18

#### STABILITY OF MEMBRANE SHEETS IN OVERHEATED WATER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 84 pp 27-29

RAKHMAN, M. Z., MALKINA, L. B. and VAKORINA, M. V., Leningrad Branch of All Union Scientific Research Institute of Rubber Industry

[Abstract] Rubber-fabric membranes capable of performing at 125-150°C in overheated water with oil admixtures are widely used in industry. Because of the fact that their performance capability is related to lining rubber reinforcing the fabric and to the strength of the adhesive binding, changes in membrane fabric from aliphatic and aromatic polyamide fibers were studied as a function of the filler, the vulcanizing group and various treatment methods used with the fabric. Analysis of experimental data showed that rubber-fabric membrane sheets impregnated with effective vulcanizing group (EVC) containing mixtures were not stable in overheated water, resulting in a distinct layering effect of the material tested. Improved stability in overheated water was observed in membrane sheets based on aliphatic or aromatic polyamide fibers (capron up to 125°C and SVM up to 150°C) with rubber lining from SKN-26M obtained by vulcanization in a system consisting of p-2uinoedioxime + peroxyon F-40 + iron oxide, Figures 3; references 8 (Russian, 1 by Western authors).  
[92-7813]

UDC: 541.64:546.215:547.315.3

#### ROLE OF ALCOHOL IN RADICAL POLYMERIZATION OF ISOPRENE INITIATED BY HYDROGEN PEROXIDE

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B; GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE in Russian No 10, Oct 84  
(manuscript received 2 Feb 84) pp 34-37

GRISHCHENKO, V. K., BOYKO, V. P., VALUYEV, V. I. and DMITRIYEVA, T. S., Institute of Chemistry of High Molecular Weight Compounds, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A previous work had established that during polymerization of isoprene in a solution of isopropyl alcohol the oligomer includes fragments



of isopropanol with terminal tertiary hydroxyl groups. Every second oligomer molecule contains one tertiary hydroxyl group regardless of the molecular mass of the oligomer and degree of conversion of the monomer. In order to determine whether these regularities are general in nature, polymerization of isoprene was studied with isopropyl, methyl and ethyl alcohols as solvents, labeled with  $^{14}\text{C}$ . Polymerization was performed at 363 K. The functionality, determining the number of terminal alcohol fragments per oligomer molecule, was near 0,5 for both methanol and isopropanol. the ethyl alcohol functionality was slightly lower--about 0.4. The functionality as calculated by the results of acetylation of hydroxyl groups increases with increasing molecular weight. Oligomer fractions of high molecular weight therefore contain branched molecules with high functionality resulting from the reaction of chain transmission to the polymer by the primary hydroxyl radicals. When isoprene is polymerized in an alcohol solution, the fragments with terminal hydroxyl groups are introduced in the stage of initiation of polymerization by the alcohol radicals formed upon reaction of hydrogen peroxide with the alcohol. Figure 1; references 4: 2 Russian, 2 Western,  
[73-6508]

UDC: 678.43:678.01:53

POSSIBLE USE OF POLYMER FOAM WASTES BASED ON POLYVINYL CHLORIDE AND BUTADIENE-NITRILE RUBBER MIXTURE VULCANIZATE

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 4-6

MEL'NIK, L. A., VIKHIREVA, N. P. and SHCHERBINA, I. V., Scientific Research Institute of Rubber [Kazan Branch?]

[Abstract] A discussion is presented of problems of utilization of wastes consisting of elastomer-polymer compositions as fillers. Mixtures were prepared by rolling at 90-100°C after preliminary expansion in a plasticizer and vulcanized in a press at 160°C for 20 minutes. Fillers were used both as produced and after crushing by repeated passage through rolls with a gap of 1-3 mm at 90-100°C. The data obtained indicated the need for preliminary crushing of wastes before use as fillers. The filler was found to decrease foaming height, increase apparent density while leaving the properties of the filled vulcanizate almost unchanged. The filler is therefore inert in the polymer system studied. Up to 30% ground vulcanizate can be used in the manufacture of polymer foam materials based on polyvinyl chloride and butadiene-nitrile rubber. Figures 2; references 9 (Russian).  
[82-6508]

UDC: 678.033:621.9.01(04)

STUDY OF PROCESS OF HIGH SPEED BREAKING OF RUBBER MIXTURES WITH VARIOUS DEGREES OF STRUCTURE AND COMPLEX LOADING

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 8-10

SOLOV'YEV, Ye. M., AREF'YEV, N. V., BORISOV, Ye. M. and OVCHINNIKOVA, V. N., Yaroslavl Polytechnic Institute

[Abstract] A study was made of the influence of design and technological parameters of the process on the force and specific work of cutting of rubber with various degrees of vulcanization. Studies were performed at an installation modeling the breaking of materials in cutting type grinders, allowing recording of the force and deformation during breaking of a specimen at constant deformation speed between 0.1 and 65 m/s with various angles of blade rotation. As the cutting speed increases between 5 and 30 m/s, cutting force decreases for all rubber types tested. At speeds below 5 m/s, the specimen is not fully cut. Increasing speed decreases deformation before fracture. Cutting force varies directly with the degree of cross linking, less so at higher cutting speeds. Cutting force decreased with increasing blade rotation angle up to about 10°, after which cutting force increased. A speed of 3 m/s and a blade rotation of 10° are considered optimal for cutting of all rubbers, regardless of degree of vulcanization. Figures 3; references 4 (Russian).

[82-6508]

UDC: 678.664.01

STUDY OF INFLUENCE OF STRUCTURE OF SEGMENTED ELASTOMERS ON THEIR DEFORMATION PROPERTIES

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 13-15

DRONOV, S. V., MATYUSHOV, V. F. and LUNEVA, N. A., Kiev Branch, All-Union Scientific Research Institute of Polygraphy

[Abstract] A study is presented of the physical and mechanical properties of reticular polyurethanes obtained from unsaturated segmented oligourethane-urea methacrylate with formed domain structure. UV radiation was used to polymerize the oligomers at the double bonds without breaking the structure. For comparison, a polymer based on oligourethane acrylate with  $n=2$  was also studied, utilizing triethylene glycol as an elongator during synthesis. The results of determination of the concentration of gel fraction of the polymers indicate an imperfection in the process of three-dimensional polymerization, resulting from the low concentration of double-bonds. The chemical network is found to have a significant influence on the formation of the domain structure. The strength characteristics of polyurethane urea methacrylates are determined by the structure of the chain elongator and concentration of rigid blocks and correlate with the physical bond network

density. The formation of the domain structure in the oligomer stage before formation of the chemical network allows maximum realization of the capability of the network of physical bonds to improve physical and mechanical properties. Figures 2; references 7: 3 Russian, 4 Western.  
[82-6508]

UDC: 678.763.2:620;193,418.001.5

STUDY OF THERMAL STABILITY OF KR NAIRITE COMPOSITIONS WITH CHLOROCARBOXYLATED POLYETHYLENE

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 15-16

PIROYEVA, I. M., MKHCHYAN, S. A., SELIMYAN, A. Ye. and KABALYAN, Yu. K., Yerevan Department, All-Union Scientific Research Institute of the Cable Industry

[Abstract] A composition consisting of type KR nairite plus chlorocarboxylated polyethylene (CCPE) was prepared on laboratory rolls at 30+5°C. Thermograms of individual polymers and polymer mixtures were measured at 20-500°C in air. Dielectric characteristics were determined over a broad temperature range using film specimens 0.3 to 0.6 mm thick. Films were obtained by dissolving the mixture in chloroform, pouring the solution out onto a cellophane film and removing the solvent at room temperature. The results of the studies show that the compositions with up to 30% CCPE have superior properties in comparison to individual polymers and can be used in the production of technical rubber and cable products. Figures 3; references 5 (Russian).  
[82-6508]

UDC: 678.7.046:539.612

MODIFICATION OF RUBBERS WITH EPOXYOLIGODIENES

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 18-20

OSOSHNIK, I. A., SHEIN, V. S., SKOPINTSEVA, N. V., Voronezh Institute of Technology

[Abstract] A study was made of the interaction of a combination of low- and high-molecular weight rubbers with reactive coagents and its influence on properties of the rubbers. The reactive coagent, hexachloroparaxylene or m-phenylene-bis maleinimide, interacted with both low and high molecular weight raw rubber. The coagent was partially utilized in lengthening molecular chains of both the polymer and the ESKDP-N low molecular weight rubber with epoxy groups. Tire tread rubber with the dual modifying system ESKDP-N plus hexachloroparaxylene was found to have better wear properties, higher hardness and less elongation. Usage of one part by weight ESKDP-N

with one part hexachloroparaxylene decreased wear by 14% while increasing force required for 300% elongation by 23% and hardness by 20%. Figure 1; references 8 (Russian).  
[82-6508]

UDC: 678.4.049.93:678.027.7:625.2-597.3

USE OF STABLE AQUEOUS DISPERSION OF CALCIUM STEARATES AS PRESS MOLD LUBRICANT FOR FORMATION OF ASBESTOS FRICTION PRODUCTS

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 27-28

MANTSEV, V. S., TROITSKAYA, M. A. and BUGROVA, M. V., All-Union Scientific Research Institute of Asbestos Technical Products

[Abstract] Various surface-active agents as well as additives, including some which changed the pH of the medium, were tested for their ability to improve the stability of a dispersion of calcium stearates, since untreated dispersions were unstable (80% of calcium stearate particles precipitated within one day). It was found that the use of a combination of OP-10 and sodium carbonate yielded very stable dispersions with good antiadhesion properties. Optimal concentrations were found to be: calcium stearate 47%, calcined soda 40%, OP-10 13%. Figures 3; references 9 (Russian).  
[82-6508]

UDC: 678.747.01.536.485

DETERMINATION OF OPTIMAL CONCENTRATION OF DIBUTYLSEBACINATE IN CREATION OF FROST-RESISTANT RUBBERS

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 33-36

NIKOLAYEVA, Yu. K., KUCHERSKIY, A. M., ZAKHARENKO, N. V. and DONTSOV, A. A., Scientific Research Institute of Rubber and Latex Products, Scientific Research Institute of the Rubber Industry

[Abstract] A study was made of frost resistance in the temperature range from 23°C to the glass point of unfilled rubbers based on nonpolar butadiene-styrene and polar butadiene-nitrile raw rubbers. The content and type of vulcanizing agents were varied to vary the elasticity modulus and the grid structure. The plasticizer was introduced by the swelling method, which helped to increase frost resistance. The DBS content corresponding to the maximum on the curve of frost resistance coefficient did not depend on the type of vulcanization system used. It increased upon transition from nonpolar to polar raw rubbers. The influence of temperature and plasticizer concentration was felt through the same mechanism, increasing flexibility of chains and decreasing intermolecular interaction between them. The frost

resistance of rubbers plasticized with DBS was found to depend on concentration of plasticizer, type of polymer, elasticity modulus of rubber and type of vulcanization grid, as well as test temperature. Figures 2; references 6 (Russian).  
[82-6508]

UDC: 678.019.391

STUDY OF POSSIBILITY OF MAINTAINING CONSTANT MOISTURE CONTENT OF POLYMER MATERIALS IN ACCELERATED CLIMATE TESTING

Moscow KAUCHUK I REZINA in Russian No 10, Oct 84 pp 36-37

FIDLER, Kh. N., KHACHATUROVA, O. A., ZAMBAKHIDZE, D. V. and ELIASHVILI, I. A., VNIISM Institute [Expansion unknown], "Isari" Scientific Production Association

[Abstract] A method is suggested for maintaining constant moisture content in polymer materials during accelerated climatic testing at elevated temperatures. The essence of the method is to determine moisture content of the air in the working volume of the climatic chamber at each of the assigned test temperatures such as to assure the mass fraction of water in the material is equivalent to the equilibrium moisture content under the suggested storage and testing conditions. To do this, specimens are conditioned in climatic chambers at the temperature and relative humidity of the air corresponding to normal storage and use conditions. Conditioning is continued until the moisture content of the specimen stabilizes, monitored by periodic weighing at intervals of 72 hours. Specimens are then exposed to the higher test temperatures at relative humidities ranging from 60 to 96%, then each 72 hours the specimens are removed from the chambers, cooled within 30 minutes to  $20 \pm 2^\circ\text{C}$  and weighed again. In this manner, the relative humidity required to maintain the same moisture content in the specimens can be determined for different temperatures. For many polymer materials at temperatures of  $80^\circ\text{C}$  and higher it is impossible to create conditions which will maintain the same constant moisture content as at  $20^\circ\text{C}$ . Figure 1.

[82-6508]

WATER TREATMENT

UDC: 628.3:628.16.081.3

PURIFICATION OF WASTE WATER FROM PRODUCTION OF NITROBENZENE BY ADSORPTION  
ON POLYMER SORBENT

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 11 Feb 83) pp 2225-2229

EL'BERT, A. A., SHLOMA, E. N. and BOGUDLOVA, D. D., Scientific Research  
Institute of Organic Semiconductors and Dyes

[Abstract] This work is directed toward creation of a new method of purification of waste waters from the production of nitrobenzene. The work was performed in two stages: laboratory and pilot-scale industrial studies. Laboratory studies utilized the domestic polymer sorbent S 40/100. Adsorption was performed in glass columns 14 mm in diameter with 90 mm sorbent-layer height. It was found that increasing the feed rate to over  $7 \text{ hr}^{-1}$  resulted in a significant decrease in dynamic capacity to breakthrough and a decrease in the quantity of waste water which could be purified effectively in one cycle. The pilot-scale installation utilized a glass column with an inside diameter of 35 mm, sorbent-layer height 700 mm. Waste water was fed from the top down at 3 to  $13 \text{ hr}^{-1}$ . Regeneration was performed by methanol at a feed rate of  $1-2 \text{ hr}^{-1}$ . Nitrobenzene breakthrough occurred significantly later and adsorption was more effective on polysorb than was the case for nitrophenols. Adsorption on the polymer sorbent is quite different from adsorption on activated carbon; diffusion of sorbed substances in the pores of the sorbent into the structure of the polymer, causing swelling, is quite probable. The concentration of nitrophenols in the purified water increases with increasing initial concentration both of nitrophenols and of the sum of nitrophenols plus nitrobenzene. The nitrophenols are the limiting components, causing first breakthrough. Regeneration was found to be complete and effective at  $1 \text{ hr}^{-1}$  using 900 ml of methanol. It is recommended that regeneration be performed with 750 ml methanol, 1.1 times the volume of sorbent in the column. Figures 2; references 10: 2 Russian, 8 Western.  
[75-6508]

UDC: 628.543

ELECTRIC TREATMENT OF OIL-EMULSION WASTE WATER WITH ASYMMETRICAL CURRENT

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 10, Oct 84  
(manuscript received 25 Jan 83) pp 2380-2382

KHALTURINA, T. I., PAZENKO, T. Ya., ZOGRAF, G. M., STAFEYCHUK, L. V. and  
ALEKSANDROV, A. A., Krasnoyarsk Polytechnic Institute

[Abstract] The possibility of electric processing of oil-emulsion waste water with asymmetrical current was studied in order to attempt to decrease power consumption and allow the process to be performed under stable conditions. When oil-emulsion waste with various concentrations of petroleum products must be purified by asymmetrical current treatment, an optimal current shape can be selected by changing the period, duration of back current and amplitude of positive and negative pulses. The back current energy used to break down the oil film can be selected to be minimal. In this case, power consumption is minimal for high effectiveness of purification. Data obtained in experiments were used to derive a regression equation which can be employed to optimize the characteristics of the process. The studies demonstrate that the use of asymmetrical current decreases the cost of electric power and allows the process to be performed under stable conditions. Figures 2; references 5 (Russian).  
[75-6508]

UDC: 628.165:621.359.7

INFLUENCE OF CERTAIN FACTORS ON THE PROCESS OF MAXIMUM CONCENTRATION OF SALTS IN ELECTRODIALYSIS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 5 Nov 82) pp 399-401

GREBENYUK, V. D., PENKALO, I. I., FEDOROVA, I. A. and GUDRIT, T. D.,  
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Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A study was made of the influence of concentration of dialysate, temperature, type of electrolyte and ion exchange membranes used on the concentration of brine. Experiments were performed in a five-chamber frame type cell with a membrane separation of 4 mm at  $25 \pm 2^\circ\text{C}$ . The linear speed of the solutions in the electrode chambers and desalination chambers was 0.4 cm/s. It is concluded that the use of pairs of MA-41 and MK-40 membranes is preferable for higher concentration and more rapid achievement of the maximum concentration of the use of MA-40 and MK-40 membranes. An empirical equation is derived to calculate a model of the water supersaturated in the process of electrodialysis of 1 mole of sodium chloride. Electroosmotic permeability increases with increasing temperature. Figures 5; reference 1 (Russian).  
[81-6508]

UDC: 541.135-145:66.064-944

CONCENTRATION OF TRANSITION METALS IN MULTICOMPONENT SOLUTIONS BY COMPLEX  
FORMATION AND ULTRAFILTRATION

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 13 Feb 84) pp 401-404

DYTNERSKIY, Yu. I., ZHILIN, Yu. N., VOLCHEK, K. A., BEREZIN, G. I. and  
MIKIRTYCHEV, V. Ya., Moscow Institute of Chemical Technology  
imeni D. I. Mendeleev; "Plastmash" Planning and Design Bureau, Krasnodar

[Abstract] A model system study is presented of the process of complex formation and ultrafiltration, as well as a study of the possibility of its use for selective extraction of transition metal ions from actual multicomponent solutions--industrial waste waters and sea water. The influence of the type and quantity of water-soluble polymer added, solution pH, type of membrane, operating pressure, solution concentration and flow speed on the process was studied on  $10^{-4}$  M solutions of copper and nickel chlorides and sulfates. The binding polymer agents used included polyvinyl pyrrolidone, polyacrylamide, commercial flocculants VA-2 and VA-212 and polyethyleneimine (PEI) with molecular weight 30,000. PEI yielded the greatest concentration effect and was selected as polymer ligand in subsequent experiments. It was found that the process has a number of advantages over traditional extraction processes. For example, complex formation and ultrafiltration are performed in a homogeneous medium, allowing more effective capture of ions of metals extracted than sorption or ion exchange. The process is convenient for automation and continuous mode operation. Figures 3; references 5 (Russian).  
[81-6508]

UDC: 661.183.123.2

NONEXCHANGE ABSORPTION OF SODIUM HYDROXIDE FROM AQUEOUS SOLUTIONS OF ANION-  
EXCHANGE STYRENE-DIVINYLBENZENE POLYMERS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 31 Jan 83) pp 407-409

KOGANOVSKIY, A. M. and TOMCHUK, L. I., Institute of Colloid Chemistry and  
Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences,  
Kiev

[Abstract] Data are presented from measurements of the equilibrium distribution of NaOH between solution and the weakly basic anionite AN-22 or strongly basic anionite AV-17 to explain the fact that when NaOH is absorbed from solutions of identical concentration by resins of different basicities, weakly basic resins absorb more NaOH than strongly basic forms. Both ionites tested are copolymers of styrene and divinylbenzene, but in AN-22 the ionogenic functional groups are primary amino groups, while in AV-17



they are primarily quaternary ammonium bases. The absence of any change in concentration of the external solution as a result of swelling of the anionites indicates that NaOH diffused into the grains of the resins with the same hydration with which its ions were present in the external solution, so that hydration of primary amino groups of the resin in the alkaline solution did not occur. Material balance equations were composed. The mean hydration number of functional groups of the anionite was determined. It was found that the variation in mean hydration number in NaOH solutions as a function of concentration is very nearly linear within the limits of 1 to 5 moles/dm<sup>3</sup>. This allowed it to be used to determine the probability of the relationship of various hydrates of NaOH in this concentration interval.

References 10 (Russian).

[81-6508]

UDC: 621.359.7

#### DESALINATION OF TAP WATER IN AN ELECTRODIALYZER WITH ION EXCHANGE PACKING

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 5 Nov 82) pp 441-443

PISARUK, V. I. and GREBENYUK, V. D., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A study was made of the possibility of intensifying the process of electro dialysis with ion exchange packing for desalination of water with initial low mineral content by the use of macroporous ionites. Kiev tap water was used in the experiments with specimens of KU-2 and AV-17 strong electrolytes as well as series-produced MK-40 and MA-40 membranes. The data showed that the resistivity of water leaving the gel resin chamber was significantly decreased after 170 l of liquid passed through, whereas resistivity at the outlet downstream from a mixed layer of KU-2-8 and AV-17P resin remained at a high level, indicating sufficient purification of the water. The decrease in resistivity for gel resins apparently results from poisoning of the resin. Figures 5; references 5 (Russian).

[81-6508]

UDC: 628.543:547

PURIFICATION OF WASTE WATER FROM ORGANIC SYNTHESIS FACILITIES BY  
ELECTROOXIDATION

Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 20 Dec 82) pp 444-445

TYURIN, B. K., ZYABLITSEVA, M. P., KHABIBULLIN, A. A., KUDINOV, V. I.,  
BIKBULATOV, I. Kh., NURUTDINOV, S. Kh. and SAVUSHKINA, G. S., State  
Scientific Research and Planning Institute of the Chlorine Industry,  
Sterlitamak Branch

[Abstract] A mathematical model is presented of the process of purification of waste water from organic synthesis facilities by destructive electrooxidation. The mathematical model was used to determine optimal conditions for the process of complete destructive oxidation of organic impurities: electrolyte pH  $7.0 \pm 0.2$ ; catalyst concentration as metal  $0.5 \pm 0.1 \text{ kg/m}^3$ , electrolyte temperature  $35 \pm 2 \text{ K}$ . These laboratory data were confirmed under pilot plant conditions. Tests were performed on a continuous  $0.10\text{--}0.15 \text{ m}^3/\text{hr}$  installation over 17 days. Electrical characteristics were found to be stable and the oxide ruthenium-titanium anode maintained steady characteristics. References 4 (Russian).  
[81-6508]

UDC: 628.337:088.8

PURIFICATION OF MINERALIZED WASTE WATER TO REMOVE HYDROGEN SULFIDE

Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 6, No 6, Sep-Oct 84  
(manuscript received 21 Feb 83) pp 445-447

FILIMONOV, A. I., AGEYENKO, O. I. and SOKOLOV, R. P., Volgograd State  
Scientific Research and Planning Institute of the Petroleum Industry;  
Volgograd Polytechnic Institute

[Abstract] The most suitable equipment for electrochemical processing of waste waters containing hydrogen sulfide, from the standpoint of compactness and simplicity, is a system patented in the USA (US patent No. 3847764). In this article a combination of chemical and electrochemical purification methods was used. The influence of the addition of salts and oxides of iron and copper in combination with electrolysis on degree of purification of waste water was studied. The waste water was modeled by a 15% NaCl solution in distilled water, saturated with hydrogen sulfide to the required concentration. The effectiveness of purification in the presence of Fe(II) and Fe(III) was found to be identical. The effectiveness of copper oxide was somewhat less. The study showed that a combination of electrochemical and chemical methods of purification reduces power consumption by a factor of 2 and greatly reduces consumption of reagent in removal of hydrogen sulfide from waste water. Figures 2; references 5: 4 Russian, 1 Western.  
[81-6508]

UDC: 628.3:66.067.85

EVALUATION OF NATURAL ADSORBENTS FOR PURIFICATION OF WASTE WATER FROM  
DOMESTIC SERVICES SHOPS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 21 Feb 83) pp 449-451

IL'YAYEV, D. V., SHIKHALIZADE, P. D., GANIYEVA, T. F., SALIMOVA, N. A.,  
MUSTAFAYEV, S. A. and ALIYEV, F. M., Azerbaijan Institute of Petroleum  
and Chemistry imeni M. Azizbekov, Baku

[Abstract] A laboratory study was performed of the possibility of using various adsorbents to purify waste water from a laundry, contaminated with soap, fats and petroleum products. The adsorbents used included activated carbon type AG-3, NaX and CaX zeolites and their modified forms, aluminum oxide, bentonite clay and a modified clay specimen obtained by treatment of an aqueous bentonite clay suspension with an aqueous solution of amine salts. The waste water was passed through a 1.5 cm diameter column filled with an adsorbent layer about 20 cm high at a rate of 0.3 l/hr. The degree of purification was determined by chemical analysis of the incoming and outgoing water. Activated carbon was found to be most effective as determined by tests of dry residue, chemical oxygen demand, content of chloride and sulfate ions. However, removal of synthetic detergents, soaps, fats and petroleum products is best performed by bentonite clay, apparently because the organic substances with high molecular weight are not well adsorbed by activated carbon due to the pore dimensions. References 6: 5 Russian, 1 Western,  
[81-6508]

UDC: 628.113:628.162.52

PURIFICATION OF MACHINE-BUILDING-ENTERPRISE WASTE WATER WITH ALUMINUM 2/3  
HYDROXYCHLORIDE

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 21 Dec 82) pp 453-454

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[Abstract] Experiments were performed on actual waste waters with turbidity 20-200 mg/l, bichromate oxidizability 100-300 mg/l, pH 6-8.5. Coagulants used were  $Al_2(SO_4)_3 \cdot 18 H_2O$  and  $Al(OH)_2Cl \cdot 3.75 H_2O$ . Aluminum hydroxychloride was obtained by electrolysis of 1 M solution of  $AlCl_3$  by 50 cycle ac at 80-85°C. The effect of clarification of waste water by aluminum 2/3 hydroxychloride depends on the concentration of coagulant solutions. Increasing the concentration of the aluminum 2/3 hydroxychloride can achieve a 10 to

30% savings of coagulant. The effect of clarification increases with an increase in coagulant dose or pH of the initial water. There is a maximum on the curves for aluminum sulfate, after which the purification effect decreases with increasing dose. Aluminum sulfate decreases pH 2 to 3 times as strongly, making its use in doses over 40 mg/l impossible without stabilization of the water. Aluminum hydroxychloride can be used without additional treatment practically throughout the range of working values of pH. The use of aluminum 2/3 hydroxychloride as a coagulant can eliminate the operation of pH stabilization and significantly lengthen the time of operation of water processing systems at machine building enterprises. Figures 4; references 7: 5 Russian, 2 Western.  
[81-6508]

UDC: 628.356:676

REMOVAL OF SULFATE LIGNIN AND LIGNOSULFONATES DURING BIOLOGICAL PURIFICATION OF WASTE WATERS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 11 Jan 83) pp 463-465

YURCHENKO, V. A., VRUBLEVSKAYA, S. N. and ISTOMINA, L. P., All-Union Scientific Research Institute of Water Supply, Sewerage, Water Engineering Structures and Engineering Hydrogeology, Khar'kov Branch

[Abstract] The purpose of this work was to determine the effects of removing sulfate lignins and Na-lignosulfonates in comparison with the data of other authors and to establish the variation in the effective removal of lignin derivatives as a function of quantitative content of sulfate lignins (SL) and lignosulfonates (LS) in waste waters. Studies were performed under periodic cultivation conditions. Model waste water solutions were made with distilled water from sulfate and sulfite alkali from a cellulose-paper combine. Experiments were performed over 5 to 24 hours at 18-20°C with Khar'kov sewer plant active silt and gelatin protein adsorbent. Laboratory experiments with active silt showed that an increase in the quantity of lignin-like compounds removed is observed as concentration in waste water increases to about 750 mg/l, after which the process stabilizes. Apparently, at this content of lignin-like compounds, the adsorbent becomes saturated and further increases in lignin concentration do not increase its removal. It was found that the decrease in effect of purification with an increase in content of LS in LS:SL mixtures to 2.1 occurs much more rapidly with an increase in the load on the silt. Effectiveness is increased with a decrease in content of LS in the LS:SL mixture. Figures 3; references 8: 5 Russian, 3 Western.  
[81-6508]

UDC: 628.356(088.8)

BIOCHEMICAL PURIFICATION OF SULFATE-CONTAINING WASTE WATERS

Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 6, No 5, Sep-Oct 84  
(manuscript received 17 Jan 83) pp 465-467

GUBIN, V. Ye., SMIRNOV, Yu. G., SMIRNOVA, G. F., GORELOV, V. S.,  
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Institute

[Abstract] A study was made of the possibility of biochemical purification of waste water from the production of synthetic fatty acids (SFA). This waste water contains up to 70-100 g/l sodium sulfate, a large quantity of organic substances ( $BOD_{bichr}$  10-20 g  $O_2/l$ ), 10-15 mg/l heavy metal ions and a number of other pollutants. The use of sulfate-reducing bacteria (SRB) is very promising for biochemical purification of sulfate waste waters. An accumulated culture of SRB was used, removed from the bottom silt of a sulfate accumulating pond. Experiments were performed in glass reactors without removal of the gas phase. SRB were found to grow in the sulfite waste water at all sulfate concentrations studied, though growth rate was reduced by high sulfate concentration. The SRB grew most rapidly during the first 10 to 20 days. The studies showed the promise of the use of an accumulator culture of sulfate-reducing bacteria for biochemical purification of sulfate waste waters from the production of SFA. Figures 2; references 6 (Russian).

[81-6508]

UDC 628.543:[64.66]

TREATING HOUSEHOLD CHEMICAL ENTERPRISES WASTE EFFLUENTS CONTAINING SURFACTANTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 11, Nov 84 pp 659-661

NOVIKOVA, S. P., SOKOL, Ye. Ya., SHKORBATOVA, T. L., VERVEYKO, A. V.,  
SERGEYEV, V. G. and GLAZYRINA, O. I.

[Abstract] Waste effluents of 70-150 m<sup>3</sup>/day containing 50-250 mg/liter of surfactants are produced at enterprises manufacturing household detergents. These effluents also contain phosphates and carbonates. In the present work an electrochemical method was developed and tested on model solutions and effluents from the Vinnitsa and Kazan household chemical plants. Aluminum and iron electrodes were employed for electrocoagulation of surface-active contaminants with additions of sodium and calcium chlorides to eliminate electrode passivation and suppress foaming. Technical and economic indicators for a unit operating at the Vinnitsa detergent plant with a daily effluent of 150 m<sup>3</sup> were calculated. Two electrodes of 3.1 m<sup>3</sup>/hour capacity involves a capital investment of 4,508,000 rubles, operating expenses

of 2,142,000 rubles, adjusted expenses of 2,818,000 rubles and a production cost of 0.51 ruble/m<sup>3</sup>. Expected annual savings by replacing a reagent method is 285,000, an ion-exchange method is 595,000, dissolution and biological treatment--36,000 and burning off--445,000 rubles. Figures 2; references 7 (Russian).  
[114-12765]

UDC: 543.422.8

ADSORPTION OF X-RAY FLUORESCENT DETERMINATION OF HEAVY METALS IN NATURAL WATERS AFTER GROUP CONCENTRATION ON SPHERONOXINE

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 39, No 10, Oct 84  
(manuscript received 28 Nov 83) pp 1750-1753

BRYKINA, G. D., STEFANOV, A. V., OKUNEVA, G. A., ALEKSEYEVA, N. G.,  
ALEKSEEV, V. A. and NIKITIN, Yu. S., Moscow State University  
imeni M. V. Lomonosov

[Abstract] A study was made of the possibility of group preconcentration of Fe, Cu, Ni, Zn, Cd, Pb and Mn on a chelate adsorbent spheronoxine under static conditions for subsequent x-ray fluorescent determination of heavy metals in natural waters. Spheronoxine is a chelate-forming adsorbent containing 8-hydroxy quinoline groups attached through an azo group to the side chain of modified glycol methacrylate gel. Metals are adsorbed by spheronoxine usually by formation of 1:1 or 1:2 complexes. The method combining preconcentration with x-ray fluorescent determination of heavy metals was used to determine background and anomalous concentrations of soluble trace elements in underground waters of seismically-active regions and the waters of mud volcanos. Samples were taken in dark glass bottles and pumped through membrane filters with 0.2  $\mu$ m pore size. Data from the determination of metals are not presented, Figures 3; references 5: 3 Russian, 2 Western.  
[70-6508]

UDC 677.494,675-486.32.017.636

STUDY OF SELECTIVE PROPERTIES OF HOLLOW FIBERS FOR ULTRAFILTRATION

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84  
(manuscript received 6 Jun 84) pp 14-16

BORSHCHEV, A. P., ZHDANOVA, N. A., FEDOTOVA, Ye. A., ZHDANOV, A. V.,  
GOLUBEV, A. M., AFANAS'YEV, O. N., PEREPECHKIN, L. P. and BUDNITSKIY, G. A.

[Abstract] A study was made of the selective properties, i.e., macromolecule-holding properties of hollow fibers used to separate polyethylene and protein solutions by ultrafiltration. It is shown that the increase in

entrapment coefficient and specific permeability resulting from an increase in flow rate during separation of solutions of kinetically relatively-flexible polyethylene glycol macromolecules is not related to concentration polarization, but rather may be explained as being due to the deformation of clumps of polyethylene glycol macromolecules as the solution flows through fine capillaries, such as hollow fibers. Complete entrapment curves for polyethylene glycol and protein are presented. Hollow fibers may be used to concentrate solutions of proteins of 15,000 or more in molecular weight. Figures 3; references 4 (Russian).

[119-12765]

UDC 628.543.49.081.3:677.463

#### USE OF CHEMOSORBING FIBERS FOR REMOVING ZINC FROM WASTE EFFLUENT

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 16-17

ZVEREV, M. P., ROMANOVA, T. A., VOLKOV, L. A., ZAKHAROVA, N. N. and YEGOROV, K. K.

[Abstract] Ionite pellets used to treat waste effluent of viscose production do not completely remove all of the zinc, and a second stage treatment with fibrous ionite has been proposed. In the present work the possibility of using fibrous ionites VION KS-3 and VION KN-1 to remove the remaining 10-20 mg/liter of zinc was studied. Fiber VION KS-3 is preferred when the effluent contains less than 0.5 g/liter of sulfuric acid and 0.2 g/liter of sodium sulfate. Fiber VION KN-1 may be used to treat effluents having pH of 4 and up to 10 g/liter of sodium sulfate, although in this case the ionite fiber must be in Na-form. Figures 2; references 4: 1 GDR, 3 Russian.

[119-12765]

UDC 628.543:66.097.38

#### REGENERATION OF SODIUM-CATIONITE FILTERS WITH PRE-TREATED EFFLUENTS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 18-19

SHIMKO, I. G., ROMANOVA, T. A., TOLSTOV, V. N., MALYAR, E. I. and LYUBINA, R. B.

[Abstract] Water treatment plants producing industrial-grade water from natural sources often produce effluents containing considerable amounts of hardness salts, chlorides and suspended matter which are recycled into the water basin. As a result, the salt content in many Ural springs is being doubled every 4-5 years. A study of the possibility of regenerating sodium-cationite filters with model solutions of sodium sulfate and pre-treated effluent in place of sodium chloride shows that the process is effective and may be used to lower the chloride throw-off into the water basin. Figures 2; references 3 (Russian).

[119-12765]

UDC 628.344+628.344.5

USING LIME-SULFUR SETTLER TO TREAT VISCOSE PRODUCTION EFFLUENT

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 p 20

CHERNETSKIY, Ye. K. and GENS, A. M.

[Abstract] Zinc-containing effluent from viscose production is treated with lime water to raise the pH to 9-10.5 to convert the zinc ions to the insoluble hydroxide which is then filtered out. The pH of the resulting water, however, must be re-adjusted to 6.5-8.5 before it can be submitted for biotreatment or recycled to the water system. This is normally done with sulfuric acid, which causes secondary pollution with sulfates. In the present work it is shown that it is more rational to precipitate the zinc at pH 7.3-8.5 with a lime-sulfur settler, wherein the lime and sulfuric acid consumption is reduced 0.23 and 0.25 kg/m<sup>3</sup> of effluent, respectively, and secondary pollution with sulfates is avoided. The sulfur is obtained by recovery from hydrogen sulfide removed from ventilation air.

References 3 (Russian).

[119-12765]

UDC 543.253.541.138

DETERMINING ZINC IN VISCOSE PRODUCTION EFFLUENTS BY INVERSION POTENTIOMETRY

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84  
(manuscript received 27 Feb 84) pp 24-25

BOGOSLOVSKIY, V. V.

[Abstract] Inversion potentiometry is used to determine zinc content in viscose production effluent. Both the equipment and the technique are simpler and more rapid than polarography or inversion volt-amperometry. The method makes it possible to make rapid analyses of low concentrations of toxic metals in the presence of large quantities of organic and inorganic compounds. The accuracy of zinc determination may be increased by adding a 10-fold excess of gallium over copper in the effluent. Figures 2; references 10: 4 Russian, 6 Western.

[119-12765]



UDC 628.543.677.494

DETOXIFYING CYANIDES IN EFFLUENTS FROM NITRON FIBER PRODUCTION

Moscow KHMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 84 pp 25-26

STEPANOVICH, V. A. and SVYATAYA, A. S.

[Abstract] Effluent resulting from nitron fiber production containing cyanides is detoxified by treatment with hydrogen peroxide in the presence of copper sulfate to convert the cyanides to cyanates. Laboratory tests show that the peroxide must be in 1.5 fold excess to cyanide and the copper ion concentration must not be less than 0.5 mg/liter in order to lower the cyanide concentration in water from 8 to 3 mg/liter. References 4:

1 Russian, 3 Western.

[119-12765]

UDC: 628.162.2

USE OF SPENT ETCHING SOLUTIONS TO PURIFY INDUSTRIAL WASTE WATER

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHMICHNYKH NAVUK in Russian No 5, Sep-Oct 84 (manuscript received 2 Mar 84) pp 97-101

KUZ'MICHKINA, V. S., LOMAKO, G. I., PETKEVICH, T. S., MITSKEVICH, N. I. and PESTRAK, A. F., Institute of Physical-Organic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] Spent solutions from acid etching processes can be used as a source of iron (II) ions, which in turn are used to transform Cr (VI) to Cr (III) for subsequent precipitation as an insoluble sediment in order to purify chromate and bichromate industrial waste waters. In tests, one volume of spent acid etching solution was sufficient to treat 800 to 1000 volumes of a model chromate solution containing 25 mg/l chromium (VI), while one volume of spent ferrous chloride solution could treat 2000 volumes of chromic acid waste containing 25 mg/l Cr (VI). Figure 1; references 3 (Russian).

[66-6508]

WOOD CHEMISTRY

UDC 630\*863.4.001.4

PREPARATION OF FEED SUGAR BY HYDROLYSIS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 7,  
Oct-Nov 84 p 20

ZHDANOVA, A. V., chief, TsZL and OTK [expansions unknown], Onega Hydrolytic  
Plant

[Abstract] A method has been devised at the Onega Hydrolytic Plant for the preparation of sugar suitable for animal feed. Technical details are presented on pH control of the "neutralized" solutions serving as the raw material for sugar production, and the methods employed to control mineral and organic admixtures. Production of 2.5 m<sup>3</sup> of such sugar requires 30-35 m<sup>3</sup> of the neutralized starting solution, with the entire process completed in 2.5-3 days. The final product appears as a viscous dark-brown solution that meets the requirements of TU 59-02-004-04-80.  
[98-12172]

UDC 630\*863:547.724.1.002

FURFURAL PRODUCTION AT KRASNODAR CHEMICAL COMPLEX

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 7,  
Oct-Nov 84 p 21

GLADKOVA, A. A., chief, Central Laboratory, Krasnodar Chemical Complex

[Abstract] Recently, a method has been devised for the production of furfural from sunflower shells by the steam-acid digestion method. The resultant furfural-containing solution contains 1.5-2.5% of the product, which is equivalent to a yield of 4.7-5.4% of the dry raw material. To further improve the quality of the product, a continuous vacuum-distillation apparatus has been installed, insuring that the Krasnodar furfural meets all the requirements of GOST 10437-80.  
[98-12172]

UDC 630\*866.5:658.286

TRANSPORTATION OF ROSIN BY TANK TRAILERS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 7,  
Oct-Nov 84 pp 21-22

SHAVRINA, A. D., engineer

[Abstract] Since the Barnaul Rosin-Turpentine Plant is located in the middle of the city without railroad access, a method has been devised for filling tank trailers with hot rosin by gravity for transportation to the railway depot. Approximately 500 tons a month are shipped out of the plant in this manner. For each ton of rosin that is shipped out in the heated state the plant saves 2,75 rubles in electricity costs that would have been incurred if cold rosin were to be dispensed into the tank trailers.  
[98-12172]

UDC 630\*863.1.002.5

DESIGN OF FERMENTERS WITH HIGH RATE OF MASS EXCHANGE

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 7,  
Oct-Nov 84 pp 23-25

GRAF-TIO, V. P., senior scientist, and KUZNETSOV, A. M., laboratory chief,  
Irkutsk Scientific Research Institute of Chemical Machines

[Abstract] A schematic is presented for a 10 m<sup>3</sup> fermenter for continuous cultivation of yeasts on raw materials containing 3.5-5% sugar and assuring a high filling ratio (0.4-0.5). The unique features assuring continuous function are a special sucking apparatus for maintaining adequate oxygen levels (5,2 to 6.8 kg O<sub>2</sub>/m<sup>3</sup>·h) for processing materials with high sugar levels, and a blade mechanism for hydrodynamic foam control, thereby guaranteeing a high degree of filling. Under optimal conditions, dry biomass levels of 4.4 kg/(m<sup>3</sup>·h) were obtained, in the face of energy expenditures on the order of 1 kWA/kg. Figure 1; references 4 (Russian).  
[98-12172]

- END -