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## USSR: CHEMISTRY

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AEROSOL AND MATERIALS-SCIENCE STUDIES ON 'MIR' STATION

Moscow SOVETSKAYA ROSSIYA in Russian 7 Mar 87 p 1

[Text] Flight Control Center, March 6 (TASS) -- The space mission of Yuriy Romanenko and Aleksandr Laveykin has been in progress for a month. All planned work on the further equipping of the base block and work in line with the mission's scientific program have been carried out in entirety by the crew.

Work with the "Progress-28" spaceship is scheduled for today, as are experiments for studying features of the behavior of hydrosols and aerosols in conditions of zero gravity, and visual observations and photographing of individual areas of land surface and the waters of the world's oceans, using hand-held cameras.

During the days just past, a series of experiments called "Vikhr" was performed with the unit "Pion-M", in line with the space materials-science program. The purpose of these experiments is to study convection currents produced in a liquid by forces of surface tension in the presence of a temperature gradient.

According to telemetry information and reports from orbit, the flight of the manned complex "Mir" is proceeding normally.

Cosmonauts Yuriy Romanenko and Aleksandr Laveykin are healthy and are feeling well.

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CSO: 1841/238

UDC 615.212./214:547.834.2/.012.1

SYNTHESIS OF SELECTED INDOLYLETHYLQUINAZOLINES-4

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 39, No 11, Nov 86  
(manuscript received 24 Jun 85) pp 704-707

[Article by L.G. Mesropyan, F.R. Shiroyan and I.S. Sarkisyan, Institute of Fine Organic Chemistry imeni A.L. Mndzhoyan, Armenian SSR Academy of Sciences, Yerevan]

[Abstract] In order to expand the scope of agents with anticonvulsive and antisedative effects, a series of derivatives of indolyethylquinazolines-4 were synthesized, by conventional chemical methods, for animal testing. Spectroscopic studies confirmed the synthesis of 2-methyl-3-(indolyl-3'-ethyl)quinazolines and 2-methyl-3-(indolyl-3'-ethyl)-1,2-dihydroquinazolines. Selected agents in the latter group induced hypothermia in mice, potentiated the soporific effects of hexanal, and -- in rats -- elevated brain levels of serotonin by 15% while depressing norepinephrine concentrations. Tables 2; references 5 (Western).

12172/12379  
CSO: 1840/217

## REASONS FOR LAGGING PRODUCTION OF CHROMATOGRAPHS

Moscow MOSKOVSKAYA PRAVDA in Russian 11 Mar 87 p 3

[Article by E. Timofeyeva]

[Abstract] The article examines problems with production of equipment for chromatography.

It is recalled that the USSR Ministry of Instrument Building, Means of Automation and Control Systems (Minpribor), which is the country's principal producer of chromatographs, created the All-Union Scientific Research Institute of Chromatography (VNIikhrom) several years ago. This institute and the "Khromatograf" plant in Moscow are now the chromatography research and production divisions of the "Manometer" production association. The USSR Academy of Sciences' scientific council on chromatography is said to be coordinating work at over 200 organizations, including 12 design bureaus. The interbranch scientific-technical complex "Nauchnyy Pribory" (scientific instruments), which was created recently, will also be working in this field.

About 40,000 chromatographs reportedly are now in operation in the country, but several times as many are needed by science and industry, according to experts' estimates. In the years immediately ahead, chromatography will be used in about 70 percent of all analyses and studies of raw materials and products, in the opinion of specialists. An acute shortage of chromatographs and parts for them is said to exist in the chemical, medical and microbiological, and other industries, which has forced them to acquire needed equipment abroad or to begin producing it on their own. The Ministry of the Chemical Industry, for example, has organized production of a high-quality chromatograph called "Tsvet" at the Dzerzhinsk design-and-experimental bureau of the "Khimavtomatika" (chemistry automation) Research-and-Production Association. This ministry has also organized the country's largest courses for training engineers and scientists in the operation and maintenance of chromatographs. It is noted that no higher educational institution offers such training at present.

Factors contributing to the shortage of chromatographs are said to include an unrealistically high state standard which went into effect in 1985, and neglect of chromatograph production by Minpribor and the "Manometer" association.

VNIikhrom still lacks a design-and-experimental production facility of its own, for example, and introduction of new chromatographs into production is lagging at the "Khromatograf" plant.

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EXTRACTION-FREE VERSION OF PHOTOMETRIC ASSAY OF TITANIUM IMPURITIES IN NATURAL AND TECHNICAL OBJECTS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian, Vol 29, No 12, Dec 86 (manuscript received 23 May 85) pp 23-26

[Article by V.G. Amelin and Yu.V. Borisoglebskaya, Vladimir Polytechnic Institute]

[Abstract] A photometric method has been developed for assay of titanium based on its reaction with salicylfluorone in the presence of cetylpyridinium chloride. The method is recommended as the most effective and simplest for determination of titanium impurities in various objects in nature and technology. The method was tested on aluminum, quartz, sand, dinas and hematite ore. Figures 3, references 5 (Russian).

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CSO: 1841/255

UDC 678.5.01:543.66.012-52

AUTOMATED PHYSICAL-CHEMICAL ANALYSIS SYSTEMS

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 87 p 53

[Article by G.S. Bondarev, A.I. Demina, V.V. Zharkov, Yu.F. Petrov and S.F. Sergeyev]

[Abstract] "Polimersintez" Scientific-Production Association is working on the creation of automated systems for chemical technology research, mass transfer studies and physical-chemical analysis. Between 1981 and 1985, the Association has created automated systems for the study of the macrostructure of foam materials, NMR spectroscopy, chromatographic analysis and an automated system for processing of IR spectral analysis results. The spectral analysis system



can measure the intensity of absorption bands in IR spectra of polymers at 200-4000  $\text{cm}^{-1}$  with minimum separation 0.05  $\text{cm}^{-1}$ . This dialog system has a number of advantages over ordinary equipment, significantly improving spectra and reducing analyst time. The "structural analysis" system can analyze microscopic specimens and the structure of foam materials within the limits of resolution of an optical microscope, perform linear analysis and determine primary parameters. Use of the system allows analysis of the structure of polymers in automatic mode and increases the productivity of labor of researchers. References 2 (Russian)

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UDC 543.4

#### PHOTOACOUSTICAL SPECTROMETRY OF CONDENSED MEDIA AND ITS ANALYTICAL APPLICATIONS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 42, No 1, Jan 87  
(manuscript received 11 Feb 86) pp 5-28

[Article by I.P. Alimarin, V.F. Durnev and V.K. Runov, Moscow State University imeni M.V. Lomonosov]

[Abstract] This is a review of the data in the literature on the applications of photoacoustical spectrometry of condensed media in analytic chemistry. The theoretical principles of the method are outlined, plus its applications in analysis and investigation of condensed media and liquids. The use of the method for investigation of the surfaces of solids and determination of the fundamental spectroscopic and kinetic characteristics of molecules in condensed media is described. Apparatus used for analysis of condensed media by photoacoustical spectrometry is described. The review indicates the great potential of photoacoustical spectrometry, particularly for analysis of the surfaces of solids and determination of the content of organic compounds on surfaces. The authors call for the production of domestic photoacoustical spectrometers. Another promising area of development is said to be the development of methods of identification and determination of compounds in the IR band, particularly by the use of Fourier spectrometry. Figures 9; references 231: 32 Russian, 199 Western.

6508/12379  
CSO: 1841/234

## LIMITS OF DETECTION OF LASER ATOMIC FLUORESCENCE SPECTROMETER WITH LASER SAMPLING METHOD

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 42, No 1, Jan 87  
(manuscript received 17 Sep 85) pp 48-52

[Article by Ye.G. Chernobrodov and G.A. Sheroziya]

[Abstract] A study is presented of the specifics of performance of analysis and certain parameters of a laser atomic fluorescence spectrometer with laser sampling method. A solid-state laser is used to evaporate a spot from a specimen, which is analyzed in the light of an organic dye laser. The limits of detection were defined for Al ( $1.8 \cdot 10^{-7}$ ), Ga ( $2 \cdot 10^{-9}$ ), In ( $1.6 \cdot 10^{-8}$ ) and Ni ( $6 \cdot 10^{-7}$ ), all in % at. Laser evaporation allows samples to be taken from areas of  $10^{-2}$ - $10^{-5}$  cm<sup>2</sup>, allowing layer by layer analysis with depth resolution  $10^{-8}$ - $10^{-6}$  m. Figure 1; references 8: 7 Russian, 1 Western.

6508/12379  
CSO: 1841/234

## DETERMINATION OF ALKALI METAL IMPURITIES IN ORGANOSILICON POLYMERS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 42, No 1, Jan 87  
(manuscript received 13 Sep 85) pp 89-91

[Article by O.P. Trokhachenkova and N.A. Gradskova]

[Abstract] Organosilicon polymers are used for protection and sealing of the semiconductor surfaces of electronic products. This article studies a method of determining impurity Na, K and Li at  $10^{-5}$ - $10^{-4}$  mass percent in organosilicon polymer materials used as light-guide fiber shells. Extracts were analyzed on an atomic absorption spectrophotometer using an acetylene-air flame. The organosilicon compounds studied were high-viscosity systems without solvents. Atomic emission flame determination of Na, K and Li was performed using calibration graphs and comparison solutions containing 0.01-0.1 µg/ml sodium, 0.005-0.1 µg/ml potassium and lithium solutions, following preliminary reextraction to isolate the impurities in an aqueous ethanol solution. The limits of detection were found to be  $2.5 \cdot 10^{-5}$  for sodium,  $2.5 \cdot 10^{-6}$  for potassium and lithium. References 8: 7 Russian, 1 Western.

6508/12379  
CSO: 1841/234

UDC 661.531:661.668

MULTISTEP SYNTHESIS OF AMMONIA FROM NITROGEN AND HYDROGEN UNDER INFLUENCE OF CATALYSTS BASED ON POTASSIUM SALTS OF TRANSITION METAL CARBONYL HYDRIDES AND METALLIC POTASSIUM

Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 292, No 6, Feb 87 (manuscript received 31 Mar 86) pp 1409-1413

[Article by V.B. Shur, S.M. Yunusov, Z. Rummel, M. Varen and Corresponding Member, USSR Academy of Sciences, M.Yu. Volpin, Institute of Heteroorganic Compounds imeni A.N. Nesmeyanov, USSR Academy of Sciences, Moscow; Central Institute of Isotope and Radiation Studies, East German Academy of Sciences, Leipzig]

[Abstract] Following a recent report of new catalysts for gas-phase synthesis of ammonia from hydrogen and nitrogen, the authors report that the catalysts allow synthesis of ammonia in stages: first, reacting nitrogen with the catalysts, then hydrogenating the nitrogen-containing product, thus formed, with hydrogen to ammonia. The results thus open a path for separate studies of the stages of activation and hydrogenation of nitrogen on this type of catalyst. Experiments were performed in a flow-type reactor at 250-400°C atmospheric pressure, utilizing a stoichiometric nitrogen-hydrogen mixture. Figures 4; references 4: 2 Russian, 2 Western.

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EFFECT OF THALLIUM (I) AND THALLIUM (III) ON PARAMETERS OF OSCILLATIONAL  
CHEMICAL REACTION BROMATE-CERIUM (III, IV)-MALONIC ACID-SULFURIC ACID

Kiev TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA in Russian Vol 23, No 1,  
Jan-Feb 87 (manuscript received 5 Feb 86) pp 106-111.

[Article by K.B. Yatsimirskiy, D.V. Matyushov and L.P. Tikhonova, Institute of  
Physical Chemistry imeni L.L. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev]

[Abstract] Reasons are presented for changed parameters in Belousov-Zhabotinskiy oscillational chemical reactions in the system bromate-Ce (III, IV)-malonic acid in 1.5 mole/l sulfuric acid under the influence of thallium (I) and thallium (III). Both of the Tls increased the oscillation period in this system; this led to a hypothesis that either Tl (III) is reduced or Tl (I) is oxidized during this reaction. Actually, both were shown to take place in this process; bromoderivatives oxidized Tl (I) and the reaction products of malonic and bromomalonic acids reduced Tl (III). Tl linked bromide ions leading to a prolonged retention of the oscillations (a similar effect could be observed by adding  $Ag^+$  or  $Hg^{++}$ ). Figures 3; references 12: 7 Russian, 5 Western.

7813/12379

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UDC 541.135

CATALYTIC FORMATION OF HYDROGEN DURING ELECTROLYSIS OF DIVALENT CHROMIUM  
CHLORIDE

Kiev TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA in Russian Vol 23, No 1,  
Jan-Feb 87 (manuscript received 8 Jan 86) pp 111-113

[Article by N.Ye. Nechayeva and A.V. Gorodyskiy, Institute of General and  
Inorganic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Chromium chloride solutions in water represent a non-equilibrated system which tends to achieve an equilibrium. This process is strongly shifted

to the right, especially in case of hydrogen evolution from the solution. However, due to its high energy of activation, this process does not occur to any appreciable extent. Electrolysis of solutions containing Cr(II) and Cr(III) leads to deposition of metal on the cathode, conversion of Cr(III) to Cr(II) and evolution of large amounts of hydrogen. The latter process is connected with electrolytic breakdown of water superimposed on the equilibrium reaction in which the electrode plays a role of heterogenous catalyst. As a result of this superimposition, hydrogen evolution is substantial (on the order of 3500 to 4500%). Figure 1; references 5 (Russian).

7813/12379

CSO: 1841/264

## CHEMICAL INDUSTRY

### SHCHIGRY GEOEXPLORATION EQUIPMENT PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Mar 87

[Article by Brigade Leader S. Malykhin, Shchigry, Kursk Oblast: "Under Foot: An Open Letter from Brigade Leader S. Malykhin to Minister of Chemical and Petroleum Machine Building V. Lukyanenko"]

[Text] Dear Vladimir Matveyevich:

Unusual circumstances for the collective induce us to turn to you through SOTSIALISTICHESKAYA INDUSTRIYA. Our geological exploration equipment plant, in Shchigry, which recorded its hundredth anniversary this past year, appeared in them. And inasmuch as the plant is the head of the Geomash Association, all its misfortunes have become the misfortunes of the association also.

I alone of those veterans of the plant still working had the occasion to bear the whole weight of its rehabilitation after World War II. We built up the enterprise from ruins by screw and brick. And we built it up, and for many years we took pride in the brand of our own plant. During the last three five-year plans, the collective was in the front line and more than once was provided with incentives for high labor achievements. And, it would seem, this secure well-being has collapsed: the 1986 annual plan failed in all indicators. Since 1 Jan of this year, production of the head plant has been presented for state acceptance. The sharply rising undoubtedly justified requirements for its quality intensified our difficulties. Thus, in both January and February the association was not equal to the plan. Things are not going better in March.

The breakdown of the plan, naturally, impinged on the national economic interests. Our earnings also received an appreciable blow: the average wage in the association fell by thirty plus rubles. Twenty persons left in January and February, and several dozen more gave notices. And this happens in a city in which industry is not at all large and in which often it is not simple to find a new position. This means a surplus and they have to go away. And it was not only a matter of a drop in earnings. There are 550 plant workers in line for housing, or almost every third worker. Among them are people who have given the enterprise not one decade, but who thus have not waited for a decent apartment. At the beginning of this year, your deputy Boris Pavlovich

Vasilyev visited us. We placed no small hopes on his coming. But to the question as to how to extricate ourselves from such a situation, he answered:

"We cannot give any help. You yourselves earn money, renovate, and build new buildings and housing."

I shall say at once, we did not count on the deputy minister presenting us with tens of millions of rubles and more for a saucer with trim. But we wanted to hear that the ministry leaders are extremely worried about the situation, are conscious of their own fault for our catastrophic drop, and were thinking of efficacious measures. As we see, the hopes were not justified. We are to blame for everything, it seems, only we; we got ourselves into the mess and we now must get ourselves out of it.

Our association beginning with this year has converted to self-financing. I am not very strong in financial-economic niceties, but I know that the norms for deduction from profits for the use of the collective enable tidy capital of the enterprise to be formed, normally for living and working. It would have been this way, I repeat, if we by the efforts of the ministry had not fallen into an extended debacle.

The name of the plant itself signifies its specialization: our main product is equipment for geologic and engineering exploration. For a long time, when the plant was subordinate to the USSR Ministry of Geology, we did not know woes. Thirty years ago production was renovated and since that time without an increase in the labor force the volumes have risen by a factor of 5 to 7. The safety margin which renovation gave was the result for many years. Growth also did not cease when we were transferred to the Ministry of Chemical and Petroleum Machine Building.

However, no safety margin is unlimited. The growth resource has been exhausted. This has strongly disturbed the collective and the rayon and oblast party committees. For the last ten years the plant leadership and the party agencies insistently have tried to "force" the idea of renovation to the ministry. We understand, Vladimir Matveyevich, that you became the minister recently and that you are not responsible for the actions of your predecessors. But you must know that former deputy minister M. Troitskiy repeatedly promised us renovation in the 12th Five-Year Plan. He established protocol on this score. V. Pavlov, then head of the All-Union Petroleum Industry Machine Production Association, and other leaders gave assurances by letter. And all this proved to be empty phrases.

The central press wrote about our misfortunes several times. They reacted to the criticism. But how? They made new promises, which also were not fulfilled. Finally on 17 Dec 86 you signed Order No. 508 on technical reequipment of the association, which mandates carrying out operations using the organization's own resources. And now, dear Vladimir Matveyevich, let us think about this orientation, which is correct at first glance and which is wholly in agreement with the principles of self-financing.

I cannot name the exact total of expenditures for renovation. However, the director of the association also cannot, because there are still no technical

and economic justifications; there has been no time for arranging it for more than two five-year plans. And just the same it is known that about 40 million rubles are required. Indeed, in essence we have to modernize all the shops, especially steel, blacksmith, galvanizing, electrical equipment, etc. And the forces available are only the capital construction department composed of 77 people. There is practically no construction industry base in the city, so there is no one to count on. According to the economic method, as you know, materials are divided into half of the amount of the contract method. Over how many five-year plans does the ministry think of extending renovation?

The impression that has been created is that Geomash is a fifth wheel of the cart for the ministry. You, Vladimir Matveyevich, do not know the apparatus and where you would stick our association. Finally, we are subordinate to Main Administration for Fittings. On that basis, apparently, the small Lgov fittings plant is part of Geomash. And there the central committee (Yu. Rokhlov is already the third chief there) constantly requires an increase in the output of all kinds of nonprofile products, on which forces of procurement, assembly, and instrument productions are squandered. In combination with tough planning, a sharply deteriorating material supply, and a stock of dilapidated machine tools, this means a notorious failure of tasks.

It turns out that the leaders of the central directorates and the ministries by requiring a plan at any price for many years, have brought the plant to complete breakdown, and now they have considered the time most appropriate for changing direction, citing the new conditions of economic management. We, the workers, consider this maneuver to be deeply irresponsible. Namely, the faith of people in renovation is undermined in this way: The right words are said about careful training and the creation of proper conditions, but actuality is something completely different.

Vladimir Matveyevich! We know you as the leader of the Sumy Association imeni Frunze, which together with VAZ [as published] boldly brought new methods of economic operation into existence. You understand well the complexity of present conditions. But ways to overcome the difficulties are known to you, truly better than to others. I understand that you do not have a ready answer. But our collective hopes are you will thoroughly investigate the specific circumstances and will help us overcome the breakdown.

12410

CSO: 1841/262



DOMESTIC EQUIPMENT FOR CHEMICAL INDUSTRY

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian 11 Nov 86, p 32

[Author: E. Shpakovskaya]

[Text] At VUzy of the republic, original equipment has been developed for the chemical industry. For example, an assembly of ion selective electrodes (ISE) determines concentrations of gold, silver, and palladium in galvanizing tanks and technical solutions. With its aid, it is possible to quickly and precisely control the mixture of electrolytes, enabling one to improve the quality of coatings and increase the labor productivity of galvanization operators and analysts. ISE's have been introduced in a number of factories of the republic with an economic effect of more than two million rubles.

An apparatus for evaporating aqueous solutions of various substances, i.e., carbamide, can be used not only in the chemical but also in the food industry. Experimental-production prototypes of it were effectively put on line at the Grodnenskoye PO "Azot" without interfering with technical operating conditions.

An apparatus intended for dosing, mixing and delivering components in a liquid form has found application in the construction and production of refrigerators (their internal spaces are filled with heat-insulating material). Its use will allow us to completely substitute the imported pouring machines used today.

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FROM BRIGADE COST ACCOUNTING BASED ON SOCIAL ACCOUNTS TO SELF-AMORTIZATION OF THE ENTERPRISE

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 2-3

[Article by Yu.I. Vlasov, Central Committee, Chemical and Petrochemical Workers Union]

[Abstract] The great transition to cost accounting and self-supporting operation has required extensive education and indoctrination of workers. The experience of "Krasnyy Bogatyr" Production Association in Moscow and the valuable initiatives of the brigades of workers at this Association should be utilized throughout the nation. The administrators of this Association understand that what is needed first of all is to change the psychology of all workers, abandoning old working methods and showing, using specific examples, that the success of the brigade depends directly on the contribution of each worker and specialist. The work of each brigade is to be evaluated by the additional profit which it contributes to the total profit of the enterprise, as well as its deduction to the social fund. The actual profits received by the enterprise due to improving the productivity of labor and fulfilling the plan have been calculated in monetary terms, allowing workers to evaluate their contribution to the enterprise. Members of leading brigades have taken on high socialist obligations to improve profits and decrease costs in 1987. The central committee of the Union has approved this initiative and recommended it for other enterprises.

6508 / 12379  
CSO: 1841/282

## AUTOMATED WORK STATION FOR RUBBER PRODUCT DESIGNER

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 41-43

[Article by V.P. Shevchuk, M.A. Krakshin, Ye.A. Delakov and V.I. Terekhova]

[Abstract] One of the most promising trends in automated manufacture of rubber products is the development and introduction of personal automated work stations for leading specialists. This article describes an automated personal work station for an engineer involved in the development of formulas for rubber mixtures. The work station, called ARMintekh, is based on an "ISKRA-1256" microcomputer plus software allowing the computer to be used by a technologist who is not a programmer. It can automate the following stages in planning of rubber product formulas: Planning of experiments is based on a set of limitations; statistical processing of the results of the planned experiments; approximation of experimental data in order to obtain the formalized relationships among rubber mixture parameters; optimization based on a mathematical model; and formulation of the basic entry and intermediate results of work in tabular and graphic form. The work station was approved for use at all large rubber product design enterprises. Figures 2.

6508/12379

CSO: 1841/282

## RELIABLE INFORMATION ON MATTER

Moscow TEKHNIIKA I NAUKA in Russian No 12, Dec 86 pp 22

[Article by R. Khadzhiev, Deputy Chief, Public Press Center, All-Union Scientific and Technical Organization]

[Abstract] A complex system for supporting the national economy with standard reference data on the thermophysical properties of technically important gases and liquids has been developed, after almost 20 years of hard work. The system is to provide the economy with reliable data on thermophysical properties of gases and liquids, and includes programs for investigation of the thermophysical properties of the substances, a system of specialized reference publications to contain the information, methods of calculation of the values required, and automated computer systems to support research and development. The system was used to set up an information service for more than 80 large scientific-production associations, planning-design organizations and institutes. The economic effect achieved by utilization of reliable reference information in planning is estimated as 5 to 8 rubles per ruble of cost.

Introduction of the new reference data at enterprises of the Petrochemical Industry Ministry will yield an economic effect of about 4.5 million rubles per year.

6508/12379  
CSO: 1841/225

#### CYBERNETICS AS MAJOR FACTOR IN ADVANCES IN CHEMICAL ENGINEERING

Moscow TEORETICHESKIYE OSNOVY KHIMICHESKOY TEKHNologii in Russian Vol 21, No 1, Jan-Feb 87

[Article by V.V. Kafarov]

[Abstract] Consideration is given to the cybernetic approach to control systems in chemical engineering, as a major factor affecting further advances in this branch of knowledge. Developments in computer science, harnessed with the concepts of cybernetics, have already created efficient automatic control systems with great impact on chemical engineering. cursory details are provided to the organization of various closed-loop feedback systems, manipulation of the guiding information, and the processes responsible for filtering out immaterial or disturbing information from the information flow. The review also covers the significance of appropriate mathematical models, a systems approach to chemical engineering, and their combination for efficient control systems. Figures 5; references 29: 28 Russian, 1 Western.

12172/12379  
CSO: 1841/214

## COMMENTARY ON MATERIALS STUDIES IN 'PION-M' UNION ON 'MIR' STATION

Moscow KOMSOMOLSKAYA PRAVDA in Russian 7 Mar 87, p 2

[Article by S. Leskov]

[Excerpt] Cosmonauts Yuriy Romanenko and Aleksandr Laveykin have been working for one month on board the orbiting station "Mir". A major event for the crew occurred two days ago. The cargo spaceship "Progress-28" docked with the complex "Mir"--"Soyuz TM-2".

Romanenko and Laveykin are conducting studies with the unit "Pion-M", which has already proved itself on the "Salyut-7" station. The goals of these studies are far-reaching ones -- laying the scientific groundwork for industry in space. But first problems of the physics of surface phenomena and of hydrodynamics and heat exchange in zero gravity must be clarified, as well as new laws of phase transitions, and methods must be learned for utilizing such factors as vacuum and the absence of gravity for the purpose of obtaining superpure semiconductors, alloys, and medicinal preparations.

In the opinion of Professor L. V. Leskov, one of the directors of the experiments with the "Pion" unit, the cosmonauts have obtained results that are interesting for understanding thermocapillary convection, a phenomenon that is insignificant on Earth but of major importance for processes in space.

Colloid chemistry experiments for studying electrostatic fields of force around aerosols and hydrosols were organized with the participation of the USSR Academy of Sciences' Institute of Physical Chemistry. These experiments are relatively simple as yet. All that is necessary is to shake a test tube and see what happens in it, and how particles cling together.

But very curious things have come of this. The cosmonauts have documented how particles of silica aerogel in suspension in a test tube conglomerate, forming tiny saucers about 5 millimeters in size which are suspended with no support. Scientists must now figure out what is happening here.

This series of experiments is called "Kolosok". Scientists plan soon to eliminate the primitive method of shaking test tubes from "Kolosok". Precisely calculated ultrasonic pulses will produce measured effects at certain frequencies and intensities and in certain directions. It will become possible to create the 'saucers' and other objects to order.

Among the many things the "Progress-28" ship brought from Baykonur to "Mir" is an electric furnace called "Korund" for producing semiconductors, metals and alloys. It, too, is no newcomer on orbiting stations. The "Korund", incidentally, has the largest capacity in the family of space furnaces.

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CSO: 1841/238

'PION-M' UNIT ON 'MIR' STATION DESCRIBED; NEWLY DELIVERED EQUIPMENT NOTED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Mar 87 p 1

[Article by G. Lomanov, correspondent at the Flight Control Center]

[Excerpt] Associates of the USSR Academy of Sciences' Institute of Physical Chemistry came up with a series of experiments in colloid chemistry. Microscopic particles of various materials were placed inside ampoules. Results have surprised even the scientists. Silica aerogel, a variety of glass, conglomerated into rather large masses shaped like saucers. Fluoroplastics formed weird tree shapes, and glass pellets gathered into solid clumps. And even bits of stainless steel which were placed specially in each ampoule as 'mixers' could not break them up. It appears that the scientists have entered into a new and puzzling field of colloid chemistry.

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UDC 541.18.045

## ULTRAFILTRATION SEPARATION OF WATER-SOLUBLE COMPOUNDS ON MODIFIED NUCLEAR FILTERS

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 1, Jan-Feb 87 (manuscript received 2 Jan 86) pp 45-50

[Article by V.M. Kochkodan, M.T. Bryk and Ye.A. Tsapyuk, Institute of Colloid Chemistry and Water Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Nuclear filters, otherwise known as nucleopore membranes, have strictly cylindrical pores practically perpendicular to the surface with a very narrow range of distribution of pore sizes, so that they can be used for experimental verification of theoretical concepts of mass transfer through ultrafiltration membranes. They have been widely used for the production of very pure water in the electronics industry, for purification, concentration and sterilization of viruses and vaccines and in cytology. Broader utilization of these filters will require investigation of the theoretical principles of mass transfer through such systems and modification of their physical-chemical and separation properties. The authors studied chemical modification of nuclear filters by graft polymerization of monomers on their surface to determine the possibility of regulation of the separating characteristics of such membranes and the influence of the chemical nature of the graft polymer on transfer of neutral and ionized water-soluble polymers and dyes through the membranes. The studies showed that chemical modification can in principle be used to regulate the separating and physical-mechanical properties of the membrane. The chemical nature of the surface of such membranes was found to be important in determining their separating and adsorption characteristics. Figures 4; references 10: 5 Russian, 5 Western.

6508/12379

CSO: 1841/224



## EFFECTS OF WEAK CHEMICAL INTERACTIONS ON DISPLACEMENT OF ONE LIQUID BY ANOTHER FROM SOLID SURFACES IN PRESENCE OF SURFACTANTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 5 Feb 86) pp 377-381

[Article by A.A. Abramzon, L.V. Toropina and N.L. Golovina]

[Abstract] Studies were conducted on the wetting angles and the work of displacement of one liquid by another from a solid surface in the presence of surfactants, using nonideal liquids. Consequently, the organic solutions involved ethyl acetate with 8.5% solubility in water and butyl acetate with 0.5% solubility, and alcohols (hexyl, heptyl, nonyl) and chloroform as compounds that form weak chemical bonds with water. The surfactants employed were sodium lauryl sulfate and cetyltrimethylammonium bromide, with quartz and sapphire providing the high-binding energy surfaces and MF-4 fluoroplast the low-energy surface. Measurements of the wetting angles and the work of displacement of an organic solvent by water and by water-surfactant combinations demonstrated that deviation from the behavior of ideal solutions was obtained only in cases where there was chemisorption of one of the liquid phases, or of the surfactant, to the solid surface. Similarly, deviation was also seen when the liquid phases gave evidence of weak chemical interactions. References 3 (Russian).

12172/12379  
CSO: 1841/279

## MATHEMATICAL MODELING OF PARTICLE ENCAPSULATION IN DIFFUSION APPARATUS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 13 Dec 85) pp 427-429

[Article by N.V. Penkov and O.M. Flisyuk]

[Abstract] Mathematical modeling was applied to encapsulation in a cylindrical diffusion apparatus with ideal transverse mixing. A series of differential equations were advanced to cover a system consisting of A, B and AB particles, assuming a growth in A and AB particles at the expense of B particles. The mixing in the apparatus was based on the effective diffusion coefficient and previously formulated assumptions delineated by the authors [Zhurn. Priklad. Khim., 58(11):2604, 1985; 59(11):2568, 1986; 58(5):1156, 1985]. References 5 (Russian).

12172/12379  
CSO: 1841/279

UDC 532.69

EFFECTS OF METHOD OF TITANIUM-CONTAINING SURFACE TREATMENT ON WETTING BY EPOXY OLIGOMERS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 20 Feb 85) pp 454-455

[Article by Ye.Ye. Bibik, Ye.A. Popova and G.S. Skok, Leningrad Technologic Institute imeni Lensovet]

[Abstract] Trials were conducted on the effects of various modes of treatment of the surface of titanium-containing alloy OT-4 on wettability by ED-20 epoxy resin. Treatment of the surface by a mixture of acids, and mechanical abrasion resulted in a reduction in the wetting angle by ca. 40°. However, treatment with toluene solutions of aminomethylene derivatives of pyrazol-5-one resulted in a more profound reduction in the wetting angle that persisted for a longer duration. The effectiveness of the latter wetting agents was attributed to the heteroatoms (-O-, -NH-, -S-) that formed additional bonds with the metallic surface, as well as to the presence of a central metal atom that reacted with the oxygen atom of the epoxy group. References 2 (Russian).

12172/12379  
CSO: 1841/279

UDC 66.069.82

BREAKDOWN OF FLOODED GAS JET INTO BUBBLES IN FIXED EXTERNAL FLUID FLOW

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 29, No 12, Dec 86 (manuscript received 24 Apr 85) pp 101-104

[Article by D.O. Bytev, S.Yu. Makarov and V.B. Svetovoy, Department of Theoretical Mechanics, Yaroslavl Polytechnic Institute]

[Abstract] The breakdown of a gas jet flowing from a single aperture into a moving fluid is studied by methods of statistical physics. The breakdown of the jet forms a polydispersed system of bubbles. Equations are derived for calculation of the mean diameter of the bubbles thus formed. The effect of the movement of the liquid is defined, as is the minimum speed at which the effect occurs. Figures 2; references 6: 4 Russian, 2 Western.

6508/12379  
CSO: 1841/255

## THEORY OF THERMAL POLARIZATION OF BODIES IN RAREFIED GAS STREAM

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 49, No 1, Jan-Feb 87 (manuscript received 6 Feb 85) pp 45-53

[Article by V.I. Roldugin, Institute of Physical Chemistry, USSR Academy of Sciences, Moscow]

[Abstract] The phenomenon of thermal polarization of bodies in a flow of rarefied gas has been confirmed. The effect of thermal polarization is related to thermophoresis through the relationship of symmetry of kinetic coefficients  $\alpha_{11}$ ,  $\alpha_{12}$ ,  $\alpha_{21}$  and  $\alpha_{22}$ , included in the phenomenologic equations of motion of particles in heterogeneous gases. This article undertakes proof of correctness of the equation  $\alpha_{12} = \alpha_{21}^t$  with arbitrary values of Knudsen number and arbitrary interaction of gas molecules with the surface of the body immersed in the flow. The rate of thermal slipping along the curve of the surface is then calculated, producing closed expressions for the rate of thermophoresis and thermal polarization effect, which can be used to determine the values of accommodation coefficients of momentum and energy. The influence of the correction to the thermal slipping coefficient related to the curvature of the flow surface on the experimentally-determined accommodation coefficients is estimated. References 14: 9 Russian, 5 Western.

6508/12379  
CSO: 1841/270

## DIPLOPHORESIS OF COLLOIDAL PARTICLES NEAR THE INTERFACE BETWEEN TWO MEDIA WITH TOTAL INTERNAL REFLECTION OF LIGHT BY THE INTERFACE

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 49, No 1, Jan-Feb 87 (manuscript received 28 Feb 85) pp 98-103

[Article by V.N. Shilov, I.A. Razilov and V.R. Estrela-Llopis, Institute of Colloid Chemistry and Water Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Sea water is transparent in the optical region of the spectrum. This work studies the possibility of diplophoresis of a colloidal particle in a strongly heterogeneous light frequency field created near the interface between two media with different optical densities and total internal reflection from the interface of a strong electromagnetic wave such as a laser beam. The force of attraction or repulsion acting on the particle and

effectiveness of its capture near the interface are calculated considering Brownian diffusion and ion-electrostatic repulsion forces for the case of a flat interface. With particle radius over  $0.4 \mu\text{m}$ , specific light-source-power  $120 \text{ W/mm}^2$ , the potential energy of the conducting particle in the medium is greater than the energy of the Brownian motion plus the height of the energy barrier, indicating that the interaction of a mineral particle and microorganisms is not determined by dielectrophoresis of particles in an electromagnetic field radiated by the microorganisms. Figures 2; references 10: 8 Russian, 2 Western.

6508/12379  
CSO: 1841/270

UDC 531.527:534.141

#### EXCITATION OF VORTEX CURRENTS BY OSCILLATIONS ON SURFACE OF LIQUID

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 49, No 1, Jan-Feb 87 (manuscript received 18 Jan 85) pp 154-157

[Article by G.A. Kardashev, A.V. Salosin, S.G. Manukyan and A.V. Solovev, Moscow Institute of Chemical Machine Building]

[Abstract] The coefficient of surface tension of a liquid is measured by excitation of capillary waves on the surface of the liquid. Previous studies using this method have not reported existence within the grid of surface-capillary waves of a cellular vortex structure. The authors found that a number of frequencies could be selected at which standing surface-capillary waves are excited. Nodes of two types arise: Those formed at the intersection of nodal lines on the x and y axes, and nodes formed by the addition of maxima and minima on the x and y axes. A unit cell containing a vortex is formed around each of the nodes of the first type. The angular velocity of the vortices was experimentally determined by photographic observation of particles of milled pepper sprinkled onto the surface. It was found that the angular velocity of a vortex varied complexly with dissolved NaOH content of the water. Angular velocity increased linearly with increasing oscillation amplitude, decreased with increasing viscosity, and increased with increasing surface tension of the fluid. The angular velocity was always less than the angular frequency of the exciting oscillations, and was not in a simple integer relationship with the angular frequency of the exciting oscillations. Figures 4; references 3 (Russian).

6508/12379  
CSO: 1841/270

## METHOD OF MODELING ELECTROSURFACE CHARACTERISTICS OF GAS BUBBLES IN AQUEOUS SOLUTIONS

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 49, No 1, Jan-Feb 87 (manuscript received 25 Jan 85) pp 162-166

[Article by S.V. Lopatenko, Odessa University]

[Abstract] Due to the difficulty of modeling unsteady electrohydrodynamic processes, the physical model of the mechanism of drop charging is descriptive in nature. Since the equations of the charging process are not known, the problem of the similarity of the phenomena of development of excess surface charge density at the solution-air interface during movement of a gas bubble through a solution and during separation of a droplet from the volume of a solution of a similar type in air is solved using the theory of dimensions. The desired quantity was the surface charge density at the liquid-gas interface. It was found that the curves illustrating droplet charge, as a function of dispersing solution concentration for all surfactants studied, agreed satisfactorily with the  $\chi$ -potential curves of gas bubbles in similar solutions. Therefore, data on the change in surface charge density at the solution-air interface obtained by atomizing a solution into droplets can be used to estimate the influence of ionogenic surfactants on electrosurface characteristics of gas bubbles in solutions as well. Figures 2; references 16: 12 Russian, 4 Western.

6508/12379  
CSO: 1841/270

## STUDY OF STABILITY OF HIGHLY DISPERSED EMULSIONS OF PERFLUORINATED ORGANIC COMPOUNDS STABILIZED BY A HYDROPHILIC NONIONIC SURFACTANT

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 49, No 1, Jan-Feb 87 (manuscript received 29 Jan 85) pp 178-182

[Article by O.B. Pavlova-Verevkina, Yu.D. Aprosin, L.V. Novopashina and N.I. Afonin, Central Scientific Research Institute of Hematology and Blood Transfusion, Moscow]

[Abstract] Highly-dispersed, perfluorinated organic emulsions stabilized by nonionic surfactants are being intensively studied as a part of the process of development of blood substitutes for transfer of oxygen. The task of

stabilizing emulsions of these compounds is particularly urgent. This article studies the inter-phase properties of systems consisting of perfluorinated organic compounds plus an aqueous solution of proxanol 268 and the mechanism of breakdown of a highly dispersed perfluoro-decaline emulsion. It was found that wide variation in concentration of the dispersed phase, viscosity of the dispersion medium and droplet volume had practically no influence on the rate of breakdown of the perfluoro-decaline emulsion. The stability of these emulsions, stabilized with proxanol 268, is independent of particle collision frequency and adsorption layer properties, indicating that the emulsions break down by isothermal distillation, a mechanism common to other perfluorinated compounds stabilized by hydrophilic nonionic surfactants. Stabilization of blood substitutes based on these emulsions therefore requires introduction of a fourth component to modify the dispersed phase or transition to an emulsifying system which forms a more compact adsorption layer than does proxanol 268. Figures 3; references 9: 7 Russian, 2 Western.

6508/12379  
CSO: 1841/270

UDC 546.171.1'175

EFFECTS OF MOISTURE AND EXCESS NITRIC ACID ON THERMAL DECOMPOSITION OF SOLID AMMONIUM NITRATE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 1, Jan 87 (manuscript received 14 Aug 85) pp 3-7

[Article by Yu.I. Rubtsov, A.I. Kazakov, L.P. Andriyenko, I.I. Strizhevskiy and Ye.B. Moshkovich]

[Abstract] Mathematical analysis was combined with experimental data to assess temperature-related decomposition of solid ammonium nitrate in relation to moisture and nitric acid concentration in the liquid phase. Mass-spectrometric measurements on the  $H_2O-HNO_3-NH_4NO_3$  eutectic mixtures at 20 to 140°C after 1 to 90 days of equilibration demonstrated the autocatalytic nature of the decomposition process. Presence of excess nitric acid significantly accelerated the initial rate of the reaction. With decomposition, the liquid component of the system increased; further decomposition of the solid ammonium nitrate leads, in turn, to a further increase in the concentration of nitric acid forming the basis for the autocatalytic nature of decomposition in the presence of moisture and nitric acid. References 8: 7 Russian, 1 Western.

12172/12379  
CSO: 1841/256

UDC 541.124

PROMOTED AUTOIGNITION WITH A CHAIN-THERMAL UNBRANCHED PROCESS MECHANISM

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 10 Dec 85) pp 100-112

[Article by A.A. Borisov, V.M. Zamanskiy, V.V. Lisianskiy, G.I. Skachkov and K.Ya. Troshin, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The purpose of this work was to determine the kinetic aspects of the promoting effect in chain-thermal unbranched combustion and to provide a

basis for selection of an optimal promoter on the basis of the initial kinetic characteristics of the system by analytic and numerical solution of a simplified kinetic scheme which considers promoting. The influence of a promoter which decomposes to form active particles in the process of combustion under these conditions was theoretically analyzed. The analytic and numerical calculations showed that for various rates of the reaction of chain breaking, various dependences of  $\tau$  on promoter decomposition rate are possible: An asymptotic curve or a curve with a minimum. Analytic equations are derived for the delay in promoted combustion and the rate constants of decomposition of the promoter most effective in this reaction. The influence of temperature, promoter decomposition rate constant and promoter concentration on the combustion process is studied. Calculations based on the model suggested agree well with experimental data and data from the literature. Figures 5; references 20: 10 Russian, 10 Western.

6508/12379  
CSO: 1841/213



## PROSPECTS OF COMPACT POWER PLANTS BASED ON FUEL CELLS

Moscow IZVESTIYA in Russian 22 Feb 87 p 1

[Article by Blokhnin, A., correspondent (Sverdlovsk and Moscow)]

[Excerpt] Work on development of fuel cells has been in progress for a number of years. Soviet scientists, who are leaders in development of so-called high-temperature fuel cells, have come up with plans for extraordinarily economical, compact and lightweight power stations.

As commentary, we cite the following excerpt from a document prepared by authoritative specialists: "Scientific research, design and technological developments which the Institute of Electrochemistry of the USSR Academy of Sciences' Urals Research Center has carried out in the field of high-temperature fuel cells indicate that power-generating efficiencies as high as 55-60 percent are quite achievable when the chemical energy of gaseous fuel is converted directly into electrical energy by means of high-temperature fuel cells, and that the total efficiency of such plants can reach 80 percent when the heat of waste gases is utilized by conventional methods."

"The physical nature of the processes that take place in a fuel cell with a solid electrolyte is well understood in principle," said A.N. Baraboshkin, corresponding member of the USSR Academy of Sciences and director of the electrochemistry institute. "The main task lies in selecting a material, the most economical designs for the electrolyte's elements, and coatings, which perform the role of electrodes. Power plants based on high-temperature fuel cells would be very compact and light. A power plant with a capacity of 10 kilowatts, for example, thus ought to weigh only 120-140 kilograms and occupy a volume of just a little more than one-half cubic meter, according to calculations."

When assembled into large blocks, high-temperature fuel-cell stations could play a role in large-scale power engineering. At the electrochemistry institute, I was shown a poster with a drawing of a four-unit station of this type. Each of its units has a capacity of 250,000 kilowatts. Even a layman would notice that the dimensions of these units are unusually small: each is 63 meters long and 30 meters wide.

How far is all of this from being realized in technology?

"Soviet scientists are now ahead of their foreign colleagues in high-temperature fuel-cell developments, and we must maintain this lead," said academician Ya.M. Kolotyarkin, head of a scientific council on fuel cells. "These developments involve -- and this I wish to emphasize -- qualitatively new technology which will make possible advances in power engineering in great strides rather than steps. It will not even take very much to launch work in high-temperature fuel-cell power engineering. But, paradoxical as it may seem, this is what is standing in the way of such projects. Because it is a rather small thing that does not involve costs of hundreds of millions of rubles, it has not been included among the projects of the 5-year plan of the State Committee for Science and Technology. The Japanese, incidentally, would like to be producing approximately 15 percent of their energy with fuel cells by the end of the century."

Production of everything necessary for assembling prototypes, and possibly even for series production, of power plants of the new type could be organized in Sverdlovsk.

/12379

CSO: 1841/238

UDC 541.138.2

STUDY OF UNSTEADY KINETICS OF ANODIC OXIDATION OF SILICON IN GALVANOSTATIC MODE

Moscow ELEKTROKHIMIYA in Russian Vol 23, No 2, Feb 87 (manuscript received 26 Dec 84) pp 192-198

[Article by V.P. Parkhutik, Yu.Ye. Makushok, V.I. Kudryavtsev and A.N. Khodan, Moscow Institute of Radio Engineering]

[Abstract] An attempt is made at a complete study of the growth kinetics, composition and structure of porous oxide layers formed on silicon in aqueous solutions of a number of acids. This article in the resultant series presents the results of investigation of the unsteady growth kinetics of anodic oxide upon anodization of silicon in aqueous solutions of sulfuric acid in galvanostatic mode. Silicon of both types of conductivity was studied. The kinetic dependence of anodic potential as a function of charge is either an aperiodic nonmonotonic curve with one potential maximum or periodic, depending on electrolyte temperature. The amplitude of fluctuations in anode potential is greater, the higher the temperatures of the electrolyte and the concentration of sulfuric acid, but decreases with increasing anode current density. The surface of the oxide was found to hydrate, forming  $\text{Si(OH)}_x$ , and sulfate ions were embedded in the oxide. The drop in anode potential on the kinetic curves corresponded to etching of the barrier oxide formed in the initial stage of the anodization process. A model of growth of a porous oxide on silicon in acid electrolytes is suggested. Figures 5; references 11: 4 Russian, 7 Western.

6508/12379

CSO: 1841/278

UDC 541.13:621.359.2

ELECTROCHEMICAL INSTABILITY OF LIQUID MEMBRANES DURING ELECTRODIALYSIS TRANSFER OF CATIONS

Moscow ELEKTROKIMIYA in Russian Vol 23, No 2, Feb 87 (manuscript received 25 Jun 85; after revision, 27 Dec 85) pp 249-253

[Article by V.N. Golubev and A.S. Kontush, Odessa Institute of Food Industry Technology, imeni M.S. Lomonosov]

[Abstract] Experimental data on the filling of water in liquid membranes are used to analyze the relationship between selectivity of macrocyclic carriers and the type of electrochemical instability of liquid membranes under the conditions of electrotransfer of cations. Studies were performed in a five-chamber dialyzer using liquid membranes formed as a "thick" (1-3 mm) layer with cellophane barriers at the phase interface. The electrochemical and transport characteristics of liquid membranes modified by microcyclic compounds are found to depend largely on their structure and complex-forming capability, which must be considered in selecting the composition of membranes both for creation of ion-selective electrodes, and for the conduct of directed membrane ion separation and extraction processes. Figures 4; references 13 (Russian).

6508/12379

CSO: 1841/278

UDC 537.311.33:621.382.323

STUDY OF PROPERTIES OF GALLIUM PHOSPHIDE/DIELECTRIC INTERFACE

Moscow ELEKTROKIMIYA in Russian Vol 23, No 2, Feb 87 (manuscript received 5 Feb 85) pp 260-262

[Article by P.K. Kashkarov, A.N. Nevzorov, I.N. Sorokin, Yu.N. Sosnovskikh and A.I. Syagaylo, Moscow State University imeni M.V. Lomonosov]

[Abstract] A study is reported of the volt-farad characteristics of gallium phosphide MOS structures with two types of dielectric layers in a search for processes for the formation of dielectric coatings to be used in micro-electronic devices. Single crystals of n-type GaP with electron concentration  $10^{17} \text{ cm}^{-3}$  were used, oxidized in an electrolyte consisting of a water-ethylene glycol solution of an organic acid. The use of a double oxide was found to decrease the hysteresis of the volt-farad characteristic of the MOS structures by practically an order of magnitude. Possible causes include a change in the conditions of growth of the GaP oxide beneath an  $\text{Al}_2\text{O}_3$  film, apparently

influencing the defect content of the transition area between semiconductor and dielectric, decreasing the density of states in the oxide responsible for volt-farad characteristic hysteresis. Also, a portion of the traps in the structures with double dielectrics were separated from the semiconductor by a greater energy barrier than in specimens with natural oxide due to the significant width of the forbidden zone of  $Al_2O_3$ , significantly slowing the exchange of electrons between traps in the oxide and the conductivity zone of the GaP. Figures 2; references 6: 4 Russian, 2 Western.

6508/12379  
CSO: 1841/278

UDC 541.135.5

ELECTROCHEMICAL BEHAVIOR OF INTERCALATION COMPOUND  $Me_xCoO_2$  IN NONAQUEOUS ELECTROLYTES

Moscow ELEKTROKIMIYA in Russian Vol 23, No 2, Feb 87 (manuscript received 23 Sep 85) pp 287-289

[Article by I.Ye. Shpak, V.I. Shilo, A.O. Dmitrienko and L.I. Stolyarenko, Saratov]

[Abstract] Alkali metal cobaltate is a new material which is of great interest in the development of high-energy batteries in connection with the high specific capacity and open circuit voltage achieved in a pair with a lithium electrode. Alkali metal cobaltate specimens were prepared by heating in air of a pressed mixture of oxides of cobalt with alkali metal carbonate or peroxide at 400-900°C, 20-24 hours. The products obtained were identified by x-ray structural and chemical analysis, indicating that the  $Me_xCoO_2$  phases crystallized in a layer structure similar to  $Li_xTiS_2$ . Systems were studied in which the alkali metal atom in the compound, alkali metal cation in the electrolyte and type of solvent were varied. Changes in atom type resulted in significant differences in electrochemical behavior in the same electrolyte. The most promising of the alkali metal cobaltates was found to be lithium cobaltate in a salt solution with the same cation in solvents similar in physical and chemical composition to tetrahydrofuran. Group I metal cobaltates can be used not only as current sources but also in chemotronics. Figures 3; references 3 (Western).

6508/12379  
CSO: 1841/278

DIFFUSION GROWTH OF  $\beta$ -PHASE LAYERS IN CATHODIC INCORPORATION OF LITHIUM INTO MAGNESIUM

Moscow ELEKTROKIMIYA in Russian Vol 23, No 2, Feb 87 (manuscript received 11 Oct 85) pp 292-294

[Article by A.D. Modestov, I.I. Astakhov and D.Yu. Kudryavtsev, Institute of Electrochemistry imeni A.N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] Experiments were performed in a carefully dewatered LiCl-KCl electrolyte of eutectic composition at 380 and 400° C. The anode and comparison electrode were made of an LiAl intermetalide obtained by introducing lithium into aluminum from the same electrolyte. The cathode was made of Mg 96. A curve is presented illustrating the variation in electrode potential as a function of  $\beta$ -phase composition. The curve is found to fall approximately halfway between the points presented in two previous works. The curve was used to calculate the thermodynamic factor, which increases with increasing lithium concentration from 2.2-3.5. The mutual diffusion factor in the  $\beta$ -phase also increases with increasing thermodynamic factor from  $8.2 \cdot 10^{-8}$  to  $14 \cdot 10^{-8}$  cm<sup>2</sup>/s, again agreeing well with previously published results. Figures 3; references 11: 8 Russian, 3 Western.

6508/12379  
CSO: 1841/278

UDC 541.121:536.7

ELECTRICAL CONDUCTIVITY OF LiCl+NaCl(1:1)-AlCl<sub>3</sub> MELTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 31 Jan 86) pp 412-423

[Article by V.A. Petrov, L.D. Petrova and A.G. Morachevskiy]

[Abstract] Measurements were made of the specific conductance of LiCl+NaCl(1:1)-AlCl<sub>3</sub> melts, in which the AlCl<sub>3</sub> component ranged from 0.041 to 0.611 over a temperature range of 444 to 1004 K. The specific conductance of each melt was seen to increase with an increase in temperature. The specific conductivity isotherm displayed an inverse relationship between the increase in the AlCl<sub>3</sub> component and conductivity, reaching a minimum at ca. 40 mole% AlCl<sub>3</sub>. Subsequently, a conductivity maximum is reached at 50 mole% AlCl<sub>3</sub> (at 923 K), followed by another decline. These complex changes were attributed to the interaction of the components in the system, and the formation of AlCl<sub>4</sub><sup>-</sup> ions. References 12: 7 Russian, 5 Western.

12172/12379  
CSO: 1841/279

## STUDY OF EFFECTIVENESS OF USING Na-Tl-Hg AND Na-In-Hg AMALGAMS AS LAMP FILLING IN HIGH PRESSURE SODIUM LAMPS

Alma Ata IZVESTIYA AKADEMII NAUK KazSSR: SERIYA KHIMICHESKAYA in Russian No 1, Jan-Feb 87 (manuscript received 27 Dec 84) pp 54-60

[Article by M.B. Dergacheva, Yu.P. Petrenko, G.R. Khobdabergenova, S.N. Gromova and N.S. Markov, Institute of Organic Catalysis and Electrochemistry, KaSSR Academy of Sciences, Alma Ata]

[Abstract] High pressure sodium lamps (HPSL) are the most effective, long-lasting gas discharge light sources. Because of the wavelength of sodium, the lamps glow in yellowish tint, giving poor color resolution. Therefore they are primarily used outdoors. Altering the pressure of sodium vapor inside the lamp leads to changed glow parameters. This can be done by changing the composition of sodium amalgam in the lamp. Vapor pressure of the following compositions was obtained at different temperatures: Na-Tl-Hg and Na-In-Hg; the former showed higher pressure. Optimal amalgam composition was found to be: Na - 50%, Tl - 25% and Hg - 25%. Lamps with filaments of this composition showed stable characteristics even after 100 hrs of operation. Figures 4; references 15: 4 Russian (1 by Western author), 11 Western.

7813/12379  
CSO: 1841/283

UDC 678.026.37

## METALLOPOLYMERIC ELECTRODES AND THEIR APPLICATIONS

Kiev VISNYK AKADEMIYI NAUK UKRAYINSKOYI RSR in Ukrainian No 12, Dec 86 pp 43-53

[Article by Z.R. Ulberg, doctor of chemical sciences, and V.I. Podolska, candidate of chemical sciences]

[Abstract] A review is presented of the current trends and developments in metallopolymeric electrodes. The review covers and assess formulations of acceptable metal and polymer combinations, the electrochemical behavior of various metallopolymer electrodes, and the significance of composition coatings. The technical advantages of coprecipitation of polymers and metal are presented, with special emphasis on homo- and heterocoagulation in the perielectrode zone, the significance of the electrokinetic potential of the polymeric particles, concentration of the dispersed phase, and polymer-metal interaction. The resultant formulations may contain metal dendrites and

needles as well as colloid metal particles. The interrelationship of these two basic metal forms determines the behavior of the metallopolymeric electrode in cathodal and anodal polarizations. Corrosion-resistance of such electrodes is determined by the polymer:metal ratio, with a metal content of 55-80% generally representing the optimum formulation. Introduction of colloid metal forms greatly improves the physical and mechanical characteristics of the metallopolymeric electrodes, reduces their friction coefficient, and improves lifetime. In addition, the thermal and electrical conductivities of these electrodes lend themselves to extensive manipulation. Figures 6; references 49: 4 Ukrainian, 42 Russian, 3 Western.

12172/12379  
CSO: 1841/236

UDC 541.62.03:546.49.34

INVERSE TEMPERATURE DEPENDENCE OF CONDUCTIVITY OF LITHIUM SALT SOLUTIONS IN APROTIC MEDIA

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 6, Feb 87 (manuscript received 8 Apr 86) pp 1426-1430

[Article by V.N. Plakhotnik, N.F. Tovmash and Yu.V. Kovtun, Dnepropetrovsk Institute of Railroad Transport Engineers imeni M.I. Kalinin]

[Abstract] In previous studies of the physical and chemical properties of lithium salt solutions in aprotic dipolar solvents, the authors discovered the phenomenon of inverse variation of conductivity with temperature, with conductivity decreasing as solutions of  $\text{LiAsF}_6$  in tetrahydrofuran were heated from  $-40$  to  $+50^\circ\text{C}$ , with practically no variation in this same temperature range for  $\text{LiBF}_4$ -THF solutions. Analysis of information obtained since then on the behavior of lithium salts in aprotic dipolar solvents indicates that reactions among particles are not limited to the formation of ion pairs or triplets, but also include processes of construction of more complex structures involving ions, associates and solvent molecules. Temperature variations in maximal molar salt: solvent ratios in the liquid phase in phase equilibrium are presented, serving as a qualitative characteristic of comparative solvating capability of the solutions, which do not correspond with the ionizing capabilities in some temperature intervals. Current transfer may partially occur by rotation rather than movement of a fragment in a viscous medium. Increasing the temperature breaks down the structure of fragments, decreasing the contribution of this component to conductivity and leading to compensation of changes in viscosity. Figures 2; references 15: 13 Russian, 2 Western.

6508/12379  
CSO: 1841/249

## INFLUENCE OF CORRELATION AMONG CURRENT CARRIERS ON THERMO-EMF IN CHANNEL-STRUCTURE SOLID ELECTROLYTES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian, Vol 292, No 6, Feb 87 (manuscript received 1 Apr 86) pp 1436-1440

[Article by V.I. Tsidilkovskiy and V.A. Mezrin, Institute of Electrochemistry, Urals Science Center, USSR Academy of Sciences, Sverdlovsk]

[Abstract] A study is reported of the influence of correlation among mobile ions on the temperature variation of thermo-EMF and the relationship between the heat of transfer and activation energy of conductivity in solid electrolytes with jump-type channel conductivity. A model of a one-dimensional chain of alternating nodes of two types is used, allowing strict consideration of correlation pairs among charge carriers and corresponding closely to the actual channel-structure solid electrolyte. The variation of the s-contribution of the solid electrolyte to the heterogeneous component of thermo-EMF with correlation results in nonlinearity and the presence of local extremes in variation of thermo-EMF as a function of inverse temperature, significant difference in experimentally determined values of heat of transfer, and a change in the direction of the thermo-EMF with a change in temperature or concentration. Figures 3; references 5: 2 Russian, 3 Western.

6508/12379

CSO: 1841/249

UDC 621.9.048

## ELECTRIC EROSION CHEMICAL TREATMENT OF VTZ-1 TITANIUM ALLOY WITH ELECTRODE VIBRATION

Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 12, Dec 86 (manuscript received 25 Apr 85) pp 71-74

[Article by Ye.M. Rumyantsev, V.I. Volkov and V.A. Borodulin, Department of Technology, Ivanovo Institute of Chemical Engineering]

[Abstract] A study was made of electric-erosion chemical broaching of apertures in VTZ-1 alloy up to 100 mm deep. The influence of the electric tool material (copper, gray cast iron, type 3 steel and type EEG carbon-graphite) on the rate of penetration, change in voltage used in processing at 3-100 mm depth and relative wear of tool with low-voltage power supply were studied. It was found that the rate of penetration with an EEG electrode is significantly lower



than with a metal electrode, while the wear of the tool is 2-3%, apparently a result of the low conductivity of the carbon. Equipment and a technological process were developed for deep electric-erosion chemical broaching, featuring a 500 mm stroke length and a dc power supply converted to operate in pulse mode by the addition of thyristors to the control circuit. A positional tracking system was used to improve accuracy. Copper tools were used to produce apertures 40 mm in diameter and 100 mm deep under production conditions, with a mean penetration rate of 8 mm/min. Figure 1; references 4 (Russian).

6508/12379

CSO: 1841/255

UDC 662.613.5:614.72

## OZONE AND TRANSFORMATION OF NITROGEN OXIDES IN ATMOSPHERE

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 1, Jan-Feb 87 (manuscript received 10 Feb 86) pp 66-70

[Article by A.M. Kuklin, Institute of Gas, Ukrainian Academy of Sciences, Kiev]

[Abstract] Results are presented from a study of the content of atmospheric ozone, which is important in the process of transformation of oxides of nitrogen ( $\text{NO}_x$ ) in the atmosphere. Studies of the  $\text{NO}-\text{O}_3-\text{NO}_2$  system near a large electric power plant and in a mountain region were undertaken in 1983-1985. Pollution of urban air with oxides of nitrogen and its content of nitrogen was studied in the city of Kiev. The results of the experiments near the power plant and in Kiev showed that emission of nitrogen oxide leads to a decrease in the content of atmospheric ozone, confirming its role in the transformation of  $\text{NO}$  to  $\text{NO}_2$ . It is suggested that the content of atmospheric nitrogen be monitored near power plants and in cities. Ozone monitoring is particularly valuable in the vicinity of large power engineering complexes. Figures 4; references 7: 4 Russian, 3 Western.

6508/12379

CSO: 1841/224

ENVIRONMENTAL IMPACT OF PLANNED APATITE PLANT NEAR LAKE BAIKAL

Moscow TEKHNIKA I NAUKA in Russian No 12, Dec 86, pp 10-13

[Article by A.Z. Petrenko, Chief Specialist, State Consulting Commission, USSR State Planning Commission, V.G. Stoyakin, Chief of Subdivision of Consultation for Industrial Transportation and Communications, and Candidate of Economic Sciences A.A. Ryvkin]

[Abstract] The Consultation Commission of the USSR State Planning Commission recently analyzed a plan for construction of the Transbaikal Apatite Plant and its environmental impact, and concluded that the construction project should be cancelled since it would be impossible to protect the environment of the area, and the plan would threaten the pollution of Baikal, the Selenga River and the city of Ulan-Ude. The authors, members of the Commission, discuss the decision. Previously, two large cellulose combines were built near Baikal and these presently form the major source of pollution of the lake. The Commission decided that construction of the Apatite Plant, in spite of planned emission control measures, would threaten the pollution of the environment in the area and contradict the policy of protecting Baikal from pollution. Any future plan to utilize the Oshurkovskiy Apatite Ore Deposit should include complex measures for reduction of the existing background of pollution by environmental protection steps in the Lake Baikal basin. Only reduction of the planned capacity of the plant by a factor of 4-5, with placement of the beneficiation plant a safe distance from Ulan-Ude and the Selenga River, could reduce the danger. These steps would make utilization of the deposits economically impractical. Not constructing the plant according to the plan now under consideration would be the most constructive solution to this difficult problem and in the final analysis would help to preserve the natural riches of Baikal, a national treasure.

6508/12379

CSO: 1841/225

LONG-LIVED IODINE, CESIUM AND CARBON ISOTOPES IN AIR-SOIL-PLANT SYSTEM

Moscow AGROKHEMIYA in Russian No 2, Feb 87 (manuscript received 10 Mar 86)  
pp 79-85

[Article by F.A. Tikhomirov and I.T. Moiseyev, Moscow State University]

[Abstract] A review is presented of the circulation of I-129, Cs-137 and C-14 in the air-soil-plant cycle, noting the similarities and differences in the behavior of these radionuclides. Thus, C-14 enters the plant system primarily from the air, with only 1% of the intake coming from the soil, whereas in the case of I-129 and Cs-137 direct deposit on the plant surface constitutes the most prevalent route of ingress. Uptake of I-129 and Cs-137 from the soil would become a factor only after prolonged periods of soil exposure lasting for decades or hundreds of years. The soil functions as a depot for the radionuclides in question in the geochemical cycle. The specific role of soil depends on its physical and chemical characteristics, as well as climatic conditions. References 26: 23 Russian, 3 Western.

12172/12379  
CSO: 1841/273

DYNAMICS OF CHLOROANILINES IN SOLID AND LIQUID SOIL PHASES

Moscow AGROKHEMIYA in Russian No 2, Feb 87 (manuscript received 14 Apr 86)  
pp 90-96

[Article by R.V. Galiulin, Institute of Soil Science and Photosynthesis, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Studies were conducted with gray forest soil to assess the rates of biodegradation of 3,4-dichloroaniline (I) and 4-chloroaniline (II), with assays performed on the solid phase in the case of I, and with the solid and liquid soil phases in the case of II. Over a 4-year period the rate of biodegradation decreased 1.7-fold for I, when evaluated in terms of the time required for a 50% reduction in the starting level. The mean time for the 50% decrease in 1978 was 4.2 days (3.5-4.8 days), and 7.3 days (6.8-7.9) in 1982. Analysis of the solid and liquid phases demonstrated that the 50% decrease time for the former phase was 7.4 (6.6-8.1) days in the case of II, and 194.3 (70.2-318.4) days for the liquid phase, i.e., 20- to 26-fold greater. Addition of glucose to the liquid phase separated by centrifugation increased the rate of

biodegradation of II 1.7-fold. These observations demonstrated temporal changes in the rate of degradation of chloroanilines by soil samples, and the fact that the rate of biodegradation is dependent on the physical state of the sample. The biological activity of the liquid phase was deemed insufficient for efficient elimination of this class of compounds. Figures 2; references 19 (Russian).

12172/12379  
CSO: 1841/273

UDC 631.811:98:(575)

#### UPTAKE OF URANIUM-238 AND THORIUM-232 BY WHEAT PLANTS FROM CHEMICAL ASIAN SOILS

Moscow AGROKHIMIYA in Russian No 1, Jan 87 (manuscript received 25 Nov 85)  
pp 86-88

[Article by G.S. Ishchenko, A.S. Butnik, T.F. Afanasyeva, V.A. Rastopchina and Z.G. Ovchinnikova, Central Asian Scientific Research Institute of Phytopathology, Tashkent]

[Abstract] An analysis was conducted on soil effects in uptake of uranium-238 and thorium-232 by Unumli-Bugday spring wheat. The data demonstrated that the rate of uptake varied 1.9- to 6.2-fold, depending on the soil. An inverse correlation prevailed between the rate of uptake and the soil levels of humus, the physical characteristics of the soil (facilitated by light soil), and the concentration of mineral nutrients in the soil. In terms of the rate of uptake, the soils ranked as follows: desert sandy > light and typical serozem > prairie meadow and boggy meadow. On all soils, uranium-238 tends to concentrate preferentially in the straw and husks, and to smaller extent in the seeds. In the case of thorium-232, the highest concentrations are noted in the straw and seeds, with the least found in the husks. References 5: 4 Russian, 1 Western.

12172/12379  
CSO: 1840/231

UDC 631.45:661.665.2

#### ADVERSE EFFECTS OF DUST AND GAS EXHAUST WASTES FROM METALLURGICAL PLANTS

Moscow KHIMIYA V SELSKOM KHOZYASTVE in Russian No 2, Feb 87 pp 54-56

[Article by Ye.A. Vazhenina, candidate of agricultural sciences, and N.M. Fateyeva, Soil Institute imeni V.V. Dokuchayev]

[Abstract] Studies were conducted on the effects of dust and gas emissions from ferrous and nonferrous metallurgical facilities on vegetable crops of

collective farms within a 10-15 km radius. Chemical analysis of the plants (cucumbers, tomatoes, beets, cabbage, potatoes) demonstrated a significant rise in the levels of Fe, Mn, Zn, Ni and Cr in direct relationship to the level of soil contamination. Furthermore, the studies demonstrated that leaves may be used as an indicator of the degree of pollution: an inverse relationship prevailed between the degree of pollution and the concentration of total nitrogen and nitrogenous compounds. In addition, a direct relationship was established between the carbohydrate level of the root crop and the degree of pollution. On the whole, the dust and gas wastes were determined to have adverse effects on vegetable crops. Tables 3.

12172/12379

CSO: 1841/299

## FERTILIZERS

### INTERNATIONAL CHEMICAL CONFERENCES ENDS IN SUMY

Moscow TASS in English 1159 GMT 26 Mar 87

[Text] An international meeting of specialists in the chemical industry of the CEMA member countries has ended in the city of Sumy (Ukraine) today with the signing of a treaty on cooperation until the year of 1990 in the field of joint development and application of liquid mineral fertilizers.

Representatives of Bulgaria, Hungary, the GDR, Poland, Cuba, the USSR and Czechoslovakia outlined, on a contractual basis and along cooperative lines, ways for an accelerated creation of advanced waste-free technologies, equipment and apparatuses, and methods and mechanisms for the storage, transport and application of liquid fertilizers.

/12379

CSO: 1841/287

INSTALLATION 'CRYSTAL' - A REFRIGERATOR FOR ATOMS

Leningrad TASS in Russian 0635 GMT 12 Feb 87

[Text] Installation "Crystal", constructed at the Institute of High-Frequency Current, allows us to obtain new materials by striking metal with a powerful temperature shock.

Metal, placed in a vacuum, is heated up almost immediately with a super-high frequency magnetic field. At the same time, the force of the field holds the melt in a "suspended" state. It does not touch against the chamber walls and therefore does not receive any extraneous impurities. A heavy drop of smelt falls on the swiftly rotating drum. As it spreads, it forms not only a micron tape, but it also cools down.

The cooling speed seems impossible - one million degrees per second. This happens so quickly that atoms do not even have time to form a crystalline lattice. The microscope proves this: looking through the lens, one can see that the metal has assumed an amorphous structure, the same as glass.

The tape, obtained in one minute, weighs 100 grams and is two and a half km long. Possessing unique magnetic qualities, it is capable of storing a colossal volume of computer information. It is also possible to manufacture granules from the "glass" metals. Cutting instruments pressed from them are as durable and resistant to corrosion as goods made from chrome, tungsten and other alloys.

/12379

CSO: 1841/239P



## SIGRAN--NEW SYNTHETIC GRANITE

Moscow Radio in Russian 1715 GMT 7 Jan 87

[Text] Scientists at the Chemical Engineering Institute, imeni Mendeleev, jointly with specialists of the Kaluga glass works, have created synthetic granite, SIGRAN. SIGRAN can be made in the form of a continuous strip or pressed tiles, using ordinary equipment of the glass industry. Various color hues can be imparted to it. Moreover, the cost of SIGRAN is a half to a third of granite. SIGRAN can be used for the inside and outside facing of walls of cultural and domestic service buildings, sports, trade and other buildings, and metro stations. Our correspondent Vladimir Besverkhiiy visited the Kaluga glass works, where he interviewed Vladimir Mikhaylovich Peskov, the director of the works.

[PESKOV]: Two years ago the flooring of the Olympic complex in Moscow was finished with our granite. Our granite can already be found today in Lithuania, Latvia and in the Tula Oblast, which borders on ours. The need for granite is very great. If we look at our order book, it will be clear that today hundreds of thousands require it. We are getting letters from all over the Soviet Union. PRAVDA featured SIGRAN at one time, that is why many are already familiar with it. Fifteen countries have already requested patents for making SIGRAN. Today an experimental shop is making SIGRAN but it has a capacity of only 20-22,000 sq.m. per year. We had planned to put into operation the first stage of an industrial complex this year [1986] for 50,000 sq.m. But as you can see, this has not succeeded.

[BESVERKHIY]: A few years ago erection of a new specialized shop started for the commercial output of SIGRAN. It was designed for the production of 100,000 sq.m. of output per year. However, the Kaluga Building Directorate was not in a hurry. Its sub-units operated frequently in an uncoordinated fashion, sluggishly.

[PESKOV]: 300,000 rubles were planned for further production of SIGRAN per year, in '82, '83, '84, '85 but only 1,000, 10-15,000 rubles, were received, thus causing a very great delay to occur. And the 200,000 rubles which they will allocate this year [1986] will virtually make it impossible to start work on the technical part. We cannot install the glass-making furnace, we cannot install the crystallizers, we can not assemble the technical equipment. For 1986 the builders have not allocated a single ruble for their production plan.

The commissioning of the shop for the production of a material very much needed by the country is again being delayed through the fault of the Kaluga builders. One would like to hope that this red tape will receive a principled assessment from the local party and Soviet bodies.

/12379

CSO: 1841/239P

'KORUND' STUDIES ON 'MIR' BRING SPACE PRODUCTION OF SEMICONDUCTORS NEARER

Moscow KOMSOMOLSKAYA PRAVDA in Russian 26 Mar 87, p 2

[Article by S. Leskov, correspondent at the Flight Control Center]

[Excerpt] The mission of Soviet cosmonauts Yuriy Romanenko and Aleksandr Laveykin continues on board the orbiting complex "Mir"--"Soyuz TM-2"--"Progress-28". The crew has begun complex technological experiments and Earth-resources studies.

The cargo spaceship "Progress-28" delivered a unique apparatus, "Korund-1M", to the orbiting station.\* This apparatus, which weighs 130 kilograms, is intended for perfecting basic processes for producing semiconductor materials on an industrial scale in space.

"Cadmium sulfide crystals which were grown on board 'Salyut-7' were used in laser screens for projection television," related Candidate of Technical Sciences Ye. Markov, the experiment's director. "You may be sure that we would never have obtained the quality we did if it hadn't been for space.

"Space flight is expensive, of course. But delivering materials to distant orbits pays for itself many times over. Here are some figures. The number of usable crystals per wafer grown in space is 10 times greater than the number obtained on Earth. Profit per wafer is 1,900 rubles for 'terrestrial' wafers, and 9,400 rubles for 'space' ones. Isn't that convincing? Work on semiconductor-materials science must therefore be expanded to the maximum. Romanenko and Laveykin are to perform exactly 48 experiments with the 'Korund', involving specimens with the most diverse properties and possible applications. Among them are such rare and extremely valuable semiconductors as cadmium sulfide, zinc oxide and gallium arsenide."

"But when will we finally proceed from experiments to industrial production?" I asked Ye. Markov.

"By 1995, we hope to be able to obtain semiconductor materials for various purposes in amounts of 30-35 kilograms each. These materials will be used in superhigh-speed and superlarge integrated circuits, in infrared and laser technology, in photocells for orbiting stations' solar panels, and even for needs of medicine, which is waiting for sensitive infrared imagers, for

example. Let me emphasize that this is a high-priority direction for the advancement of Soviet science, and we are not running second to anyone here."

/12379

CSO: 1841/263

## COMMENTARY ON 'KORUND' UNIT FOR GROWING CRYSTALS ON 'MIR' STATION

Moscow PRAVDA in Russian 17 Mar 87, p 6

[Article by A. Pokrovskiy, correspondent at the Flight Control Center]

[Abstract] The article reports briefly on the "Korund" technologic unit on the orbiting station "Mir". It is the latest in a series of furnaces of the same type, which have been used for perfecting processes of making semiconductor materials on board orbiting stations. "Korund" is said to differ from its predecessors such as the "Kristall", "Splav" and "Magma-F" units in that it is larger, weighing 136 kilograms, and possesses greater capabilities. It is referred to as a pilot-scale unit, whereas the others were research units.

It is recalled that the first version of the "Korund" was operated by Anatoliy Berezovoy and Valentin Lebedev on the "Salyut-7" station. According to Candidate of Technical Sciences Ye. Markov, single crystals of cadmium selenide and indium antimonide which they grew there and brought to Earth were found to possess properties very close to desired ones. Therefore it was decided to continue crystal-growing experiments with a somewhat modernized "Korund" unit. Markov explained that the modernizing was aimed at giving the unit more of an industrial character, so that basic production processes could be perfected on it. Six processes for 10 different materials are planned for testing, according to Markov.

The new "Korund" reportedly has a built-in minicomputer so that experiments can be conducted automatically. It is said that both the profile of the heating zone and the rate of movement of ampules with specimens can be varied. The temperature can be varied from 20 to 1,270 degrees, and it can be held steady within one-half of a degree. Experiments can last from 6 to 150 hours. The output of the "Korund" is said to be measured in kilograms of semiconductor materials. All that the operator reportedly has to do is to load ampules with specimens into a special drum. The drum turns according to a control program, holding the ampules in the heating zone in the prescribed sequence.

It is mentioned that the materials produced in the "Korund" are to be used in electronics and in infrared and laser equipment.

/12379

CSO: 1841/238

CONDUCTIVITY OF  $V_2O_5-V_2O_3-Cu$  SYSTEMS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 28 Oct 85) pp 402-405

[Article by A.I. Snegrirev, A.A. Fotiyev, P.Ya. Novak, Ye.Ya. Gimpelman and V.I. Pivovarova, Institute of Chemistry, Urals Scientific Center, USSR Academy of Sciences]

[Abstract] An analysis was conducted on the effects of composition and temperature on the electrical conductivity of  $V_2O_5-V_2O_3-Cu$  samples. The studies made with samples containing different ratios of the components over a temperature range of 577-697°C led to derivation of regression equations between temperature and conductivity. Electrical conductivity was shown to increase with a decrease in the  $V_2O_5$  component, passing through a maximum at ca. 0.65 Cu. A linear relationship between conductivity and temperature was obtained: max. conductivity =  $-2362.5 + 4.1(T)$ . X-ray phase analysis of the samples provided data indicating that thermal stability was impaired by  $V_2O_5$ , and the electrophysical characteristics were predicated on the  $V_2O_3$  and metallic Cu components. Figures 5; tables 1; references 6 (Russian).

12172/12379

CSO: 1841/279

## EFFECT OF IONIC BOMBARDMENT IN ARGON ON STRUCTURE OF THIN ALUMINUM FILMS

Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No 1, Jan-Feb 87 (manuscript received 24 Dec 84) pp 39-42

[Article by A.I. Faynshteyn and N.A. Litovchenko, Odessa]

[Abstract] Ionic bombardment is used to purify surfaces in vacuum, to initiate surface reactions, to pulverize materials or to alloy them by implantations of ions in the surface layer. Using an example of thin aluminum films, processes were studied occurring during ionic bombardment of a surface in glowing discharge in argon atmosphere. One of the characteristics of glowing discharge is the fact that the ionic stream is not monoenergetic. The source of ions in glowing discharge is the border between the dark cathode space and positive pole. Here the energy of electrons broken out of the cathode becomes adequate for effective ionization of gas molecules. Depending on glowing discharge parameters, ionic bombardment will show different effects on the surface. In

actual experiments using translucent electronography, the following was observed in this process: increased lattice period, expanded diffractive maxima and anomalous noncoherent electron dispersion after film bombardment with argon ions. The last phenomenon is connected with nonuniform inclusion of argon in polycrystalline aluminum films. Figure 1; references: 16 Russian (6 by Western authors).

7813/12379  
CSO: 1841/266

UDC 54-1-11

### CRYSTALLIZATION OF PURE METALS

Alma Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 1, Jan-Feb 87 (manuscript received 14 Jul 84) pp 9-14

[Article by A.A. Presnyakov, Institute of Organic Catalysis and Electrochemistry, KaSSR Academy of Sciences, Alma Ata]

[Abstract] Crystallization problems present substantial interest from a scientific and practical point of view. Many reviews have been devoted to this subject. In the present paper, crystallization processes are presented as multi-stage actions including atomic changes going beyond simple additions of atoms to a crystalline lattice. Studying the solidification process, it should be viewed as two processes: conversion of atoms from "liquid" state into a "solid" one and only then the actual crystallization with characteristics resembling chain reactions, which under real conditions is terminated at different stages yielding different metastable molds. An extreme case of maximum metastability of solidified bodies is represented by formation of metallic glasses when, with high rate of heat removal the conversion of the atoms from "liquid" to "solid" state is arrested so that they can not crystallize, forming quasiamorphous structures instead. References 31: 29 Russian (3 by Western authors), 2 Western.

7813/12379  
CSO: 1841/283

## DEVELOPMENT OF POLYMORPHOUS CONVERSIONS IN METALS AND ACCOMPANYING PHENOMENA

Alma Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 1, Jan-Feb 87 (manuscript received 14 Jul 84) pp 14-17

[Article by A.A. Presnyakov and R.K. Aubakirova, Institute of Organic Catalysis and Electrochemistry, KaSSR Academy of Sciences, Alma Ata]

[Abstract] From a physical point of view, polymorphous conversions represent conversion of atoms from one state into another, occurring in stages; crystallization and recrystallization represent fixations of one of these stages under predetermined cooling conditions. The physical sense of polymorphous conversions narrows down to transition of atoms from one state into another by gradual (stage-wise) alteration of their structures such as redistribution of electrons (by energy levels, in membranes), different number of valence electrons and forms as well as "dimensions" of Fermi surfaces. Possibilities of fixation of individual stages of polymorphous conversions were discussed which could lead to formation of various metastable phases. References 13: 12 Russian, 1 Western.

7813/12379  
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UDC 546.654.431.824.21

CRYSTALOCHEMICAL AND ELECTROPHYSICAL CHARACTERISTICS OF  $\text{Ln}_{2/3-x}\text{M}_{3x}\text{TiO}_3$  COMPLEX OXIDES

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87 (manuscript received 14 May 85) pp 283-286

[Article by A.G. Belous, G.N. Novitskaya, S.V. Polyanetskaya and Yu.I. Gornikov, Institute of General and Inorganic Chemistry, UkSSR Academy of Sciences]

[Abstract] A physical-chemical study is presented of complex  $\text{Ln}_{2/3-x}\text{M}_{3x}\text{TiO}_3$  oxides, where Ln is from La to Nd, and M is Li, Na or K, including x-ray phase analysis and studies of electrophysical characteristics. Where M is Na or K, dielectric permeability and thermal stability are high improving from La to Nd. The results of studies of conductivity indicate high carbon conductivity through lithium ions. Figure 1; references 4: 3 Russian, 1 Western.

6508/12379  
CSO: 1841/286



STUDY OF SOLID SOLUTIONS OF  $\text{LaCo}_{1-x}\text{Al}_x\text{O}_3$  ( $0 < x < 0.15$ ) by NMR

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87  
(manuscript received 11 May 85) pp 280-282

[Article by Ye.V. Vanchikova and B.Ya. Brach, Syktyvkov State University, imeni 50th Anniversary of the USSR]

[Abstract] The major component of  $\text{LaCo}_{1-x}\text{Al}_x\text{O}_3$  solid solutions is the complex oxide  $\text{LaCoO}_3$ , which has perovskite-type structure. This article studies  $\text{LaCoO}_3$  and solid solutions based upon it by NMR directly on  $^{59}\text{Co}$  nuclei. It is found that for cobalt atoms with electron configuration  $3d^6$  in lanthanum cobaltate and solid solutions based on it, simultaneous existence of cobalt atoms in the low-spin ( $\text{Co}^{\text{III}}$ ) and high-spin ( $\text{Co}^{3+}$ ) electron states is possible only with cooperative interaction among the high-spin cobalt atoms. Partial elimination of these interactions leads to destabilization of the low-spin state of the cobalt atoms in the solid solutions and facilitates transition of  $\text{Co}^{3+}$  and  $\text{Co}^{\text{III}}$  atoms to the +4 and +2 oxidation states. Figures 2; references 6 (Western).

6508/12379  
CSO: 1841/286

UDC 546.651

THERMAL DECOMPOSITION OF  $\text{LaNiO}_3$ 

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87  
(manuscript received 10 Dec 85) pp 508-510

[Article by V.N. Tsygankov, A.V. Frolov, K.Yu. Odintsov and K.I. Petrov, Moscow Institute of Precision Chemical Technology, imeni M.V. Lomonosov]

[Abstract] A study was made of the kinetics of the solid phase reaction of decomposition of  $\text{LaNiO}_3$  by the method of measurement of the resistance of the reaction mixture. Synthesis of the  $\text{LaNiO}_3$  was performed by a ceramic technology at 1110-1190 K over 100 hours with periodic agitation, while  $\text{La}_2\text{NiO}_4$  was synthesized at 1550 K, 50 hours. Thermal decomposition was performed by continuous isothermic treatment at 1550 K. The decomposition process can be monitored by measuring kinetic changes in resistance of the products of the solid-phase reaction. Figures 2; references 5: 3 Russian, 2 Western.

6508/12379  
CSO: 1841/286

## BEHAVIOR OF PHOTOCELLS BASED ON EPITAXIAL JUNCTIONS

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 42, No 7, Jul 86  
(manuscript received 18 Apr 85) pp 20-23

[Article by G.D. Guseynov, A.M. Pashayev, G.A. Mamedova, G.G. Bannayeva, E.G. Abdullayev and A.A. Kuliyeu, Institute of Physics, Azerbaijan SSR Academy of Sciences]

[Abstract] The first reported use of a heteroepitaxial pGaSe-nInSe[Ag] system for photocells is reported, since junctions of this type facilitate the use of that portion of the solar spectrum (1.2 - 2 eV) that favors maximum efficiency of conversion. Volt-ampere characteristics are presented for pGaSe-nInSe[Ag] cells illuminated with 2800 K light from a W filament lamp, as well as subjected to x-ray and gamma irradiation. The sensitivity of the system to x-rays was found to be greater than that of currently used semiconductor-based photocells, with significantly greater for the other forms of radiation. These findings demonstrated that stoichiometric pGaSe-nInSe[Ag] systems may be used in photocells suitable for both terrestrial and space applications. Figures 2; references 5: 4 Russian, 1 Western.

12172/12379  
CSO: 1841/299

## THERMODYNAMICS OF DISSOLUTION OF ARGON IN TETRAETHYLAMMONIUM IODIDE SOLUTIONS IN 1,2-ETHANEDIOL AT 263-343 K

Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 29, No 12, Dec 86 (manuscript received 3 Jan 85)  
pp 112-114

[Article by D.P. Kuz'min and G.A. Krestov, Department of Inorganic Chemistry, Ivanovo Institute of Chemical Engineering; Institute of Chemistry of Nonaqueous Solutions, USSR Academy of Sciences]

[Abstract] A study is reported of the solubility of argon in the system 1,2-ethanediol - tetraethylammonium iodide at 263-343 K in the area of electrolyte concentration of 0.0-0.10 m.d. Analysis of the results obtained and of the literature on solubility of argon in electrolyte solutions in water and tertbutanol indicates that solvophobic effects appear in a certain interval of temperatures which depends on the nature of the components of the solution.

Near the crystallization temperature of the solvent, these effects may occur in other solvents previously considered "non water-like." Figures 2; references 8: 7 Russian, 1 Western.

6508/12379  
CSO: 1841/255

UDC 546.3-19'11

#### NEW HYDRIDE PHASES IN SYSTEMS R-Mg-H(R=Y, La, Ce)

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 3, Jan 87 (manuscript received 10 Apr 86) pp 632-634

[Article by M.Ye. Kost, N.T. Kuznetsov and A.L. Shilov, Institute of General and Inorganic Chemistry imeni N.S. Kurnakov, USSR Academy of Sciences, Moscow]

[Abstract] Results are presented from detailed study of the interaction of intermetallic compounds and alloys in the system Y-Mg, La, Mg and Ce-Mg with hydrogen. The alloys were produced by melting the metals under a layer of LiCl-KCl flux in a resistance furnace. Hydrogenation was performed in a glass vacuum-installation at room temperature, hydrogen pressure about 0.1 MPa. Decomposition of hydrides was found by thermal analysis to occur as follows: At 470-580 K the hydride decomposed to binary rare earth hydrides and magnesium with liberation of heat;  $CeMg_3H_3$  decomposed in two stages with the formation of  $CeMg_{12}$  in the intermediate stage. At 630-645 K,  $MgH_2$  decomposed. At 880-895 K, the solid solution based on Mg melted, then at 1220-1235 K a strong exothermic effect was observed, probably a result of the interaction of liquid Mg with the material of the thermographic vessel rather than hydride conversion. The hydrogen liberation temperature from La and Ce dihydrides is 1400-1450 K, coinciding with that of individual  $LaH_2$  and  $CeH_2$ , indicating absence of any significant interaction with the liquid magnesium. References 8: 7 Russian, 1 Western.

6508/12379  
CSO: 1841/259

UDC 541.127

RATE CONSTANTS OF THERMAL DECOMPOSITION OF  $\text{CF}_3\text{I}$  AND RECOMBINATION OF  $\text{CF}_3 + \text{I}$  IN SHOCK WAVES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 11 Oct 85) pp 136

[Article by I.S. Zaslono, Yu.K. Mukoseyev and S.V. Slinkin, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] Analysis of processes in high power photodissociation lasers based on  $\text{CF}_3\text{I}$  molecules requires information on the kinetics of reactions involving these molecules. This article studies the thermal decomposition of  $\text{CF}_3\text{I}$  in reflected shock waves. Absorption measurements were performed in a shock tube of stainless steel, inside diameter 38 mm, in mixtures of 2-5%  $\text{CF}_3\text{I}$  in argon. The absorption of  $\text{CF}_3\text{I}$  in the 316-400 nm area was measured. After the jump in optical density at the leading edge of the reflected shock wave, absorption drops to a steady value related to dissociation of  $\text{CF}_3\text{I}$  molecules. The absorption intensity profile over time can be used to determine the rate constant of thermal decomposition of  $\text{CF}_3\text{I}$ , using an equation presented in the article. Analysis of this rate constant as a function of pressure and temperature indicates that decomposition of  $\text{CF}_3\text{I}$  occurs in the transitional pressure area. The activation energy agrees with the bond strength of  $223 \pm 4$  kJ/mol suggested by Brouwer and Troe. A comparison of the measurements with low temperature data from previous studies indicates a slight positive temperature variation in rate constant over a broad temperature range, typical for recombination reaction such as the recombination of  $\text{CH}_3$  radicals. Figures 2; references 7: 4 Russian, 3 Western.

6508/12379

CSO: 1841/213

UDC 546.65+546.881+546.883

PHASE RELATIONSHIP IN  $Y_2O_3(LA_2O_3)-V_2O_5-Ta_2O_5$  SYSTEMS UP TO 1250°C IN  
SUBSOLIDIUS AREA

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87  
(manuscript received 19 Dec 85) pp 535-536

[Article by M.G. Zuyev and A.A. Fotiyev, Institute of Chemistry, Urals Science  
Center, USSR Academy of Sciences, Sverdlovsk]

[Abstract] Compounds with mixed anions containing transition and rare-earth  
metals are used as luminophors, particularly cathode-luminophors. Specimens  
for the study of the phase relationships were synthesized in air by multistage  
heating of the components of the mixture with concentration less than 50 mol. %  
 $V_2O_5$  at 600, 800, 1000 and 1200°C with intermediate mixing. Figures illustrate  
the phase relationships determined. Absence of isostructuring of isotypical  
compounds  $MVTa_2O_9$ , where  $M = Y, La$ , indicates the influence of dimensional and  
energy parameters of the transition metal cations on the structure of the mixed  
anion sublattice containing the tantalum and vanadium atoms, which may  
influence the physical properties of the compounds. Figure 1; references 7: 4  
Russian, 3 Western.

6508/12379  
CSO: 1841/286

UDC 541.11:546.65'13

ENTHALPY OF FORMATION AND ENERGY OF ATOMIZATION OF RARE EARTH ELEMENT HALIDES

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87  
(manuscript received 22 May 85) pp 318-321

[Article by A.M. Sapegin, A.V. Baluyev and O.P. Charkin, Institute of New  
Chemical Problems, USSR Academy of Sciences]

[Abstract] An attempt was made to produce accurate estimates of the values of  
 $E_a$  (atomization energy) and  $\Delta H_f$  (formation enthalpy) of lanthanide di- and  
trihalides by using the approximate variations of these characteristics  
established in analysis of experimental values of thermochemical quantities for  
the lanthanide chlorides. The dissociation energy of the  $D(X_2Ln - X)$  bond does  
no change monotonically as Ln changes along the 4f period, but rather passes  
through a minimum at Eu and Yb, increasing sharply by Gd and Lu.  
Figure 1; references 10: 7 Russian, 3 Western.

6508/12379  
CSO: 1841/286

UDC 535.34

## SPECTRAL STUDY OF CONVERSION OF Zn-TETRABENZOPORPHYRIN IN IODINE AND BROMINE VAPORS

Moscow KHIMICHESKAYA FIZIKA in Russian, Vol 6, No 1, Jan 87 (manuscript received 14 Mar 86) pp 122-126

[Article by A.N. Sidorov]

[Abstract] Electron and oscillating IR absorption spectra were used to study the products of interaction of polycrystalline layers of Zn-tetrabenzoporphyrin (Zn-TBP) with iodine and bromine vapor to compare the properties of these products with the properties of cation salts of nonmetallic TBP. The end product of the interaction of Zn-TBP with iodine consists of monocations, representing a difference in the properties of iodine and bromine as oxidizers. The monocation salts of Zn-TBP are quite stable. Contact with air causes shifting of some absorption bands, indicating the possibility of an association interaction between the cations and oxygen. The behavior of TBP and Zn-TBP in interactions with halogens indicates that in both cases a sequence of monocations and di-cations is formed, with the zinc atom not participating directly in the formation of the ion layer. The di-cation salts of both substances can adsorb pyridine molecules from vapor to become a mono-cation salt. Unlike Zn-TBP, TBP forms both mono-cations and di-cations with iodine. The electron donor capability of the TBP molecule is thus higher than that of the Zn-TBP molecule. Figures 2; references 4: Russian.

6508/12379

CSO: 1841/213

## OXIDATION OF SUCCINIC ACID BY OXYGENATED COMPLEX OF COBALT WITH L-HISTIDINE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 2, Feb 87  
(manuscript received 26 Dec 85) pp 398-402

[Article by Yu.I. Bratushko and N.I. Yermokhina, Institute of Physical Chemistry, imeni L.V. Pisarzheskiy, UkSSR Academy of Sciences]

[Abstract] Results are presented from studies of the kinetics of the reaction of succinic acid with an oxygenated cobalt complex  $\text{Co}_2\text{hist}_4\text{O}_2$  (where hist is the L-histidine ion). The experimental reaction rate constant was found to increase in proportion to the concentration of succinic acid. The results are used to derive a kinetic equation for the reaction. The oxidation rate decreases with increasing pH from 6.7 to 8.8. At pH 9.5, no change in the state of the system was observed for 6 hours after mixing of the reagents. The binuclear oxygenated complex of cobalt with L-histidine is thus found to oxidize succinic acid, although the histidinate complex cannot catalyze the process of oxidation of this substrate with molecular oxygen. Figures 4; references 20: 12 Russian, 8 Western.

6508/12379  
CSO: 1841/286

## POSSIBLE ELECTRON STRUCTURE OF COMPLEXES OF 3d-TRANSITION METALS REVERSIBLY BONDING MOLECULAR OXYGEN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian, Vol 292, No 6, Feb 87 (manuscript received 28 Jan 86) pp 1400-1405

[Article by Yu.N. Shevchenko and Corresponding Member, USSR Academy of Sciences, M.A. Poray-Koshits, Institute of Physical Chemistry imeni L.V. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev; Institute of General and Inorganic Chemistry imeni N.S. Kurnakov, USSR Academy of Sciences, Moscow]

[Abstract] A mechanism is suggested for the reversible bonding of oxygen observed in hemoglobin. The basic mechanism of oxygenation and deoxygenation of hemoglobin is said to be a change in the nature of the interaction of the Fe(II) ion with axial ligands due to its intrusion into the plane of the macrocyclic porphyrin ring and departure from it (low-spin and high-spin states) due to a change in the composition of the  $\text{O}_2 + \text{CO}_2$  gas mixture. When the Fe(II) ion enters the plane of the ring, all 3d orbitals directed on the axial coordinate are fully filled with electrons. The conditions arise for

axial acceptor ligands to influence the bonding of the Fe(II) ion, requiring only conformation changes sufficient to reorient the imidazole ring of histidine so that its vacant acceptor orbital of the -C=N bond can interact with the filled d-orbitals of the Fe(II) directed along the axial coordinate. Further experimental and theoretical studies of the problem are required. Figures 4; references 15: 3 Russian, 12 Western.

6508/12379

CSO: 1841/249



SCIENTISTS PROTECTION OF GRAIN STORAGE FROM PESTS

Moscow TASS in English 11 Jan 87

[Text] Scientists from the Zelinskiy Institute of Organic Chemistry have come to the aid of grain storage facilities by deciphering the "language" of pests.

The chemists have learned to synthesize a pheromone - a compound which an insect releases from glands when contacting its fellow creatures.

Specialists in the field of organic synthesis have received the signal, deciphered it and reproduced it.

They have obtained a special type of pheromone and thereby penetrated into the camp of the flour beetles by using their "language", thereby compelling them to get out of grain storage facilities, KOMSOMOLSKAYA PRAVDA wrote today.

/12379

CSO: 1841/239P

UDC 547.462.3

## SYNTHESIS AND BIOLOGICAL ACTIVITY OF DICHLOROMALEIC ACID DERIVATIVES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 1, Jan 87 (manuscript received 13 May 85) pp 227-229

[Article by G.G. Shagas, R.B. Valitov, S.S. Zlotskiy and A.M. Davletshina]

[Abstract] A series of derivatives of dichloromaleic acid (I) were synthesized for testing for antifungal activities. The N-cyclohexylmonoamide (II) of I was prepared by reacting I with  $C_6H_{11}NH_2$  in acetone. Subsequently, the K, Cu, and Na salts of II were prepared by reacting with the appropriate hydroxides or chlorides. In addition, II was converted to the N-cyclohexylamine salt of I (III) and of II (IV) by, respectively, heating of II or by reacting II with  $C_6H_{11}NH_2$ . Pretreatment of corn seeds with II, Na-II, K-II, Cu-II, III and IV protected them from infection with *Fusarium*, *Pencilium* and *Aspergillus*. The greatest antifungal activity was exhibited by II and its K salt. References 3 (Russian).

12172/12379

CSO: 1841/256

UDC 632.951

## INSECTOACARICIDAL ACTIVITY OF PYRETHROIDS

Moscow AGROKHIMIYA in Russian No 2, Feb 87 pp 129-143

[Article by A.S. Sedykh, G.M. Abelentseva, T.I. Kreminskaya and S.A. Roslavl'tseva]

[Abstract] A review is presented of the characteristics of synthetic pyrethroids as insectoacaricidal agents with a wide spectrm of activity against common and widespread pests. These agents show useful activity in dosages (5-100 g/ha) that are smaller than required with other classes of agents, and offer the additional advantages of photostability, rapid onset of action, and

persistence on plant surfaces. A complicating factor is represented by the fact that the pyrethroids are toxic for useful insects, as well as the fact that long-term use leads to development of resistant target insects. These findings indicate that the use of pyrethroids should be alternated with other classes of agents. References 138: 4 Bulgarian, 1 Czech, 1 Hungarian, 1 Rumanian, 49 Russian, 85 Western.

12172/12379  
CSO: 1841/273

UDC 632.954:633.72

#### METABOLIC TRANSFORMATION OF $^{14}\text{C}$ -ATRAZINE IN TEA PLANTS

Moscow AGROKHIMIYA in Russian No 1, Jan 87 (manuscript received 25 Mar 86)  
pp 89-93

[Article by Kh.A. Kakhniashvili, S.V. Durmishidze and M.Sh. Gigauri, Institute of Plant Biochemistry, Georgian SSR Academy of Sciences, Tbilisi]

[Abstract] Studies on the metabolic transformation of the widely used herbicide atrazine, using C-14 labeling, demonstrated that in tea plants (*Thea sinensis*) the compound and its metabolites are detectable in all plant structures (leaves, root, runners). Most of the herbicide remains in the roots (70-80%), with a much smaller fraction reaching the leaves (8-15%). Furthermore, most of the  $^{14}\text{C}$ -atrazine is incorporated into low MW peptide conjugates (78-85%), a significant portion is released as  $^{14}\text{CO}_2$  (13-15%), and a small fraction is incorporated into biopolymers (3-8%). The peptide conjugates are represented by 6-12 amino acid entities, for the most part, shown to include leucine, methionine, alanine, threonine, glycine, aspartic acid and glutamic acid residues. Figures 1; references 15: 14 Russian, 1 Western.

12172/12379  
CSO: 1840/231

UDC 632.95

#### BIOTRANSFORMATION OF ACREX BY SOIL MICROORGANISMS

Moscow AGROKHIMIYA in Russian No 1, Jan 87 (manuscript received 20 Jan 86)  
pp 94-97

[Article by S.A. Ivashina and V.D. Chmil, All-Union Scientific Research Institute of Toxicology of Pesticides, Polymers and Plastics, Kiev]

[Abstract] Studies on the transformation of Acrex (dinobuton) in the soil showed that the process was slow and involved formation of the more toxic

dinoseb compound. Biotransformation by *Pseudomonas* and *Aspergillus* was favored by microaerophilic conditions, and the process was also dependent on soil adsorption. With application of Acrex in a concentration of 100 mg/kg, persistence exceeded 48 days even under microaerophilic conditions. The fact that Acrex persists much longer under aerobic conditions indicated that this pesticide should be employed on irrigated fields. Figures 4; references 4 (Russian).

12172/12379  
CSO: 1840/231

UDC 631.542.25:633.51

EFFECTS OF 2-BUTYLTHIOBENZOTHAZOLE ON DEFOLIATING ACTIVITY OF N-PHENYL-N'(1,2,3-THIADIAZOL-5-YL) UREA ON COTTON PLANTS

Moscow AGROKHIMIYA in Russian No 1, Jan 87 (manuscript received 15 Apr 86)  
pp 98-104

[Article by N.F. Zubkova, N.A. Gruzinskaya, Z.V. Bukashkina, N.A. Kasyanenko and D.M. Pakhomova, All-Union Scientific Research Institute of Chemical Plant Protection, Moscow]

[Abstract] *Gossypium hirsutum* and *G. barbadense* cotton plants were employed in tests on the defoliant effectiveness of 2-butylthiobenzothiazole (I) alone and in combination with N-phenyl-N'(1,2,3-thiadiazol-5-yl) urea (II). A combination of 0.001% I and 0.2% II was 2- to 4-fold as effective in defoliation as I alone. In field trials a combination of 0.15-0.20 kg/ha I and 4 kg/ha II was shown to be more effective than the standard defoliant butaphos, with the added advantage that the former combination was less toxic for mammals and prevented secondary leaf growth. The effects of II in potentiating the defoliant activity of I was attributed to depression of indoleacetic acid levels in the cotton leaves. Figures 1; references 16: 12 Russian, 4 Western.

12172/12379  
CSO: 1840/231

EFFECTS OF VARIOUS CHEMICAL AGENTS ON BIODEGRADATION OF INSECTICIDES IN PLANTS

Moscow AGROKIMIYA in Russian No 1, Jan 87 (manuscript received 7 Jan 86)  
pp 105-110

[Article by T.M. Petrova and T.F. Blinova, All-Union Institute of Plant  
Protection, Leningrad]

[Abstract] A summary is presented of various studies conducted to evaluate the effects of various chemical agents on the biodegradation of insecticides in crops. The data demonstrated that various agents diminished the rate of degradation of organophosphorus pesticides, including pesticides belonging to other chemical classes, as well as trace element fertilizer components, with the exception of copper sulfate. These findings underscore the need for more care in the use of organophosphorus pesticides in relation to the other chemical agents to which the crops may be exposed, as well as the fact that lower doses of the organophosphorus may be employed. Figures 3; references 9 (Russian).

12172/12379  
CSO: 1840/231

LUMINOPHORES

Moscow MOSCOW NEWS in English No 12, 29 Mar-5 Apr 87 p 12

[Text] Every year the world's seas are polluted by five million tons of oil products. And despite the International London Convention's strict penalties against those polluting oceans, the latter quite freely manage to escape penalty. Even when a vast oil slick is discovered on the sea surface, it is sometimes very difficult to point to its "author".

"In the near future, however, the situation may change, thanks to an invention made by our scientists," maintains Anatoly Nikanorov, director of the Hydrochemical Institute in Rostov-on-Don.

Under a microscope tiny particles of a tester-substance produce a bright fluorescence in a drop of "marked" oil. And since Rostov researchers today have more than one hundred testers, this means that over one hundred shipping companies transporting oil products over world sea routes may be provided with personal marks. Looking at a drop of marked oil taken from the sea, you can exactly determine who dumped it.

Thus, situations like the one in which Novorossiisk ecologists found themselves last summer can be eliminated. From a plane, they detected a Turkish tanker drifting smack in the centre of a vast oil slick. It was quite evident that the oil came from the tanker. And yet, because this could not be proven, the ship left unpunished.

On my desk is a report signed by some staff members and approved by the management of the water-economy inspection of the water-economy inspection of the Estonian SSR and the Hydrochemical Institute. They conducted a joint experiment on the marking and identification of oil products.

"The experiment has shown," states the report, "that the method developed by the Institute for checking oil pollution in an aqueous medium has proven to be highly effective."

An interesting detail: while preparing (in secret from the Institute's staff members) control slicks upon the water, Estonian ecologists departed from the agreement and mixed test-water samples from two beakers containing different markers. The hydrochemists, however, discovered the trick.

"The substance used as a marker does not decompose under high temperatures, and is not corroded by acids and alkalis," said Nikolai Trunov, Cand. Sc. (Technology), author of the invention. "That's why it can also be widely used to control industrial discharge, in particular, we managed to prove the fact that the scientific and production association Krasitel in the town of Rubezhnoye (Donetsk Coal Basin) is far from alone responsible for polluting the Seversky Donets with carbolic acids. Before our experiment, environmental organizations were unanimous in blaming this association alone for polluting the river."

The public negative reaction to the faults committed by the designers while erecting a dam to protect Leningrad from floods are well known. At the beginning of this year these faults were also featured by the newspaper IZVESTIA in an article "Is there a protection from the dyke?"

The designers asked the Rostov hydrochemists to render them assistance in getting such protection. It is necessary to use luminophores to trace new routes of the Neva waters towards the Gulf of Finland in order to find ways of diverting them to the needed riverbed. A similar work - checking the migration of wastes from the Priozersk cellulose plant - is also planned in Lake Ladoga.

"Technical progress often does not maintain tender relations with the environment," says Anatoly Nikanorov. "The scientists' task is to achieve full harmony among the two. Strict control to ensure the careful treatment of nature is the first step towards success."

/12379

CSO: 1841/287

EXTRACTING METALS FROM OIL IN KAZAKHSTAN

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 23 Jan 87 p 3

[Article by Kazakh Telegraph Agency correspondent, Guryev: "Metal from Oil"]

[Text] Metals can be extracted from oil using a technology developed by scientists at the Institute of Oil and Natural Salts Chemistry of the Kazakh Academy of Sciences.

Oil is not homogenous. While moving through layers of rocks, oil, like almost all liquids, "adopts" small particles of various substances. Thus, metals are also picked up by the oil. Even negligible amounts of metals cause considerable concern to oil-refiners. For example, if even one hundredth of a gram of vanadium is present in one liter of gasoline, it may cause damage to the engine. With earlier technologies, the purification of petrochemical products from admixtures of metals was a fairly expensive process which required scarce reagents. Therefore, scientists have directed their efforts to creating a less expensive method of purifying oil from metals.

One of the authors of the new method, S. Bakirova, said: "Like the majority of chemical elements, metals are capable under certain conditions of destroying existing bonds and of reacting with adsorbent substances. We decided to utilise this property for extracting metals. If oil containing vanadium is passed through wastes of metallurgical industry and clay, they attract that vanadium like a magnet, and the purified oil is sent for further processing."

12971/12379  
CSO: 1841/240



UZBEK STATION FOR UNDERGROUND GASIFICATION OF COAL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Mar 87 p 1

[Article by R. Tell, "SOTSIALISTICHESKAYA INDUSTRIYA", correspondent, Angren, Uzbek SSR: "Gas Is...Mined: In the Mining Town of Angren the First Stage of Reconstruction of a Station for Underground Gasification of Coal Has Been Completed"]

[Text] These two boiler aggregates at the Angren Power Station are special, although they work in the same mode as others and use the same coal from a local field. However, it is not necessary to bring fuel for them here: their "furnace" is located deeply underground, where flames roar in fiery mines, turning coal into gas fuel. It goes up in pipes to the power station.

The "Podzemgaz" [underground gas] station has existed in the town for a long time. However, for a number of reasons, including its dangerous proximity to coal mines, work there was almost stopped. Miners of "Sredazugol" [Central Asian Coal] who were given the station by the All-Union Production Association "Soyuzuzbekgazprom" [Uzbek Republic Gas Industry] decided to return life to the "underground fire." For the third year the miners have been skillfully increasing the output of underground gasification of coal, taking all possible measures for increasing the calorific power of fuel. Last year, about 300 million cubic meters of gas produced from underground coal deposits were obtained. And, upon the start of the new gas generator, the productivity of the "Podzemgaz" will increase two-fold.

What are the advantages? It is not necessary to build expensive roads, equip mines, and move mountains of ground and rock. Complete burning of coal layers, which virtually excludes the wastes inevitable with traditional mining and transportation of fuel, makes it possible to use weak deposits. While enumerating the advantages of this method, Iov Mikhailovich Ivanov, Technical Quality Director of the "Sredazugol" Association, especially emphasized the fact that the continuous process is not harmful to the environment, does not pollute the air, and preserves the fertility of the soil. Incidentally, employees of "Podzemgaz" created multi-acred gardens for personal use on such soils, including growth of fodder crops.

Ivanov said: "Today two such stations are operating in our country--ours and one in Kuzbass. Formerly there were six of them. Obviously the decision of

the Ministry of Gas Industry to stop work on underground gasification of coal was too hasty. In any event, the new 'master' of 'Podzemgaz', the All-Union Ministry of Coal Industry, is convinced of the opposite. Therefore, the Angren miners decided to reconstruct the functioning gas generator, to construct two new ones, to renovate the air-providing equipment and to start the development of other underground deposits."

The first stage of this work has just been completed. Over one hundred exploratory and working wells have been drilled, the functioning gas generator was "moved away" from major coal mines, and a new one is being prepared for operation. Incidentally, the gas generator does appear to be a solid unit. Large diameter pipes lead along foothills from one well to another like two threads. One line is for providing compressed air to the mine, another is for receiving and transporting obtained gas.

At first glance it is simple. But I am looking at how compressor machinist V. Direnko and operator A. Gakhov regulate the process. They are the most experienced workers at "Podzemgaz"--they determine the whims of the "fiery lava", if one can say, with flair, skillfully regulating thermal conditions at depth. During their shift the calorific power of gas is maximally high, and the effectiveness of boiler aggregates of the power station is also higher.

Incidentally, distinctive marks of innovation are noticeable everywhere. Members of the "Sredazuglerazvedka" [Central Asia Coal Prospecting] expedition have managed to finish the program of prospecting works earlier than was stipulated by the plan.

Everyone has the same goal: to make the new "Podzemgaz" complex operational before the planned date; the complex should give annually up to 800 million cubic meters of fuel toward the end of the five-year plan. Calorific power of gas is planned to be increased by one-third. The miners set a higher quota for themselves for that date: to produce one billion cubic meters of gas from fiery mines in 1990.

12971/12379  
CSO: 1841/240

UDC 665.65.002.3

POTENTIAL FOR PRODUCTION AND UTILIZATION OF HYDROCARBON RAW MATERIAL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 2, Feb 87 pp 2-5

[Article by O.B. Braginskiy, Central Institute of Mathematics of the Economy, USSR Academy of Sciences]

[Abstract] The problem of continued supply of hydrocarbons is complex and involves many branches of the national economy. Following are possible ways of increasing the resources or diminishing consumption of hydrocarbons: lower consumption of raw material, increased production, increased oil output and use of alternate raw materials. A prognostic model was developed for long range planning of the needs and availability of hydrocarbons which includes the following variables: traditional petroleum processing methods, new ways of processing heavy oil residues, pyrolysis of gaseous and liquid crude, production of aromatic hydrocarbons, production of monomers, production of microbiological raw materials, processing of alternate raw materials, etc. Several recommendations were developed for expanding the basis of raw materials.

7813/12379

CSO: 1841/242

COUNCIL FOR MUTUAL ECONOMIC ASSISTANCE STANDARDS FOR PETROLEUM PRODUCT TESTING METHODS AND TECHNICAL REQUIREMENTS APPROVED IN 1981-1985

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 2, Feb 87 p 24

[Article by V.V. Bulatnikov, N.P. Izotova, B.S. Sidorina and T.Ye. Shcherbina, All Union Scientific Research Institute of Petroleum Products]

[Abstract] In 1974 several conventions and positions were agreed upon by the Council for Mutual Economic Assistance (CEMA) which represents an important phase in the standardization developments under the aegis of this organization. Use of CEMA standards shortened the development time for various national standards and allowed a unified approach to technological politics among the member nations. Since 1974, 67 standards were developed in the CEMA system, 43 of them during 1981-1984. Most of them concern testing of petroleum products but some cover technical specifications. Fifty of the CEMA standards were accepted without changes as national standards for the USSR. Some CEMA standards had no USSR counterparts so that the new GOST had to be developed. Six cases of the latter category are discussed.

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CSO: 1841/242

UDC 629.735.03:662.613.5

FUEL QUALITY AND EMISSION OF POLLUTANTS BY AVIATION GAS-TURBINE ENGINES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 2, Feb 87 pp 34-37

[Article by V.P. Svinukhov, State Scientific Research Institute of Civil Aviation]

[Abstract] Principal pollutants resulting from combustion of organic fuels are carbon monoxide (CO), nitrogen oxides (NO), noncombusted hydrocarbons (CH) and smoke (S); their emission is controlled. Emission depends on the quality of the fuel and on construction of engines. The State Scientific Research Institute of Civil Aviation has developed a simple and easily-accessible method for determination of the tendency of fuels to emit various polluting agents. It was found that evaluation of CO and CH emissions should be performed under conditions imitating a "minimal gas" regime while evaluation of NO and S should be done in a maximal draught regimen. Increased content of mono- and bicyclic aromatic hydrocarbons led to increased smoking by the fuel while decreased content of hydrogen increased emission of NO. It was shown that the proposed method used in evaluating fuel emissions gave results equivalent to those obtained on a regular IL-62M engine. Figures 4; references 8: 5 Russian, (1 by Western author), 3 Western.

7813/12379  
CSO: 1841/242

EMULSION BOILER FUEL PRODUCED FROM COAL TAR OBTAINED BY HIGH-SPEED PYROLYSIS OF KANSK-ACHINSK COAL

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 2, Feb 87 (manuscript received 11 Dec 85) pp 451-453

[Article by I.V. Tsykovskaya, T.Yu. Stolyarova, V.A. Itskovich and T.G. Maslyanskaya]

[Abstract] Data are presented on the preparation of stable emulsion fuels for boilers, derived from the heavy and moderately-viscous coal tar fractions obtained by high-speed pyrolysis of Kansk-Achinsk coal. Fuels with 15-40% water were in some cases stabilized with emulsifying agent, such as OP-7, yielding products with a shelf-life of 6-8 months. Two fuels with heavy:moderate ratios of 1:1 and 2:1 had respective relative viscosities, flash points, and  $Q_H$  values of 3.7 and 8.5, 111 and 115°C, and 32150 and 30300 kJ/kg. Soot resulting from the combustion of these fuels was noncorrosive due to low vanadium, sodium and potassium content. Figures 2; references 5 (Russian).

12172/12379  
CSO: 1841/279

## FURTHER DEVELOPMENTS IN 'SPRUT' GLUE PRODUCTION

Moscow Radio in Russian 1715 GMT 7 Jan 87

[Summary] Ukrainian radio correspondent L. Vinogradova interviews Roman Aleksandrovich Veselovskiy, USSR state prize winner and head of a department of the Institute of High Molecular Weight Compounds of the Ukrainian SSR Academy of Sciences about the "Sprut" [octopus] glue.

[VESELOSKIY] At first we wanted to call our polymer compound materials, which we planned to use under water, "Neptun". But, then it turned out that all materials designed for use under water are called "Neptun". That is why we looked for something more original and came up with "Sprut". Since an octopus grasps and strongly holds various materials under water, there is some similarity with our materials.

Their first commercial use was in 1974 to glue a fractured gas pipeline which spans the Volgogradskoye reservoir. It would have been difficult to re-lay the pipeline and, most importantly, it would have taken very long. Since 1974, these repaired gas pipelines have operated successfully, and so far there have been no complaints about the quality of the repairs. It can be said that our polymer materials have often made it possible to reduce repair time tens, hundreds, even thousands of times, to alleviate working conditions, and, often, to repair equipment without taking it out of operation. Also, repairing a pump with glue only takes a few hours, whereas previously it took months.

[VINOGRADOVA] Repairing gas pipelines across the Ob or the Amur took two years on average. "Sprut", however, helps us do this in a few days. Once American, West German, French, British and Soviet glues were tested at the French Petroleum Institute. Our glue "Sprut 9 M" received the highest assessment, far exceeding all foreign glues.

[VESELOVSKIY] I wish to mention materials which we have developed in parallel with the "Sprut" type. These materials were designed for strengthening rock; at present they are being used widely and successfully in constructing the Severomuyskiy Tunnel on the BAM. The utilization of such polymer materials will in principle make it possible to create and build pipelines without using metal. These polymer materials are capable of greatly increasing the firmness of the soil which they impregnate. Soils of the most varied type can be impregnated: sand, kaolin, peat, dry and moist soils. Impregnating the walls

of a hole in the earth with polymer materials will obviate the need to build pipelines by the traditional methods. In other words, these will be pipelines without pipes.

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CSO: 1841/261P

NEW INSULATION, ULTRAFILTRATION POLYMERS

Moscow KHIMIYA ZHIZN in Russian No 1, Jan 87, p 43

[Text] At the VNII of Synthetic Resins, they have developed the technology and created equipment to produce the closed-cell foam plastic "Vilatrem-SL." The high moisture resistance and outstanding heat-insulating properties of the new material allow it to be used for hydro-, sound-, and heat-insulation of panel or wood constructions.

The new foam plastic is based on high-pressure polyethylene; however, foam formation occurs at low pressure and temperature, eliminating thermomechanical destruction of the polymer and, above all, allowing for a decrease in the energy required for production.

Also at that institute, ultrafiltration membranes from polyoxadiazole (a heat-resistant polymer with a heterocyclic structure) have been developed. Low toxicity of such membranes allows separation modules based on them to be used in the pharmaceutical and food industries for purifying solutions of colloid impurities or dissolved high molecular compounds and for purifying antibiotics.

The new membranes exhibit high chemical stability and completely retain their properties after regeneration with weak acid or base solutions.

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## VIBRATION-REDUCING PLASTICS

Moscow KHIMIYA I ZHIZN in Russian No 1, Jan 87, p 43

[Text] The vibrations of a heavy-duty tractor are far from being harmless. Vibrations speed the aging process of materials and consequently devalue the machine as well as negatively affect the driver. Moreover, due to vibrations in the framework and suspension, more energy is consumed - fuel is uselessly wasted. It is possible to decrease vibration by substituting several steel components with metal-containing plastic (metalloplastic) ones in which metal layers are separated by thin (approximately 1 mm) polymer layers.

Research conducted by workers at the Okhtinskoye NPO "Plastpolimer" along with specialists at the Institute of High Molecular Compounds, Academy of Sciences USSR, showed that the optimum material for preparing cushioned layers of such a composite is vinylacetate with a microheterogenous (non-uniform) structure. The vibration-absorbing capacity of this polymer is practically independent of temperature; therefore, vibration-protected machines will be able to work equally effectively in the southern regions of our country and in the Far North.

Naturally, new metalopolymer composites are not intended solely for tractors. Similar materials are necessary for the construction of ships and aircraft. By preliminary calculations, each ton of metalloplastic provides a 14,000 ruble savings.

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COMPUTER DATA BANK WITH INFORMATION ON PLASTICS

Leningrad Leningradskaya Pravda in Russian 7 Mar 87, p 1

[Article by A. Potapenko (interviewer)]

[Excerpt] At the "Plastpolimer" Research-and-Production Association in Okhta, a unique computer data center has been created. It contains information on characteristics of polymers produced in our country. Our correspondent met with the director of the new center, Candidate of Physical-Mathematical Sciences M.P. Platonov, and asked him to tell about its work.

[QUESTION] "Mikhail Petrovich, what is the 'data bank' actually, and what can it do?"

[ANSWER] "Our center provides an information-search service that covers about 10,000 brands of polymers and more than 600 of their characteristics. A designer who is developing an instrument sometimes can spend months searching through catalogues and other reference materials to find a plastic with the properties that he needs. Our data bank makes it possible to find the needed material in minutes."

[QUESTION] "What prospects lie ahead for the data bank?"

[ANSWER] "We have completed program debugging and are already servicing our first clients. The real effect from our center will be felt only when it is operating at full capacity. Right now we are making long-term contracts with enterprises and research institutes of the city of Leningrad and Leningrad Oblast. We feel that this work will be especially beneficial to such major associations as 'Elektrosila', 'Pozitron', the Leningrad Optical-Mechanical Association -- in fact to all who must work with plastics. Our research work has interested the Ministry of the Chemical Industry. Consideration is being given to creating similar data banks at other chief enterprises of the industry. After all, 'Plastpolimer' is a chief enterprise for only a part of the polymer materials that are produced in the country."

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CSO: 1841/238

## TASKS FOR ADVANCEMENT OF MEMBRANE FILTRATION TECHNOLOGY SURVEYED

Minsk SOVETSKAYA BELORUSSIYA in Russian 18 Feb 87, p 2

[Article by V. Soldatov, member of the Belorussian Academy of Sciences, director of the academy's Institute of Physical-Organic Chemistry, head of the republic large-scale program "Membrana"]

[Abstract] The author assesses progress in developing and introducing polymer membranes for microfiltration, ultrafiltration and fractionating of liquids and gases. He mentions successes of organizations of the Belorussian republic in membrane R&D, and discusses tasks for bringing Soviet membrane technology up to the level achieved in other countries.

In Belorussia, a republic program called "Membrany" has participation of 15 Belorussian institutes and industrial enterprises. This program calls for research on new methods of obtaining membranes, and for development of techniques employing membranes for microbiological analysis, and for purifying liquids in the pharmaceutical, microbiological, food, electronics and instrument-building industries. Chemically stable membranes are sought for such purposes as purifying corrosive liquids and removing viruses and protein particles from liquids. The author relates that new processes for obtaining microfiltration membranes have been developed at the Belorussian Academy of Sciences' Institute of Physical-Organic Chemistry, and production of new-generation membranes has been organized at the "Integral" production association in Minsk, with the help of this institute. The institute and association have created a joint laboratory under the direction of Candidate of Chemical Sciences V.A. Artamonov.

At the same time, the author notes that much must be done to expand production of membrane technology and to improve the quality and assortment of the products. There are shortages of qualified specialists and of equipment for producing membranes and for membrane processes in Belorussia. The "Integral" association is the only enterprise where membrane technology is broadly employed at present, although individual processes employing membranes are in use at the "Minskmedpreparaty" (Minsk medical preparations) production association and a number of other enterprises.

The author calls for specialist training to begin at the Belorussian State University and Belorussian Technological Institute, where possibilities for

this exist, and he recommends that the Moscow Institute of Chemical Engineering organize advanced training for engineering and technical personnel in the specialty "Membrane Separation Methods".

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CSO: 1841/238

## LIGHTWEIGHT PLASTICS FOR AIRPLANE SEATS AND INTERIORS

Moscow VOZDUSHNYY TRANSPORT in Russian 19 Mar 87, p 4

[Article by A. Shibanov, correspondent (Obninsk)]

[Excerpt] For airplanes, shedding 500 kilograms of weight, naturally, is an appreciable difference. Replacement of the metal in seat frames with thermoplastics allows the total weight of seats in the passenger cabin and the cockpit to be reduced by half a ton.

"The annual economic benefit from introduction of this development will be approximately 150,000 rubles per aircraft," said E. Tsybin, head of the design department of the "Tekhnologiya" Research-and-Production Association. "We are busy now substantiating many of its parameters, including economy of production, fire safety, and appearance. The polymer seat frames are intended chiefly for the IL-86 and TU-204 airplanes, but they are versatile and can be adapted also for airliners in service."

Specialists know how complex the shapes of air-conditioning systems' air ducts are. And how expensive it is to weld aluminum-alloy sheets. Glass-fiber-reinforced plastic air ducts with an improved design have been developed at the "Tekhnologiya" association. They not only are 30 percent lighter than counterparts made of the most lightweight alloys, but make it possible to reduce the number of parts by 10-15 times and save hundreds of hours of skilled labor of aircraft builders. Service-life tests of prototypes for the IL-86 are now being completed.

I held what looked almost like a bee honeycomb. It was brownish-colored and flexible. It was a honeycombed polymer plastic, the principal component of a three-layered panel for the interior lining of an airplane. In the future, this plastic will replace the aluminum currently used in the IL-96, YAK-42, TU-154 and other models. It is more durable and substantially less expensive than metal lining.

"We are producing the honeycombed plastic from a special paper, on the basis of Soviet phenylon," related S. Borisova, senior project engineer of a laboratory.

A honeycombed plastic woven from glass fiber is stronger yet. In a cockpit sound-absorbing panels made of this plastic serve much longer than their glued counterparts and have less failure from the effect of vibration.

ENERGY-ACCUMULATING MONOMERS

Moscow NOVOSTI SOVIET TV Russian 1545 GMT 15 Feb 87

[Editorial Report] In an effort to make use of the energy reserves of the oceans, the Institute of Chemistry, Bashkir Branch of the USSR Academy of Sciences, Ufa, has developed the first effective system for the accumulation of such energy. A correspondent explains that scientists have discovered a substance which, under the influence of the sun, changes its structure and thereby absorbs a large quantity of thermal energy. This substance, whether in liquid or solid form, can contain energy for a long period, and then, with the aid of a special catalyst, regain its original state. This process can be repeated several times. The deputy director of the institute adds that these monomers have been obtained by using waste products of petroleum chemistry. Video shows the substance being tested in liquid form in the laboratory. (052-989)

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CSO: 1841/239P

UDC 678.686-9:547.462.3'361.3

## MUTUAL PLASTICIZING OF POLYMER-POLYMER SYSTEMS WITH HIGH SPECIFIC FUNCTIONALITY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 3, Jan 87 (manuscript received 24 Feb 86) pp 670-673

[Article by V.F. Stroganov, V.M. Mikhalchuk, Yu.S. Zaytsev, L.I. Maklakov, and Academician, Ukrainian Academy of Sciences, Yu.S. Lipatov, Institute of Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences, Kiev; Ukrainian Scientific Research Institute of Plastics, Donetsk]

[Abstract] Polymer-polymer systems are widely used in the development of composite materials, including adhesives. The authors studied the simultaneous curing of epoxy and allyl-containing oligomers formed upon polymerization of reticular polymers with high cross-linking concentration. During simultaneous curing of these products there is a decrease in the intensity of the epoxy group absorption band and the bands related to oscillations of saturated bonds. The significant difference in reactivity of the two classes of oligomers does not prevent the formation of a polymer with a high degree of mutual penetration. Transparent polymers with a single glass point are formed. The process demonstrates the possibility of producing simultaneously mutually-penetrating veticular polymers with clearly expressed mutual plasticizing effects. Figures 4; references 7 (Russian).

6508/12379  
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UDC 678.06:542.25

## OPTIMIZATION OF FORMULA COMPOSITION OF RUBBER PLUGS BASED ON BUTYL RUBBER FOR SEALING OF DONOR BLOOD

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 16-18

[Article by I.S. Borisenko, V.A. Berestnev and L.Z. Shenfil]

[Abstract] A study was made of the influence of composition factors on self-sealing plugs of butyl rubber and the optimal formula is sought to provide

rapid sealing, low adhesion of plugs to each other during washing and sterilization and minimum turbidity of water extracts. The oxidizability of water extracts, quantity of rubber crumbs, penetrating force, frost resistance, hardness, plugging of needles, viscosity and vulcanization optimum were also considered. The formula suggested provides good self-sealing and satisfactory other qualities of plugs. Figure 1; reference 6 (Russian).

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CSO: 1841/282

UDC 678.063.01:62-752.8

#### STUDY OF VIBRATION-ISOLATING PROPERTIES OF RUBBERS UNDER HIGH LOADS

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 20-22

[Article by G.Z. Veksler, G.L. Kublitskaya, M.A. Dashevskiy and Ye.M. Mironov]

[Abstract] Rubber isolators installed beneath buildings to protect them from vibration from nearby subways must work under heavy static loads. Series-produced rubbers used for the manufacture of such products were studied to determine their vibration-isolating properties. Nonlinear changes in the dynamic modulus and dynamic rigidity during staged loading can achieve the minimum ratio of rigidity and weight, resulting in the appearance of minima on curves of natural oscillating frequency as a function of specific load. The influence of the actual loads on the dynamic modulus must therefore be considered in selecting rubbers for vibration insulation of buildings. Figures 2; references 8 (Russian).

6508/12379  
CSO: 1841/282

UDC 678.074.01:536.485;678.074.06:62.567

#### ESTIMATE OF FROST RESISTANCE OF THIN-LAYER RUBBER-METAL ELEMENTS

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 22-25

[Article by V.I. Kolosova, N.M. Galperina, M.F. Bukhina and V.N. Artemev]

[Abstract] Thin-layer rubber-metal elements used in the aviation industry must retain the required mechanical properties down to temperatures of  $-60^{\circ}\text{C}$  or lower for long periods of time. Frost resistance in crystallizing rubber is achieved by vitrification and crystallization of the rubber. The authors determined the variation in relaxation and rigidity characteristics of rubber and multilayer rubber-metal specimens as a function of temperature and time.



It was found to be effective to use rubber based on SKDP/SKI-3 raw rubbers in a 50:50 ratio for thin-layer rubber-metal elements designed for operation at low temperatures. Increasing the quantity of filler rapidly increases compressive modulus as temperature decreases. Mechanical properties at low temperatures must be determined on specimens with form factor close to its value for the rubber layer in the end products since the rubber acts as a solid and the change in modulus decreases with decreasing temperature. Figures 4; references 9 (Russian).

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UDC 541.15

#### RADIATION MODIFICATION OF RUBBERS BASED ON SKEPT-40

Moscow KAUCHUK I REZINA in Russian No 2, Feb 87 pp 43-44

[Article by L.V. Shemenkova, G.G. Ryabchikova, V.F. Timofeyeva and E.A. Cheperegin]

[Abstract] In order to improve the usage properties of rubbers based on ethylene-propylene raw rubber SKEPT-40, the surface of the products was modified by radiation graft polymerization of the following monomers: Acrylic acid nitrile, glycidyl ester of methacrylic acid and triethylene glycol dimethacrylic ester oligomer. The continuous radiation graft polymerization process was found to allow significant improvement in oil resistance and adhesion. Figures 2; references 2 (Russian).

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CSO: 1841/282

NEW RADIATION DETECTOR

Moscow KHIMIYA I ZHIZN in Russian No 1, Jan 87, p 43

[Text] Specialists at the Pereslavskiy Branch of the State NII Khimfotoprojekt created a nitrocellulose trace detector which allows one to determine the level of background radiation and to identify particles during work with ionizing radiation. The primary advantages of polymer detectors over detectors based on silver halide nuclear emulsions are low cost and ease of manufacture. Proceeding through the nitrocellulose detection layer, particles cause local changes in the structure and chemical properties of the polymer, thereby marking a "trail." After preparing the detector with an alkaline solution, the trail can be observed through a common optical microscope, with 400X magnification. Tests showed that this domestically developed polymer detector satisfied the most stringent requirements and is not inferior to analogous products of French or Japanese production.

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## STRUCTURAL AND CHEMICAL CONVERSIONS IN SOLID-LIQUID-GAS SYSTEM EXPOSED TO ACOUSTIC OSCILLATIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 293, No 1, Mar 87 (manuscript received 15 Apr 86) pp 151-154

[Article by V.M. Maltsev, L.A. Nabiyeva and N.N. Khavskiy, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] Effect of acoustic oscillation on the structure and properties of solid surfaces was studied using ultrasound dispersion of thermally-treated Taiginsk graphite in water, in aqueous hydrogen peroxide solution and  $\text{FeCl}_3$  as study materials. Dispersion in water led to formation of a long-lasting graphite suspension probably due to the appearance of OH,  $-\text{COOH}$  and  $=\text{C}=\text{O}$  groups on its surface; only 0.1% of the solid phase converted to the suspension. In 23%  $\text{H}_2\text{O}_2$  solution (aqueous) the amount of solid going into suspension went up to 20-25%, and upon addition of  $\text{FeCl}_2$  in small quantities it reached 70%. Dispersion in 20% aqueous  $\text{FeCl}_3$  led to an almost complete reduction of the trivalent iron to  $\text{Fe}^{++}$ . Thus it was shown that acoustic oscillations represent an effective physical factor stimulating structural and chemical conversions in the system solid-liquid-gas which can be viewed as a new type of sound-chemical reactions. Figures 4; references: 13 Russian (2 by Western authors).

7813/12379  
CSO: 1841/267

## OPTIMIZATION OF ROTATIONAL EXCITATION CONDITIONS OF MOLECULAR GAS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 24 Feb 86) pp 16-20

[Article by V.Ya. Panchenko and A.Yu. Tolstoshein, Faculty of Computational Mathematics and Cybernetics, Moscow State University imeni M.V. Lomonosov]

[Abstract] Two problems of optimization of rotational excitation are solved within the framework of the diffusion approximation: A source of particles with high rotational energy and a resonant laser field. The analysis is performed for the rotational distribution function of a small impurity based on an oscillating level. The examples analyzed demonstrate the possibility and desirability of using methods from the theory of optimal control to solve various problems in contemporary physics and chemistry in the area of the interaction of laser radiation and matter. Figures 2; references 9 (Russian).

6508/12379  
CSO: 1841/213

ELECTRONOGRAPHIC STUDY OF LASER-EXCITED SF<sub>6</sub> MOLECULES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 2 Jul 85) pp 27-33

[Article by A.A. Ishchenko, V.P. Spiridonov and Yu.I. Tarasov, Moscow State University, imeni M.V. Lomonosov, Department of Chemistry]

[Abstract] A theory developed previously by the same authors is applied to electronographic investigation of the redistribution of oscillating energy in SF<sub>6</sub> molecules in the field of a continuous CO<sub>2</sub> laser. The theory of excitation of fast electrons on nonequilibrium groups of molecules for excitation levels below the boundary at which oscillating energy becomes stochastic assumes that the rate of intramodal relaxation of oscillating energy is significantly greater than the rate of intermodal relaxation, and that excited electron states of the molecules are not significantly populated in oscillating excitation, so that the adiabatic potential can be used to describe the motion of nuclei of the molecule studied in its basic electron state. Based on these assumptions, an equation obtained in previous work for the scattering of electrons by laser-excited molecules is extended to compute the equilibrium internuclear distances of SF<sub>6</sub> molecules. The mean computed value is somewhat

lower than experimental results published previously, which the authors attribute to the use in the previous work of a limited set of spectroscopic constants for comparatively low levels of excitation. References 32: 13 Russian, 19 Western.

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UDC 541.14

MOLECULAR BEAM DIAGNOSIS OF STREAM OF CHEMICALLY ACTIVE PLASMA OF STEADY ARC DISCHARGE. INFLUENCE OF ADDITION OF ARGON AND NITROGEN ON IONIC COMPONENT OF TITANIUM PLASMA

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 18 Mar 86) pp 45-51

[Article by A.F. Rogozin and L.Yu. Rusin, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] A study is made of the influence of the addition of  $N_2$  and Ar to the zone of formation of a plasma stream and to a collimating chamber in which the stream is formed and its composition and intensity change little. Measurements were performed on a plasmotron with an eroding cathode or plasma accelerator, placed in a vacuum chamber and communicating with the collimating chamber which contained a specimen holder. The stream of ions was found to increase in intensity by approximately an order of magnitude due to the appearance of new processes of interaction between gas and plasma. A possible mechanism of interaction of the titanium plasma with the gases added is suggested, consisting of successive stages of formation of excess titanium vapor in the area around the cathode and ionization of the vapor by interaction with the excited atoms or molecules of the added gases. Interaction of the added gases either with the surface of the cathode or with droplets in the stream could cause an increase in concentration of neutral metal atoms, resulting in an increase in ion concentration. It is difficult to estimate the contribution of each of the two ionization mechanisms possible. Figures 4; references 24: 15 Russian, 9 Western.

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EXPERIMENTAL STUDY OF EFFECT OF LASER RADIATION ON REACTION OF ASSOCIATION OF  $\text{BCl}_3$  WITH  $\text{N}(\text{CH}_3)_3$ 

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 6, No 1, Jan 87 (manuscript received 14 Nov 85) pp 75-80

[Article by G.A. Kapalova, Ye.M. Trofimova and A.M. Chaykin, USSR Academy of Sciences, Institute of Chemical Physics, Moscow]

[Abstract] Selective laser excitation of one isotope causes selective association in the reaction of boron trichloride with trimethylamine, so that the unreacted  $\text{BCl}_3$  is enriched in the excited isotope  $^{11}\text{BCl}_3$ . The authors undertake a detailed, controlled study of the change in isotope composition of natural  $\text{BCl}_3$  in the reaction of association with trimethylamine with selective excitation of  $^{11}\text{BCl}_3$  by continuous  $\text{CO}_2$  laser radiation. The theoretical and experimental enrichment coefficients are found to agree both quantitatively and qualitatively except for experiments performed at the highest values of  $\gamma$  and the lowest concentration of initial reagents. In experiments at pressures of 3 Torr or more, the theoretical enrichment factor decreases to 1.05, while the experimental factor practically drops to unity. Although the highest values of enrichment coefficient achieved are not much greater, they are superior to those achieved in a single cycle of most other methods of isotope separation, and the mechanism of the association reaction is apparently simple and uncomplicated by secondary processes. The results also confirm the correctness of the concepts upon which the method of isotope separation is based, facilitating selection of conditions to improve its effectiveness. Figure 1; references 5: 3 Russian, 2 Western.

6508/12379  
CSO: 1841/213

## APPLICATIONS OF COMPUTERS TO CHEMISTRY

Moscow ZNANIYE-SILA in Russian No 1, Jan 87 p 66

[Unattributed article: On the Way to Computer Chemistry]

[Text] Today the subject is the application of modern computer technology to chemistry. The broad research undertaken by scientists of the Chemical Physics Institute of the USSR Academy of Sciences A. Ovchinnikov and A. Boldyrev prevails in this once again. The scientists determine the four main directions of research in which without computer support it is impossible to advance a single step.

In the first place, there is quantum chemistry. Shroedinger's equation has been known for more than half a century; however, it has been possible to solve it only for hydrogen--the atom and the molecular ion. More complex systems are calculated manually very approximately. The use of a computer increases the precision of calculations and the rate of solving them, and this means also the complexity of the molecules being calculated. An example of this is nonempirical methods achievable on a computer which have enabled molecules made up of 51 atoms containing 176 electrons to be described.

The task of modeling solutions serves as another direction. Here calculation methods have already been used successfully--direct optimization, molecular dynamics, Monte Carlo, and others. All these have proved suitable for describing complex organic and biological molecules surrounded on all sides by solvent molecules.

Still another direction is the "molecular design" of new medicinals. In order to find a new preparation in the usual way it is necessary to synthesize and test on animals not less than 20,000 chemical compounds, and this takes 7 to 12 years of work. A computer approach assumes first to establish the relationship between the physiological effect of the preparation and the action of the active fragment of the molecule with a biologically important receptor center. Then quantum chemical calculations are conducted which make possible in the course of the swift machine experiment to alter the molecule so that the medical effect is intensified sharply and purposefully.

The last important application scientists call "artificial chemical intelligence." One of its tasks is to identify the molecule of an unknown

chemical compound by its spectrum. The spectra of more than 100,000 simple and complex molecules are already known in the world, and at times it is easier to synthesize one of them anew rather than to find its analog in reference books. Actually the possibility of searching for an analog is accessible only to the computer. And there is also another task for "intelligence"--to find the strategy for the synthesis of a given compound. In this case the computer must solve the reverse task: the final molecule is taken which one needs to obtain, and the bonds in it are successively ruptured. As the result through a number of simple reactions, the required starting material is reached which is necessary for triggering the whole chain.

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CSO: 1841/262



## SYSTEMATIZING SCIENTIFIC DISCOVERIES IN CHEMICAL AREA

Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 1, Jan 87

[Article by G. M. Dzhilkibayeva, V. A. Senchevskaya and G. A. Dyachkov:  
"Systematizing Scientific Discoveries in the Chemical Area"]

[Text] The role of scientific discoveries in the development of any area of knowledge is enormous. Along with this, the CPSU Central Committee and USSR Council of Ministers decree of 20 August 1973 "Further development of inventions in the country, improving the use of discoveries, inventions, and management improvement suggestions in the economy and increasing their role in accelerating scientific-technical progress" provides for "improving the use of discoveries, inventions, and management improvement suggestions in the economy." [1]

Analysis of discovery registrations carried in the USSR's official bulletin "OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVERNYYE ZNAKI [Discoveries, inventions, industrial samples, and trade marks]" for the 1957-1981 period has shown that it lists 245 discoveries, 45 of which are in the chemical sciences area [2]. Such a number of discoveries in the chemical area were facilitated by new phenomena, properties, and mechanisms of the material sphere which appear at the interfaces of science -- chemistry and physics, chemistry and geology, chemistry and biology, and respectively pertain to physics, geology, and biology.

Until now the following types of discoveries have been officially recognized: "phenomenon", "property", and "mechanism" [3].

In the last ten years in the USSR two or three discoveries in the chemical area have been registered each year, while the time interval between posing the hypothesis and official registration of the discovery has varied from three or four to 30 years. This is because a new idea demands exacting experimental verification.

Discoveries in the areas (the divisions) of chemistry are distributed as shown in the table below.



Discoveries in polymer chemistry are also very important. Thus, the discovery "establishing the phenomenon of reaction chain transfer with rupture" (Certificate No. 38) showed that during the polymerization processes the active center can attack the polymer chain, which leads to rupture of the macromolecule. This phenomenon of chain transfer with rupture has become the basis for new methods for synthesizing block and graft copolymers, particularly thermo-stable copolymers of polyoxymethylene structure based on formaldehyde and trioxane.

The intensity of the research in polymer chemistry is illustrated also by the following discoveries: "The phenomenon of polymer formation in a shock wave" (Certificate No. 125); "The phenomenon of regrouping (isomerization) of polyhaloid aliphatic radicals in the liquid phase" (Certificate No. 170); "The phenomenon of the existence of a low temperature limit on the rate of chemical reactions" (Certificate No. 188); "The phenomenon of thixotropic lowering of internal pressures in polymer systems" (Certificate No. 199).

Establishing the phenomenon of conjugate reaction on membrane catalysts (Certificate No. 97) has been the basis for development of the quality of a new catalyst and of technological processes, and the creation of chemical and petrochemical production facilities at a higher level than existing ones.

Presently the attention of organic chemists is drawn to organic phosphorus compounds as a class of substances which have valuable properties, such as fire resistance and biological activity, and which are used as a means of protecting vegetation and medications.

Establishing in Certificate No. 184 of the phenomenon of the formation of heterocyclic systems of atoms with dicoordinate phosphorus has led to taking the direction of synthesis of organic compounds with previously determined properties.

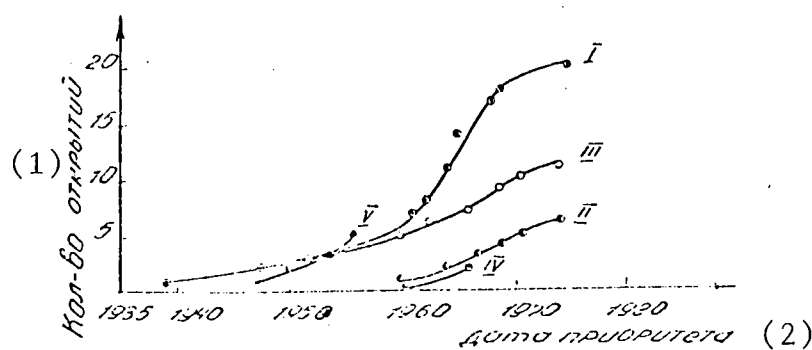


Figure 2. The Dynamics of the Appearance of Discoveries by Date Priority by Branch of Chemistry. I - organic chemistry; II - inorganic chemistry; III - physical chemistry; IV - geochemistry; V - biochemistry.

Key: 1. Number of Discoveries      2. Date priority

Figure 2 illustrates the dynamics of the appearance of discoveries by branch of chemistry in date order. As is seen from the illustration, there has been very intense research also in the physical chemistry area. Furthermore, six discoveries were registered in the inorganic chemistry area, two in geochemistry, and five in biochemistry.

Discoveries in chemistry not only expand scientific knowledge, but they generate a principally new approach to existing concepts and serve as a basis for creating new divisions of science. Thus, for example, a discovery in physical chemistry "The mechanism of morphotropy in homologous series of semiconductor-metal" (Certificate No. 196) lies at the basis of a new scientific discipline -- quantum crystal chemistry, and allows scientifically based searching for new semiconductor materials with previously determined properties and to find a path for directly alter their properties. The discovery "The law of electron photo-emission from metals in electrolyte solutions" (Certificate No. 139) gives a theoretical basis for development of new methods of research in various areas of science, including in electrochemistry -- during study of electrochemical behavior of unstable particles; chemical kinetics -- during study of reactions in solutions which are initiated by solvate electrons; in radiation physics -- when determining the characteristics of the interaction of low-energy electrons with a polar liquid; in metal optics -- when studying light absorption by a metal surface. These phenomena are registered as objects of discoveries in the physical chemistry area, as well as in organic.

Established in about equal measure are previously unknown phenomena, properties, and mechanisms in the inorganic chemistry area (Figure 2, curve II). Even though the inorganic chemistry area has been quite thoroughly studied, the discoveries registered have enormous importance for its development. Such discoveries as "The phenomenon of the formation of a highly based [vysokoosnovnoy] structural motif in calcium silicates" (Certificate No. 210) not only broaden the picture of silicate chemistry, but in a fundamental way change the established theories about the origin, structure, and properties of highly based calcium silicates, and they generate a principally new approach to the formation of a given structure of minerals based on the preferential role of the large anion in mixed frameworks. It has become possible to synthesize materials with programmed properties, particularly cement clinker.

The work of Soviet scientists in inorganic chemistry has been highly recognized outside the country. The priority of the authors of the discovery "Fixation of molecular nitrogen in mild conditions" (Certificate No. 51) has been recognized by Soviet and foreign specialists. As one example of a discovery changing the established theories in an area of chemistry in a fundamental way is the "Seven-valent condition of neptunium and plutonium" (Certificate No. 96). Establishing previously unknown properties for neptunium and plutonium which exist in solutions and in solid compounds in the seven-valent condition has allowed a new approach to evidence of a location for trans-uranium elements in D. I. Mendeleev's periodic system and has subjected existing theories of the systematization of 5f-series elements to critical review. The presence of a seven-valent state of neptunium and plutonium shows that between the elements with filled fifth and fourth

shells there is observed a much more fundamental difference than had been proposed previously.

Research and establishing discoveries in geochemistry are very important, since this not only increases our understanding of the chemical makeup of the Earth, but also allows us to predict the processes which take place within it. Certificate No. 129 was issued for the discovery "The phenomenon of changes in the chemical makeup of ground water during earthquakes." This established a previously unknown phenomenon of changes in the Earth's core of the chemical makeup of underground water which is associated with earthquakes, thanks to which underground water and gas can serve as indicators of the processes which take place at the center of an earthquake.

Analysis of descriptions of discoveries in the biochemistry area (whose dynamics are presented in Figure 2, curve IV) has shown that the discoveries are recognition of properties. That can actually be explained by the fact that biochemistry stands at the juncture between biology and chemistry and determines the properties of a material world which is based on known phenomena.

Using the objects of these discoveries has made possible the development of a number of technical solutions which have been recognized as inventions. The discovery "Property of the chemical inertness of metals in semiconductors with stoichiometric vacancies" (Certificate No. 245) has allowed us to create highly-sensitive thermo-resistors and tenso-resistors [strain-sensitive resistors], and to set up the technological preparation of semiconductor materials with highly stable parameters.

In such a way, the discoveries have made fundamental changes in our knowledge of the objective features of the essence of objects in the material world and at the same time they make possible the development and increase in scientific-technical progress.

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## FRACTIONAL VALENCE AND KINK MECHANISM OF CONDUCTIVITY IN QUASIMONOMERIC MOLECULAR SYSTEMS

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[Article by A.A. Ovchinnikov, corresponding member of USSR Academy of Sciences and I.I. Ukrainskiy, Institute of Theoretical Physics, UkSSR Academy of Sciences, Kiev]

[Abstract] Among important examples of fractional valence compounds are organic semiconductors and conductors with quasimonomeric anisotropy. Reasons for fractional valence and properties of such compounds (ion-radical salts and charge transfer complexes) have been reviewed in previous papers. In this paper, fractional valence was studied as a function of electroconductivity of donor-acceptor molecular crystals (DAMC) which do possess quasimonomeric anisotropy as well as some additional abnormalities represented by kink type electronic excitations which lead to high electroconductivity. Theoretical considerations led to the conclusion that kink characteristics of these excitations hold even for general cases. Kink mechanism of excitation explains neomic behavior of individual DAMC's in strong fields as a result of the effective kink charge represented as a function of the rate and confinement of kinks at  $E_{st} > C$ . Temperature drop in increased external pressure should lead to increased valence due to compression of the lattice and increase of coulomb forces. This was observed in the crystallite TTF-TCNQ. References 8: 3 Russian, 5 Western (3 by Russian authors).

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CRYSTALLINE AND MOLECULAR STRUCTURE OF NEW ORGANIC METAL  $\beta$ -(BEDT-TTF)<sub>2</sub> ICl<sub>2</sub>

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[Article by R.P. Shibayeva, L.P. Rozenberg, E.B. Yagubskiy, A.A. Ignatyev and A.I. Kotov, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The discovery of superconductivity in  $\beta$ -(BEDT-TTF)<sub>2</sub>I<sub>3</sub> (or  $\beta$ -ET)<sub>2</sub>I<sub>3</sub>, has stimulated a search for new superconductors among ET-based complexes. This article reports the synthesis, structure and properties of a new complex,  $\beta$ -(ET)ICl<sub>2</sub>, crystals produced by electrochemical oxidation of ET in THF on a platinum anode in dc mode at 25°C using (Et)<sub>4</sub>NICl<sub>2</sub> as the electrolyte. The conductivity of the crystals is an order of magnitude higher than that of  $\beta$ -(ET)<sub>2</sub>I<sub>3</sub> crystals. The variation of conductivity with temperature is metal-like, but no transition to the superconducting state is observed all the way down to 1.3 K. Figures 2; references 15: 10 Russian, 5 Western.

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