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30 September 1983

## USSR REPORT

## CHEMISTRY

No. 107

## CONTENTS

## ALKALOIDS

- Unusual Properties of Common Autumn Crocus Described  
(V. I. Artamonov; KHIMIYA I ZHIZN', No 5, May 83)..... 1

## ANALYTICAL CHEMISTRY

- Comparison of Photometric and Chemiluminescence Methods  
of Determining Silicon in Deionized Water  
(A. T. Pilipenko, et al.; KHIMIYA I TEKHNLOGIYA VODY  
No 3, May-Jun 83)..... 5
- Spontaneous Ignition of Hydrocarbons in Presence of Promoting  
Additives  
(A. A. Borisov, et al.; KHIMICHESKAYA FIZIKA, No 6, Jun 83).. 6

## BIOCHEMISTRY

- Automatic Analysis of Microbiological Solutions  
(L. Leont'yeva; SOTSIALISTICHESKAYA INDUSTRIYA, 2 Jul 83).... 7
- Intensifying Bactericidal Effect of Biocides in Cutting  
Fluids  
(V. I. Kachan, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I  
MASEL, No 6, Jun 83)..... 8

## CATALYSIS

- Cyclotrimerization of 1,3-Butadiene on Complex Organometallic  
Catalysts in the System  $(C_2H_5)_3Al_2Cl_3-Ti(OR)_4$   
(V. F. Tsvetkov, et al.; ZHURNAL PRIKLADNOY KHIMII,  
No 5, May 83)..... 9

CHEMICAL INDUSTRY

Chemicalization of USSR National Economy Discussed (L. A. Kostandov; KHIMIYA I ZHIZN', No 5, May 83).....	10
Tomsk Methanol Plant (V. Loysha; SOTSIALISTICHESKAYA INDUSTRIYA, 13 Jul 83).....	16
Gaurdak Open-Pit Sulfur Mine (SOTSIALISTICHESKAYA INDUSTRIYA, 2 Jul 83).....	17
Economics of the Belorussian SSR Chemical Industry (V. Sukhinin, et al.; PROMYSHLENNOST' BELORUSSII, No 5, May 83).....	18
Minister Fedorov on USSR Chemical Industry (Viktor Stepanovich Fedorov; SEL'SKAYA ZHIZN', 29 May 83)..	21
Eighth All-Union Conference on Colloidal Chemistry and Physico- Chemical Mechanics (PRAVDA VOSTOKA, 4 Jun 83).....	23
Drying Oil Containing Polymer Developed at Volgograd (I. Mordvintsev; SOTSIALISTICHESKAYA INDUSTRIYA, 13 Jul 83).....	24
Drying of Gases at High Pressures (N. Ye. Kosyakov, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	25
Solubility of Phosgene in Certain Organic Solvents (B. M. Tsigin, S. L. Guseva; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	25

COAL GASIFICATION

Production, Utilization of Methanol (M. Krivich, Dmitriy Yemel'yanovich Brazhnik; KHIMIYA I ZHIZN', No 4, Apr 83).....	27
Hydropurification of Coal Liquefaction Products in the Presence of Zeolite Catalysts (A. A. Krichko, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	32

COMBUSTION

Influence of Inhibitors on Combustion of Polyacrylonitrile Materials (S. A. Vilkova, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	33
---	----

## ELECTROCHEMISTRY

- Conductivity of Heterogeneous Solid Electrolyte-Polymer Structures  
(N. G. Bukun, et al.; ELEKTROKIMIYA, No 6, Jun 83)..... 34

## FERTILIZERS

- Production, Applications of Liquid Fertilizers  
(A. A. Novikov; KHIMIYA I ZHIZN', No 4, Apr 83)..... 35
- Improvement of Operation of Azot Industrial Association  
(V. Semenov; SOTSIALISTICHESKAYA INDUSTRIYA, 21 Jun 83)..... 39
- Quality Improvement in Fertilizer Production  
(N. Manuylov; EKONOMICHESKAYA GAZETA, No 27, Jul 83)..... 43
- Voskresensk Fertilizer Production  
(SOTSIALISTICHESKAYA INDUSTRIYA, 1 Jul 83)..... 45
- Novo-Solikamsk Fertilizer Plant  
(V. Ukolov; SOTSIALISTICHESKAYA INDUSTRIYA, 1 Jul 83)..... 46
- Sulfuric Acid for Fertilizers Produced at Ordzhonikidze  
(EKONOMICHESKAYA GAZETA, No 27, Jul 83)..... 47
- Carbamide-Zinc Sulfate Fertilizer  
(P. Laptev; SOTSIALISTICHESKAYA INDUSTRIYA, 13 Jul 83)..... 48

## FOOD TECHNOLOGY

- Yefremov Glucose Plant Begins Production  
(E. Mokhorov; SOTSIALISTICHESKAYA INDUSTRIYA, 13 Jul 83).... 49

## INORGANIC COMPOUNDS

- Uranium Phosphates  
(L. V. Kobets, D. S. Umreyko; USPEKHI KHIMII, No 6, Jun 83). 50

## ION EXCHANGE PHENOMENA

- Kinetic Characteristics of Type MA-41 Anion Exchange Membranes  
(V. A. Shaposhnik, et al.; ELEKTROKIMIYA, No 6, Jun 83).... 51

## NITROGEN COMPOUNDS

- Reactions of Hydroperoxides With Amines and Amino Alcohols  
in Aqueous Solutions in Presence and Absence of Metal Ions  
(S. K. Grigoryan; USPEKHI KHIMII, No 6, Jun 83)..... 52

ORGANOPHOSPHORUS COMPOUNDS

Interaction of Cyanophosphines With Aldehydes and Ketones (A. N. Pudovik, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	53
Reaction of Phosphorus Dithioacids and Silyldithiophosphates With Phosphorus-Containing Isocyanates (G. A. Kutyrev, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	53
Reactions of Phosphorus Containing Tri- and Tetrasulfides: Interaction of Bis(Dialkoxyphosphoryl- and Thiophosphoryl)Tri- and Tetrasulfides With Diazoacetic Ester (B. A. Khaskin, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	54
Carboimidophosphenes--Compounds Containing Two-Coordination Phosphorus Atom in a Heterocumulene System (O. I. Kolodyazhnyy; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	55
Dehydrochlorination of Tert-Butylfluorenylchlorophosphine: Tert-Butyl-Fluorenylidene Phosphene Dimers (O. I. Kolodyazhnyy, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	55
Free Radical Reactions of Dialkylphosphonoacetals (L. Z. Rol'nik, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	56
Interaction of Isocyanatodiphenylphosphinite With Aromatic Aldehydes (R. I. Tarasova, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	56
Interaction of Trivalent-Phosphorus Acid Monoisocyanates With Unsubstituted Acetic and Halogen-Acetic Aldehydes (R. I. Tarasova, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	57
Sulfoprenylation of Tributyl-, Triphenylphosphines and Triphenylarsine at High Pressures (A. M. Moiseylenkov, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	57
Phosphorylation of Methylenequinones, Part 3: Interaction of 2,6-Di-Tert-Butyl-4-Cyanomethylidene-2,5-Cyclohexadiene-1- One With Trialkylphosphites and Triphenylphosphine (V. T. Kolesnikov, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	58

Phosphorus-Containing Derivatives of Diene-Diol Form of Acetylacetone (F. S. Mukhametov, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	58
Interaction of $\alpha$ -Aminoalkylphosphonates With Ortho Ether (A. F. Prokof'yeva, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	59
New 8-Membered Heterocycles Containing Phosphorus (S. A. Terent'yeva, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	59
Trifluoroacylphosphites in Staudinger's Reaction (V. F. Mironov, et al.; ZHURNAL OBSHCHEY KHIMII, No 6, Jun 83).....	60
Reaction of Unsaturated Compounds, Part 112: Enallene Phosphonates in Reaction With Ammonia (M. G. Voskanyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	60
PESTICIDES	
Development of Viral Insecticides Discussed (N. Yefremov; KHIMIYA I ZHIZN', No 5, May 83).....	62
New Protective Mask for Pesticide Work (SOTSIALISTICHESKAYA INDUSTRIYA, 17 Jun 83).....	65
PETROLEUM PROCESSING TECHNOLOGY	
Use of Ethers as High Octane Gasoline Components (A. A. Gureyev, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	66
Hydrocracking Oil as Raw Material in Production of White Oils (V. A. Potanina, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	66
Reforming 62-105°C Fraction on Polymetallic Catalyst (A. P. Fedorov, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	67
Purification of Aromatic Hydrocarbons From Unsaturated Compounds on A-4M Adsorbent (M. M. Kuvayeva, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	67



Decreasing Pour Point of Synthetic Lubricating Oils (A. P. Alimov, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	68
Viscosity-Temperature Properties of Jet Fuels (A. F. Gorenkov, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	68
Hydrolytic Stability of Synthetic Oils (A. I. Yechin, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	69
Oxidizability of Foreign Jet Fuels (G. I. Kovalev, et al.; KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL, No 6, Jun 83).....	69
PHARMACOLOGY AND TOXICOLOGY	
Physical-Chemical Properties and Development of Methods of Sterilizing and Packing Two-Layer Polymer Self-Adhesive Films (G. A. Chukhadzhyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	70
POLYMERS AND POLYMERIZATION	
Study of Thermal and Viscoelastic Properties of Phosphorus- Containing Urethane Block-Copolymers (V. A. Vilenskiy, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	71
Kinetics of Reaction of Isocyanates With Polyoxypropyleneglycols (V. V. Komratova, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	72
Synthesis and Properties of Certain Polycyanoamides (A. V. Serbin, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	72
Concentration Dependence of Effectiveness of Light-Protective Action of Antioxidants in Polymers (V. B. Ivanov, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	73
Thermal Oxidative Destruction of Compositions Based on Aromatic Polyamides (S.-S.A. Pavlova, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	73
Structure and Properties of Polybutylmethacrylate Obtained by Polymerization in Presence of Aerosil (T. R. Aslamazova, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	74

Study of Rheologic Behavior of Aqueous Polymer Dispersions and Analysis of Sedimentation Stability of Filled Compositions Based Upon Them (V. M. Antonov, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	75
Polymerization of Propylene on a Modified Industrial Catalyst (V. M. Shepel', et al.; PLASTICHESKIYE MASSY, No 6, Jun 83).....	75
Estimate of Chemical Stability of Polymer Materials Based on Microhardness (Yu. Ye. Lobanov, et al.; PLASTICHESKIYE MASSY, No 6, Jun 83).....	76
Removing Catalyst Residue From Polypropylene by Complex-Forming Agents (Ye. I. Yevsyukov, et al.; PLASTICHESKIYE MASSY, No 6, Jun 83).....	76
Influence of Formation Conditions on Brittleness of Nonoriented Polymer Films (N. M. Beder; KHIMICHESKIYE VOLOKNA, No 3, May-Jun 83).....	77
Trinary Oxidation-Reduction Systems as Initiators of Graft Polymerization of Polycaproamide With Dimethylaminoethylmethacrylate (M. S. Kislyuk, et al.; KHIMICHESKIYE VOLOKNA, No 3, May-Jun 83).....	78
Study of Mixed Polymer Liquid Crystal Systems (A. V. Volokhina, et al.; KHIMICHESKIYE VOLOKNA, No 3, May-Jun 83).....	78
Synthesis and Polymerization Capacity of 1-Acryloyl- and 1-Methacryloylpyrazoles (E. G. Darbinyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	79
Synthesis of Certain Polyarylates Based on 2-Phenoxy-4,6-Bis(4'-Carboxyphenyl)-Symm-Triazine Chloride (G. M. Pogosyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	79
Synthesis and Properties of Polymerizable Oligoesters With Terminal Vinylacetylene Groups (S. G. Grigoryan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	80
Cyclolinear Copolymerization of Acetylene Compounds (L. A. Akopyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	81

Production of Biocompatible Self-Adhesive Two-Layer Polymer Films (G. A. Chukhadzhyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	81
Flame Resistant Epoxy Compositions (E. G. Darbinyan, et al.; ARMYANSKIY KHIMICHESKIY ZHURNAL, No 4, Apr 83).....	82
RADIATION CHEMISTRY	
Ionic Flotation of Uranium (VI) From Carbonate Solutions (S. N. Pavlenko, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	83
RUBBER AND ELASTOMERS	
Mechanism of Action of Triethanolamine Trimethacrylate in Salt Vulcanization of Elastomers With Reactive Ester Groups (E. V. Zimin, et al.; VYSOKOMOLEKULYARNYYE SOYEDINENIYA, No 6, Jun 83).....	84
Study of Epoxidation of Ethylene-Propylene Rubber by Superformic Acid by Method of Pattern Recognition (M. S. Ryabova, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	85
Extracting Uranium From LiF-BeF <sub>2</sub> Melt by a Bismuth-Lithium Alloy (V. I. Silin, et al.; RADIOKHIMIYA, No 3, May-Jun 83).....	85
Extraction of Tetravalent Berkelium by Neutral Organophosphorus Compounds (D. A. Malikov, et al.; RADIOKHIMIYA, No 3, May-Jun 83)....	86
Extraction of Tetravalent Berkelium From Sulfuric Acid Solutions by Primary Alkylamines (D. A. Malikov, et al.; RADIOKHIMIYA, No 3, May-Jun 83)....	86
Radiolysis of Tributylphosphate in Presence of Plutonium and Uranium (I. A. Kulikov, et al.; RADIOKHIMIYA, No 3, May-Jun 83)....	87
Interaction of Rock Salt With Glasses, Simulating Hardened Radioactive Wastes (Yu. I. Rodionov, et al.; RADIOKHIMIYA, No 3, May-Jun 83)..	87
Behavior of Ruthenium-106 in Ocean Water-Bottom Deposit System (V. P. Shvedov, N. M. Pushlenkova; RADIOKHIMIYA, No 3, May-Jun 83).....	88

Use of Native Clinoptilolite To Remove Cesium and Strontium From Waste Waters (N. B. Chernyavskaya, et al.; RADIOKHIMIYA, No 3, May-Jun 83).....	89
Role of Protein-Lipid Components of Natural Rubber in Structure Formation Processes (V. A. Volgin, et al.; KAUCHUK I REZINA, No 6, Jun 83).....	89
Molecular Weight Distribution of SKD-SR Rubber and Technological Properties of Mixtures Based on It (V. A. Grechanovskiy, et al.; KAUCHUK I REZINA, No 6, Jun 83).....	90
Improving Quality of SKD-SR Rubber (Ye. Z. Diner, et al.; KAUCHUK I REZINA, No 6, Jun 83).....	90
Permeability of Resins for Liquid Coolants (E. L. Bondarenko, Ye. V. Utlenko; KAUCHUK I REZINA, No 6, Jun 83).....	91
Determining Durability of Bond Between Resin and Fabric in Resin-Fabric Samples Radiated by Accelerated-Electron Beam (T. S. Fedoseyeva, et al.; KAUCHUK I REZINA, No 6, Jun 83)..	91
Principles for Creating Activizing Systems for Effective Elastomer Vulcanization (V. A. Shershnev, et al.; KAUCHUK I REZINA, No 6, Jun 83)...	92
New Synthetic Plasticizer for Butadiene Rubber (V. N. Zaboristov, et al.; KAUCHUK I REZINA, No 6, Jun 83)..	92
Copolymerization of Butadiene Dimers and Trimers and Use of Resulting Polymers for Plasticizing Butadiene Rubbers (V. N. Zaboristov, et al.; KAUCHUK I REZINA, No 6, Jun 83).....	93

#### WATER TREATMENT

Electrochemical Purification of Effluent Waters From Production of Organic Dyes (P. N. Endyus'kin, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	94
Purification of Zinc-Containing Effluent Waters With Phosphoric Acid (A. I. Kudryavtsev, et al.; ZHURNAL PRIKLADNOY KHIMII, No 5, May 83).....	94

Concentration of Electrolytes by Filtration Through Porous Diaphragms (Yu. B. Borkovskaya, N. I. Zharkikh; KHIMIYA I TEKHNOLOGIYA VODY, No 3, May-Jun 83).....	95
Characteristics of Electrochemical Purification of Waste Waters in High-Frequency Electromagnetic Field (V. V. Kovalev, M. I. Band; KHIMIYA I TEKHNLOGIYA VODY, No 3, May-Jun 83).....	96
Methods and Reagents for Decontaminating Water Purification Sediments (Z. N. Shkavro, et al.; KHIMIYA I TEKHNLOGIYA VODY; No 3, May-Jun 83).....	96
Physical Chemical Properties and Biological Activity of Water Systems Subjected to Radiation and Magnetic Action (A. M. Beskrovnyy, et al.; KHIMIYA I TEKHNLOGIYA VODY, No 3, May-Jun 83).....	97

## ALKALOIDS

### UNUSUAL PROPERTIES OF COMMON AUTUMN CROCUS DESCRIBED

Moscow KHIMIYA I ZHIZN' in Russian No 5, May 83 pp 55-56

[Article by Candidate of Biological Sciences V. I. Artamonov: "Common Autumn Crocus"]

[Text] The common autumn crocus (*Colchicum autumnale*) is truly an amazing plant. First of all, it is amazing that it has its own calendar different from any other plant.

In the beginning of April, a stem 10-15 cm high appears from the ground; shortly after, the leaves grow -- large, elongated, up to 40 cm long. Simultaneously with the leaves, the plant develops the fruit rather than the flower: a three-cell boll, first green and resembling a bud which later turns brown. By the beginning of summer, the seeds of the crocus ripen completely and pour out of the boll, the leaves turn yellow and fade, and only the bulb remains in the soil. Its year's life cycle comes to an end when other plants are still in their prime!

Even in ancient times people noticed this amazing peculiarity of the autumn crocus bearing fruit early in the spring and not in the fall. It creates the impression that seeds of this plant form earlier than its flowers.

In reality, the development cycle of the autumn crocus is, of course, the same as that of all plants, only its rosy-violet flowers appear in the preceding autumn, at the end of August-September, when the overwhelming majority of plants complete their vegetation (for this reason the autumn crocus received its specific name). Its flower ovary is hidden in the bulb, where seeds develop after fertilization and ripen by spring.

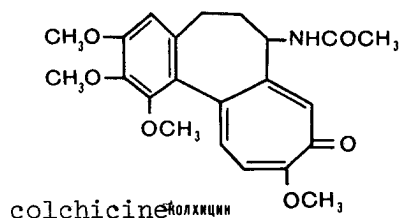
The unusual development schedule of the autumn crocus indicates that this plant is not peculiar to our flora. It is believed that it came to us from the Mediterranean area, where at one time it adapted itself to endure dry hot summers in an inactive state and vegetate during relatively mild winters.

Originally, this newcomer from the Mediterranean area populated the shores of the Black Sea, particularly its eastern shore which was called Colchis in ancient times. This habitat of this plant was mentioned by Dioscorides, a well-known ancient Greek physician. For this reason, botanists gave the name *Colchicum* to the entire genus of crocuses. Besides the Black Sea region, the autumn crocus grows in the western and southwestern regions of the European part of our country, in humid and damp places.

In the Ciscaucasian and Transcaucasian regions, it is possible to encounter the showy autumn crocus (*Colchicum speciosum*) growing at the edges and glades of mountain forests at elevations of 1800-3000 meters above sea level. In the fall, during its mass flowering, mountain forests look very beautiful.

One of the species of the autumn crocus was entered in the "Red Book of the USSR". It is Fomin's autumn crocus (*Colchicum fominii*). Its few locations are known in the Ukraine, near the village of Grebenniki and in the vicinity of Kardamichevka village (Odessa Oblast), as well as in Moldavia -- in the Kuchurgan river valley. At the present time, the area in the vicinity of Grebenniki where Fomin's autumn crocuses grow has been declared a natural monument of the UkSSR, and in Moldavia this plant is under government protection.

The autumn crocus contains a large amount of alkaloids which impart a bitter taste to it. Among them, colchamine and colchicine have received the most study:



Colchicine affects the live tissue just as arsenic. There are quite a few incidents of poisoning by the autumn crocus in the medical literature. A human being can be poisoned not only by the plant itself, but also by the milk from cows who ate it. Agricultural animals are poisoned also when they are raised in meadows where it grows and when they are fed with hay or grass with an admixture of this plant.

When this occurs, it should be kept in mind that if a patient is poisoned by the autumn crocus he should be given coating remedies such as milk, tea, or a tannin solution.

Just as many other poisonous plants, the autumn crocus was considered to be curative since olden times. Its alkaloids are used even now in medical practice, particularly cholchamine which is close in its chemical structure to colchicine, but one tenth as toxic. Both colchicine and cholchamine suppress the process of the division of cells, including malignant ones, and when acting directly on cancerous tissues, they cause their decay. Cholchamine is used in oncology in the form of a 0.5% ointment in treating skin cancers.

But the main area of practical applications of the alkaloids of the autumn crocus are the genetics and selection of plants. This is connected with the unusual effect of colchicine on the processes occurring in cells.

Usually, the cells of each species of plants and animals have a strictly definite number of chromosomes. However, sometimes within a species or related species

there are found forms with different numbers of chromosomes. For example, the einkorn wheat has the least amount of chromosomes (14 in somatic cells and 7 in sex cells); the cells of durum wheat contain 28 and 14 chromosomes, respectively, and ordinary wheat -- 42 and 21. It can be easily observed that the number of chromosomes in the cells of durum wheat and ordinary wheat is two or three times higher in comparison with einkorn wheat.

This phenomenon is called polyploidy, and plants in whose cells a certain chromosome number is repeated more than two times are called polyploids.

Polyploidy is of great interest for practical work. The point is that all organs in polyploid plants, such as flowers, fruits, seeds, etc., are usually larger. No wonder that many most important agricultural crops are represented by polyploidic forms. Sometimes, just as in the case with wheat, these polyploids appeared in a natural way. It is clear that plant breeders are very interested also in artificial development of polyploidic forms.

In 1936, a discovery was made which truly revolutionized plant selection. It was discovered that, after exposing growing tissues to the effect of the alkaloid of the autumn crocus, colchicine, the cell division mechanism is disturbed, the number of chromosomes doubles, but the cell itself does not divide. As a result of this, there appear cells which have 2-3 times more chromosomes than the normal cells. Later on, the ability of the cell for normal division restores, but all daughter cells remain polyploidic.

The colchicine method of obtaining polyploidic plants has become a powerful weapon of plant breeders in developing new valuable agricultural varieties.

The autumn crocus was of service not only to geneticists and plant breeders. Chemist Yu. A. Zhdanov, corresponding member of the USSR Academy of Sciences writes the following about it in his recently published book "Khrustal'nyy svod" [The Crystal Dome]":

"The autumn crocus set such a riddle to chemists that they struggled for half a century to solve it. Colchicine was isolated in its purest form, its composition was analyzed very precisely, but they could not construct its structural chemical formula. Chemists suspected that the colchicine molecule contained several cycles of atoms. Researchers tried in every possible way to draw cyclic models of colchicine, rearranging the rings and redoing the patterns of the familiar six-member rings. All was in vain. The properties of colchicine did not correspond to any of the formulas.

"Success was achieved by a researcher who gave up the habitual concept of six-member atom cycles and boldly proposed the unusual: the colchicine molecule has a seven-member ring of atoms.

"Thus, the autumn crocus, a modest flower, became one of the founders of a new division of organic chemistry: the doctrine of seven-member rings, which are later found in antibiotics and many other products."

In this book, the sketch about the autumn crocus ends with the words with which we would like to conclude our sketch:



"It is a strange flower! People felt this when they gave it the unusual name... To a superficial observer it may seem that it is extremely extravagant and pretentious, a kind of a vegetable snob. But it offers us new riddles and new discoveries. It is a symbol of searching."

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CSO: 1841/306

COMPARISON OF PHOTOMETRIC AND CHEMILUMINESCENCE METHODS OF DETERMINING SILICON IN DEIONIZED WATER

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 5, No 3, May-Jun 83  
(manuscript received 7 Apr 82) pp 226-228

PILIPENKO, A. T., RYABUSHKO, V. O. and TERLETSKAYA, A. V., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, UkSSR Academy of Sciences, Kiev

[Abstract] Photometric and chemiluminescence methods for assay of silicon were compared in regard to detection limit, reproducibility, simplicity and rapidity in analyses of deionized water. The study included determination of Si based on i) formation of blue, by reduction of silicomolybdic acid (SMA) with stannous chloride, with 1-amino-2-naphthol-4-sulfonic acid or with a mixture of methol and sodium sulfite; ii) extraction of SMA in the form of the blue by isobutyl alcohol; iii) formation of SMA complexes with crystal violet and methylene blue. A chemiluminescence method based on oxidation of luminol by SMA in an alkaline medium was also studied. Data presented showed that the best methods for photometric determination utilize i) formation of blue by reduction of SMA by 1-amino-2-naphthol-4-sulfonic acid and ii) formation of an SMA methylene blue complex. The advantage of the use of the 1-amino-2-naphthol-4-sulfonic acid is that the SMA-methylene blue complex is not flotated by organic solvents but is separated by centrifugation of the solution, with better reproducibility of results and great reduction of time required for one determination. The chemiluminescence method was less effective but saves time in analysis after preliminary concentration and depolymerization of the silicon. Figures 3; references 14: 12 Russian, 2 Western.  
[340-2791]

## SPONTANEOUS IGNITION OF HYDROCARBONS IN PRESENCE OF PROMOTING ADDITIVES

Moscow KHIMICHESKAYA FIZIKA in Russian No 6, Jun 83  
(manuscript received 17 May 82) pp 838-848

BORISOV, A. A., GEL'FAND, B. Ye., DRAGALOVA, Ye. V., ZAMANSKIY, V. M.,  
LISYANSKIY, V. V., SKACHKOV, G. I. and TSYGANOV, S. A., Institute of Chemical  
Physics, USSR Academy of Sciences, Moscow

[Abstract] A discussion is presented, within the framework of simple concepts of a chain-thermal explosion, of the way that promoter additives to non-cyclical motor fuels may affect ignition. Attempts are made to quantitatively estimate the significance of chemically-active particles in accelerating non-isothermal reactions; to formulate certain of the most general principles of autoignition; and, to compare experimental and calculated results. Experiments were performed in gas mixtures with liquid fuels in two modifications of a shock tube and static transfer installation. The combination of these methods allows a broad range of change of ignition delays to be encompassed from  $10^{-5}$  s to several seconds. Kinetic mechanisms for promotion of autoignition are discussed; chain reactions with unsteady concentrations are analyzed; qualitative regularities of promoted autoignition are discussed. It is decided that promoters can act on the chemical reaction in three ways: 1) acceleration of the formation of chains by rapid decomposition of an additive or its reaction with oxygen or fuel; 2) addition to the reaction system of a branching stage, determined by the interaction of the additive with one of the radicals; or 3) homogeneous catalysis, which can occur either through the formation or through the branching stage with subsequent regeneration of the catalyst. It is found that nitroderivatives such as methylnitrite and methylnitrate and tetrafluorohydrazine are the most effective promoters. The promotion effect is determined by the chemical nature of the promoter and the rate of generation of radicals. A comparison of experimental data on the ignition of methane and propane mixtures indicates that the promoting effect of an additive depends on the chemical nature of the fuel. Figures 5; references 20: 7 Russian, 13 Western. [319-6508]

BIOCHEMISTRY

AUTOMATIC ANALYSIS OF MICROBIOLOGICAL SOLUTIONS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Jul 83 p 1

[Article by L. Leont'yeva, Chechen-Ingush ASSR: "Tests Have Been Done"]

[Text] Tests of the first samples of a measuring complex for automatic analysis of technological solutions in the microbiological industry have been successfully completed. The new complex was invented by associates of the "Promavtomatika" [Industrial Automation] Scientific-Industrial Association.

12410

CSO: 1841/332

INTENSIFYING BACTERICIDAL EFFECT OF BIOCIDES IN CUTTING FLUIDS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 30-32

KACHAN, V. I., MIKITENKO, V. S. and ALPAT'EVA, T. A., All-Union Scientific Research Institute of Petrochemistry

[Abstract] A study is presented of the influence of ethylenediamine-tetraacetic acid (EDTAA) on the antimicrobial properties of a number of domestic [Soviet-made] bactericidal additives for cutting fluids. During the testing both the microbiological and primary physical-chemical properties of the cutting fluids were determined. The duration of protective action of the additives vazin, vazin FD, formacide-13, kamcide-5 and furacylin was determined with and without EDTAA in Ukrinol-1 cutting fluid. Though EDTAA itself did not show great duration of antibacterial effect, when combined with the other additives it lengthened their time of protection by a factor of 2.2 to 2.7. References 10: 2 Russian, 8 Western.  
[327-6508]

CYCLOTRIMERIZATION OF 1,3-BUTADIENE ON COMPLEX ORGANOMETALLIC CATALYSTS  
IN THE SYSTEM  $(C_2H_5)_3AlCl_3-Ti(OR)_4$ 

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 20 Jul 81) pp 1103-1107

TSVETKOV, V. F., LIKHOMANENKO, V. A., PISAREVA, V. S., KORZHOVA, N. V.,  
KAZANTSEVA, V. M., KORSHUNOV, S. P. and ZAKHARKIN, L. I., Togliatti  
Polytechnical Institute

[Abstract] A study is made of the reaction of cyclotrimerization of 1,3-butadiene on the catalytic system  $(C_2H_5)_3AlCl_3(I)-Ti(OR)_4(IIa-h)$ . Preliminary experiments established that the catalytic system studied has its maximum of activity for cyclotrimerization of 1,3-butadiene in the 50 to 60°C temperature interval. The most important factor in cyclotrimerization of dienes is the ratio of the components of the catalytic composition. Therefore, the authors studied the activity of the system  $(C_2H_5)_3AlCl_3-Ti(OBu)_4$  with various ratios of its components. Optimal conditions were found for production of cyclo-dodeca-1,5,9-triene. It is shown that the catalytic system containing ethylaluminum sesquichloride and synthesized orthotitanates has high catalytic activity and selectivity in the reaction of 1,3-butadiene cyclotrimerization. References 24: 17 Russian, 7 Western.  
[318-6508]

## CHEMICAL INDUSTRY

### CHEMICALIZATION OF USSR NATIONAL ECONOMY DISCUSSED

Moscow KHIMIYA I ZHIZN' in Russian No 5, May 83 pp 2-6

[Article by L. A. Kostandov, deputy chairman of the USSR Council of Ministers]

[Text] In the last ten years, the chemical industry became one of the leading sectors of material production. Successes of chemical kinetics, creation of new catalytic systems, particularly metal-complex systems, and development of new syntheses on their basis has made it possible to expand considerably the raw material base of the chemical industry, to process thoroughly huge amounts of natural gas and oil, and to deliver great numbers of new polymer materials and other chemical compounds to the national economy. Today, about 80,000 products are produced on the basis of oil.

New discoveries and technological studies rapidly find practical uses, closely connecting science with production. This interrelation makes it possible for us to use more rationally useful mineral and fuel and energy resources and contribute to the appearance of ever newer substances with very remarkable properties.

Now it is possible to speak of a comprehensive effect of the chemical industry and chemical ideas on the acceleration of the scientific and technical progress and the development of material production. Some examples of this effect are particularly striking.

The industrial synthesis of rubber is only half a century old, but today twice as much synthetic rubber is produced than natural rubber.

As early as in the nineteen sixties, the world production volume of plastics exceeded considerably the output of nonferrous metals, reaching 60 million tons a year. It can be assumed that in the near future the production volume of plastics will also be higher than that of steel. This does not surprise anybody. However, this is amazing!

In the last twenty years, the annual production volume of natural fibers increased in the world approximately by four million tons and that of chemical fibers -- by 12 million tons. Now, the share of chemical fibers in textile materials approaches 50%, and the tendency for further growth of their share continues. Is it not amazing that today it is possible to obtain chemical fibers which are considerably stronger than metallic fibers? For example, the tensile strength of chemical fibers is 450 kg/mm<sup>2</sup>.

The world production of natural soap dropped almost by one million tons in 20 years. It is good because vegetable oil and animal fat are used for soap. On the other hand, the annual output of synthetic detergents increased by 4.8 million tons. Their share in the total volume of products for these purposes has already reached 70%.

There are many such examples. It becomes more and more evident every year that the chemicalization of all sectors of the national economy and all spheres of human activities is an objective, necessary and inevitable process.

The Party and Government have mapped out a course for accelerated development of chemistry and petrochemistry. Between 1961 and 1980, these sectors of the national economy received about 58 billion rubles of capital investments. The fixed production capital increased more than ten-fold, and the gross production volume of the chemical industry reached 41.7 billion rubles in 1980. The average annual pace of the production growth in the chemical industry was, on the average, 1.4 times higher than for the industry as a whole.

As a result of the outstripping development of chemistry and petrochemistry, their share in the gross industrial production increased from 3.7 to 7% during 1961-1980. The share of chemists and petrochemists in the total number of industrial production personnel increased from 2.9 to 4.9%. In a short period of time, a ramified network of scientific-research and planning and design institutes, laboratories, design offices was created in the country in all sub-branches of the chemical and petrochemical industry, in the USSR Academy of Sciences, and in academies of the union republics. Personnel training for new plants, combines and scientific institutions developed widely.

The chemical and petrochemical industry of our country was not just expanding. The growth of these most important sectors of industry was truly intensive. The raw material base has changed, the techniques and technology are constantly improving. Creation of large-scale production of ammonia, sulfur, phosphoric acid, nitric acid, rubber, polyolefin, polystyrene, and polyvinylchloride made it urgently necessary to have new technological processes, to increase sharply the unit capacities of the equipment, and to use new highly effective catalyzers and catalytic systems.

Technical progress could not but justify itself. The production volume of chemical products in the last ten years increased 2.3-fold. The following was particularly important: electric energy consumption increased only 1.7 times and thermal energy consumption less than doubled.

The world energy crisis caused a sharp increase in the prices of energy and raw material resources, particularly of oil and gas. In this situation, it is particularly important to have a high growth rate of the national income and industrial production with simultaneous decrease in the consumption of raw and other materials and energy carriers. How can this be achieved? The most general answer to this is such: it is necessary to improve technological processes, introduce top-level norms for raw and other material consumption, to use secondary resources and, which is very important, to improve constantly the material production structure. The role of the chemical industry in this area is truly great. One example will be sufficient to see this.



At the present time, the replacement of metal pipes with plastic pipes of polyvinylchloride and polyethylene has become a very urgent problem. Based on the 1980 consumption, we need about one million tons of polymer pipes. This will make it possible to save five million tons of steel. However, energy evaluation, an energy-oriented approach, is just as important: this replacement, in essence, means a saving of at least 10 million tons of oil a year. The total consumption of thermal and electric energy for the production of polymer materials is one fourth of that for the production of steel and one sixth of that for the production of aluminum, and one fifth of that for the production of copper.

Discussing the chemicalization of the national economy, we should not disregard the tremendous role of catalytic processes. Due to the use of catalyzers, it became possible to synthesize a great number of chemical products. Is it not amazing that chemistry, being a high consumer of gasoline itself, has already at its disposal catalysts which make it possible to produce gasoline from gas, ethylene from gas, and hundreds of products on the basis of gas? The industry constantly poses new problems to science for developing catalyzers and catalytic systems. No progress can be ensured without this.

Today, it is impossible to use old catalysts as a basis for creating large units for methanol production -- units with a production capacity of one million tons a year. The new catalysts which have already been developed on the basis of copper, zinc and aluminum oxides have a very great activity and selectivity, which makes it possible to lower the synthesis pressure from 300 to 100 atmospheres. Here is another example. The synthesis process of acetic acid with the use of cobalt catalyzers progresses at a pressure of 500-600 atmospheres and a temperature of about 300 degrees C, while catalyzers on a rhodium base make it possible to lower the pressure to 30 atmospheres and the temperature to 100 degrees C. This is not the only example. The creation of very active selective catalysts for the polymerization of ethylene and propylene makes it possible to simplify greatly the entire purification scheme of the ready polymer, because these processes now require an insignificantly small amount of catalyzers -- a few grams per one ton of products.

There are many such examples. This is why the development of science about catalysts and catalytic systems is one of the most important directions in the work of our scientific organizations of all levels and classes.

Labor productivity in the chemical industry is 20-25% higher than the average for the entire industry as a whole. However, in the final analysis, something else is even more important: the use of chemical raw and other materials, chemical methods of their processing, in short, what we call chemicalization, increases labor productivity in all sectors of industrial production, in construction, and in agriculture.

The rapid growth of the production of chemical products and its penetration into all spheres of the national economy have played an important role in the solution of key socioeconomic problems: intensification of socialist agriculture, acceleration of the scientific and technical progress in heavy industry, development of the raw material base of light industry and production of consumer goods.

During the years of the Tenth Five-Year Plan, the output of mineral fertilizers reached 104 million tons of reference fertilizers a year, and the share of concentrated complex fertilizers was 84%. At the present time, about four centners of reference fertilizers are used per hectare of ploughed land in our country. Formerly, preference was given to industrial crops in distributing fertilizers, but now it has become possible to use them for cereal and fodder crops, potato, vegetables, and perennial plantation. However, in spite of the high effectiveness of the use of fertilizers, they are used now approximately on one half of the areas occupied by cereal crops. Therefore, it is necessary to continue the accelerated development of the mineral fertilizer industry.

A considerable role in increasing the productivity of plant growing is played by the chemical means of plant protection. In spite of the fact that the total volume of their production has already reached 470,000 tons a year, the needs of agriculture in plant protection chemicals, particularly in herbicides, are not yet fully satisfied. Therefore, in the Eleventh Five-Year Plan, measures were taken for intensive development of this direction. The production of chemicals for plant protection has its own specific peculiarities: it is necessary to renew constantly and expand the assortment of products with consideration of their applications for various crops in many regions of the country with various climatic conditions.

Chemical food supplements started being used widely in animal husbandry. The feed phosphate industry is developing in our country. Its high rate of development is explained by the economic effectiveness of the use of phosphate supplements in the diet of agricultural animals. Today, the chemical industry can supply livestock breeders also with carbamide supplements of the required quality in needed quantities.

The country's agriculture needs further expansion of chemicalization: mass use of vitamins, synthetic amino acids, food preservatives, such as acetic, benzoic and propionic acids. Of course, modern polymer materials for containers and plastic film for hothouses are needed in large quantities. The chemicalization of agriculture without them also will not be complete.

Electrical engineering, electronics, aviation and space engineering, and the automobile building industry have an acute need in new materials with special, sometimes exotic, properties. Further progress of these sectors is unthinkable without such materials. For example, electrical engineering is facing the problem of increasing the power of electric motors for deep-well pumps used in oil wells without increasing the overall size of the machines. This requires especially reliable insulation materials, films and varnishes with high dielectric characteristics.

Modern electronics, in essence, gave rise to a new subbranch in the chemical industry: production of particularly pure substances and reagents with an admixture content at the molecular level. At the same time, it became necessary to create a large series of single crystals, film resistors and other products, and ceramic and polymer materials.

The aircraft building industry and space engineering could not and cannot manage with the known existing set of metals and polymers. Composite materials with a

strength-density ratio several times higher than that of steel and aluminum alloys traditionally used in the aircraft building industry were created on the basis of synthetic resins and carbon, glass and synthetic fibers.

Quite recently, when the production of the well-known passenger cars "Zhiguli" was started, the consumption of plastics per one car was 34 kg, but now it will be 72 kg in new models, and in the near future 90 kg of plastic materials will be used for one car.

What do we have here? The leading sectors of industry, such as the machine-building, electrical engineering and electronic industries, cannot exist without the chemical industry, while the chemical and petrochemical industries, in turn, receive from these sectors powerful stimuli for their development and progress. In justice, it should be said that the plastics industry does not yet satisfy the needs of the machine building industry. The polymer chemistry still has to solve many complex problems in creating new polymer materials, highly productive processes, integrated use of raw materials and, as any constantly growing industry, in environmental protection.

Unlike many other sectors of the national economy, the construction industry is ready for large-scale effective use of polymer materials. These materials meet the requirements of modern construction engineering in the best way possible: they are stable in corrosive media, have good waterproofing and heat-insulation properties; articles made from them have a high degree of finishing. Therefore, the chemicalization of construction, particularly as large-scale as in our country, is not only necessary, but also very profitable.

Today, the following are used widely in construction: polymers, wood-fiber boards, foamed plastics, articles made of silicate cotton; the use of polymer pipes and sanitation equipment, synthetic carpeting, finishing boards, varnishes and paints is expanding. In 1980, 350,000 tons of plastic materials and synthetic resins were used in construction.

Domestic and foreign experience indicates that the construction industry can become a still bigger consumer of polymer materials. The greater their consumption the greater will be the effectiveness of their use. Further chemicalization of construction must lead to a considerable increase in labor productivity, particularly at the stage of finishing jobs.

The introduction of chemical methods in the wood-working industry should also be mentioned, since the chemicalization of this sector makes it possible to conserve wood and preserve forests. The effectiveness of the use of wood depends greatly on its chemical and chemomechanical processing. With an extensive complex processing, the degree of utilization of wood can reach 85-90%, while now it is 50-55%. In 1980, the timber, wood-working, furniture and pulp and paper industries used about 900,000 tons of carbamide and phenol-formaldehyde resins and plastic materials. It is to be supposed that this is only the beginning.

Everybody knows how much the chemicalization of everyday life and households has progressed. The production of synthetic detergents, household varnishes and paints and merchandise in aerosol cans has become truly large-scale. The output of household chemicals increased from 1.6 billion rubles in 1975 to 2 billion rubles in 1980.

Already we have mentioned that the output of the traditional soap made from animal fat and oil is decreasing all over the world and the production of synthetic detergents is expanding. Naturally, the situation is the same in our country. During the years of the Tenth Five-Year Plan, the share of synthetic detergents increased from 33% to 39%, and their output in 1980 exceeds one million tons. However, let us note that in many economically developed countries the share of synthetic detergents is already above 75%. Evidently, we still have to reduce considerably the production of soap for which natural food products are used.

The synthetic detergents which are being produced now meet the requirements of consumers to a considerably greater degree than soap, which every housewife will confirm. The necessity of such detergents is constantly increasing with the increase in the production of textile articles made of chemical fibers which cannot be washed with soap.

Household chemicals have a very important social role. Synthetic detergents, bleaches, cleaning and polishing preparations, and various aids for the care of household articles and the dwelling make housework easier and save our time for relaxation, studying, reading and sports. The role of new highly effective preparations and polymer materials is even greater in the pharmaceutical industry, in the production of medical instruments and equipment and prosthetic appliances. Perhaps, in this sense we can speak of the chemicalization of health services, whose obvious result is direct improvement of medical services.

More than ten years ago, I published an article in the journal "Chemistry and Life" about the role and place of chemistry in the national economy. That article (1971, No 1) was entitled "Chemicalization Does Not Know Any Limits". Today too, no limits for chemicalization can be seen. But still, what intermediate results can we cite?

During the last 15-20 years, due to the great emphasis placed on the development of chemistry by the CPSU Central Committee and the USSR Council of Ministers, we are witnessing a considerable progress in all sections of the chemical complex of our national economy without exception. A considerable scientific and technical potential was created in all subbranches of the chemical industry and in all sectors of the national economy -- chemical scientific and practical potential. At the present time, the chemical industry alone has about 400,000 engineers and technicians. Scientific-research and design organizations and experimental plants have about 150,000 people.

Here is another important result: the changes which occurred in the development of the chemical complex changed radically the notions about the significance of chemistry for the technical progress of all sectors of industry, about its influence on the solution of national economic problems, about its role in the implementation of the socioeconomic policy of our party.

Finally, there is another result and another conclusion: the level of the chemical industry achieved today still does not fully correspond to the role which it can and must play in increasing the effectiveness of social production. The potentialities of the chemical science and industry are not yet used to the fullest.

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TOMSK METHANOL PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jul 83 p 1

[Article by V. Loyscha, Tomsk: "Methanol-750 Is on Stream"]

[Text] Yesterday in Tomsk the first establishment for producing methanol with a capacity of 750 thousand tons per year delivered its first production, which is not only the largest in the Soviet Union but also in the world. For comparison only 12 million tons of this very valuable chemical product are now produced in the whole world.

Tomsk, which is one of the oldest Siberian cities, is gradually finding status as a center for large-tonnage chemistry. The methanol plant is second in size in the petrochemical combine being constructed here. The first, for the production of polypropylene, entered the system on the eve of the 26th CPSU Congress and since that time has been confirmed as a supplier of production not only to many domestic sectors of industry but also to dozens of foreign countries.

All the union republics and almost all autonomous republics of the country, 63 krais and oblasts, 29 project organizations and thousands of construction and assembly workers participated in the construction of the large-scale enterprise which the methanol plant is. However the whole enterprise is now operated by 170 men. In all, 22 workers and an engineer will be employed on each shift of basic production. Such is the level of automation here.

12410

CSO: 1841/332

GAURDAK OPEN-PIT SULFUR MINE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Jul 83 p 1

[Article from TASS, Gaurdak: "Chemical Base Strengthened"]

[Text] The Gaurdak sulfur plant has obtained a reliable source of raw materials. The biography of the "Southeast" open pit mine began with a powerful explosion stripping a stratum. Powerful excavators and dump trucks have been included in the work.

On the basis of its reserves, the new open pit mine surpasses all old pit mines, the resources of which are nearing depletion.

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CSO: 1841/332

## ECONOMICS OF THE BELORUSSIAN SSR CHEMICAL INDUSTRY

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 5, May 83 pp 32-33

[Article by V. Sukhinin, director of the Minsk Branch of the Institute for Technical Economic Research of the Chemical Industry, candidate of economic sciences; I. Serzhinskiy, section chief of the Economics Institute of the BSSR Academy of Sciences, candidate of economic sciences; and N. Nikolayev, candidate of economic sciences: "A Positive Step"]

[Text] The relative proportion by volume of the chemical complex comprises 12.8 percent of the industry of the republic. The capital-labor ratio here is 2.9 fold higher than in all industry.

At the present time our republic produces about 13 percent of all the mineral fertilizers of the country (in conventional units), including about half the potassium fertilizers, 21 percent of the chemical fibers and filaments and 12 percent of the synthetic resins and plastics. The high economic efficiency of petrochemical and chemical materials, their interchangeability and universality, and the possibility of obtaining different products from them by practical and highly efficient methods caused a leading growth in production volume of this important branch of the national economy. Thus in 1980 the volume of its commercial production in comparison with 1965 increased by a factor of 15, at the same time as the entire industry of the BSSR rose by a factor of 4.2. During the years of the 11th Five-Year Plan chemical production output will grow even more. Let us say that mineral fertilizer production will increase by a factor of 1.3 and chemical fiber and filament production by a factor of 1.26. Even today our republic per capita produces 6.3 fold as much chemical fibers and filaments, 5.8 fold as much mineral fertilizers, and 3.4 times as much plastics and resins as the country as a whole. Therefore, per capita, it produces considerably more mineral fertilizers and chemical fibers and filaments than such industrially developed countries as the United States, the Federated Republic of Germany and Japan.

An increase in the scale of chemical production output and the growth of its use in all spheres of the national economy of the republic played an important role in the solution of a number of large-scale social-economic problems, especially in the intensification of agriculture, the expansion of the raw material basis of light industry, the production of goods for consumer use, the acceleration of scientific and technical progress in mechanical engineering, and also in the development of industrial methods of construction.

Chemical production itself has also changed. For example, unit capacities of machinery and technological lines have been enlarged. Thus machinery was introduced at the Gomel chemical plant, with a capacity of 450,000 tons of sulfuric acid; at the Novopolotsk Polymer Association, with a capacity of 63,000 tons of polyethylene; and at the Grodno Nitrogen Association, with a capacity of 330,000 tons of carbamide and 450,000 tons of ammonia per year. The introduction of only one multi-ton plant for ammonia production permits its production cost to be halved and labor productivity to triple, which as the end result gives an economy of 7 million rubles per year.

Industry is mechanized and automated in a complex manner. Automated control systems and technological processes have been introduced at the Nitrogen, Belorussian Potassium and Polymer Associations, at the Gomel chemical plant, and at the Svetlogorsk synthetic fiber and other plants. In chemical complex enterprises today there are 270 mechanized continuous and 127 automatic lines, 159 complex-mechanized, automated and complex-automated sections, shops and factories. The relative proportion of workers engaged in manual labor in industrial unions and at complex enterprises comprises a little more than 20 percent.

In recent years chemists of the republic have been conducting an unremitting campaign to improve the quality of their production, broaden selections and raise effectiveness. As a result, in the past year, production output with the State Emblem of Quality in the chemical industry comprised 36.2 percent. Among 150 products labeled with the honorary pentagon are synthetic fiber and filaments, dimethyl terephthalate, caprolactam, polyethylene and many other forms of production.

Improvement in technology and organization of production and amelioration in planning and control methods in the last Five-Year Plan provided gains in labor productivity in the chemical and petrochemical industry of the republic of 42 percent. In many operating factories the entire production gain is provided by this factor alone. For the development of the chemical complex 1.6 billion rubles of capital outlay was allotted during these years. More than half of it was used for reconstruction and enlargement of operating enterprises. An appropriation of 2 billion rubles is forecast for 1981-1985. Thus, at the Polymer Association there are plans for introducing a second line for the production of Nitron fiber--a synthetic substitute for wool. The production of superwide gauge tires will be introduced into an operating line at the Bobruysk Tire Association. The introduction of new capacity is also imminent in the Belorussian Potassium, Chemical Fiber, Nitrogen and Novopolotsk Petroorganosynthesis Associations, in artificial fiber plants in Svetlogorsk, a synthetic fiber plant in Grodno, a petroleum refining plant in Mozyr and other enterprises. Toward the end of the present Five-Year Plan, the output of commercial production in the chemical complex of Belorussia should comprise 4 billion rubles. Almost 40 percent of it will be labeled with the State Emblem of Quality.

The basic problems posed before the chemical industry for the period up to the year 2005 are to create and make operational an output of new materials with



given properties and new forms of automobile fuel, to increase the production of commodities with improved consumer and hygienic properties and to broaden their variety.

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CSO: 1841/334

MINISTER FEDOROV ON USSR CHEMICAL INDUSTRY

Moscow SEL'SKAYA ZHIZN' in Russian 29 May 83 p 1

[Interview with Viktor Stepanovich Fedorov, minister of petroleum refining and petrochemical industry, "For Fields and Farms"]

[Text] Various products of chemical industry enter our lives in ever wider and more diverse ways. Parts of houses, cars, other vehicles, furniture, footwear, utensils, articles of household use--these and a lot more are manufactured by the workers of this important sector of the national economy, who celebrate their professional holiday on 29th of May. On the eve of the Day of the Chemical Worker TASS correspondent asked the USSR Minister of Petroleum Refining and Petrochemical Industry V. S. Fedorov to tell how the workers of the chemical industry meet their holiday.

The Day of the Chemical Worker, which in our country is celebrated by refinery workers, petrochemical workers, by workers of petroleum sales organizations, is marked nowadays by considerable achievements in production: the goal set for the first quarter has been successfully reached, and above it millions of rubles of products were turned out.

The 26th Congress of CPSU resolved to bring the 1985 production of chemical fertilizers up to 36-37 million tons (converted to 100% content of nutrient), of synthetic resins up to 6-6.25 million tons, of chemical fiber and thread up to 1.6 million tons. Also, it was stipulated to develop more widely the production of polymers with given technical characteristics, to increase output of synthetic rubber and other products.

The sectors of chemical industry are developing at an accelerated rate. So, during the first quarter of this year, 7.4 million tons of fertilizers and 16 million tires were produced. Since the beginning of the (current) Five-Year Plan the biggest-ever increase of fixed capital was ensured; 240 objects and installations were put in operation. Among them are production plants: of carbamide in Perm, of styrene in Nizhnokamsk, of tires for automobiles and agricultural machines in Chimgent and Bobruysk.

[Question] Tell us, please, how large is the contribution of chemical industry toward realization of the country's food program?

[Answer] During the November (1982) Plenum of CPSU Central Committee comrade Yu. V. Andropov said: "The workers of the agroindustrial complex must increase their efforts day after day, they must work in such a way that the immense assets, directed toward the solution, produce results even today, and more--tomorrow." Worker's collectives of the chemical industry enterprises do a lot to improve technology and increase efficiency of production. The output of chemical fertilizers is growing. More than a third of the gross agricultural production yield was due to the use of fertilizers and chemical meliorants and also means of harvest protection against diseases, pests and weeds.

During this Five-Year Plan new production capacities for farm-feed conservants will be put into operation. Production of liquid paraffins will be further increased to widen the fodder base. This will create a foundation for production of protein-vitamin concentrates, which are more and more widely used in livestock breeding, poultry and fur farming.

The outputs of feed protein, lysine and premixed combinations has increased. Overall chemicalization of agricultural production has been developed, new chemicals for harvest protection have been created, industrial production of new pesticides has been organized.

Various products of petroleum refining--fuel, oils, tires, rubber products--are widely used on farms. And the workers of the chemical industry have put forth a maximum effort to supply the farms with all that is needed. They can be credited with tens of thousands of tons of above-plan production, with thousands of "shoe" sets for farm machines.

[Question] What kind of measures are undertaken by workers of chemical industry to increase the output of (consumer) goods?

[Answer] Sectors of the chemical industry have noticeably increased the output of goods that are in high demand by the population. The enterprises of petrochemical and petroleum refining industries alone produced 23.5 million rubles of such goods above the last year plan. But demand for many products is not fully satisfied yet. To increase their production overall plans are drafted to design and develop new products, to improve quality of products, to fuller supply the population with the necessary chemical goods of mass consumption.

12422

CSO: 1841/307

EIGHTH ALL-UNION CONFERENCE ON COLLOIDAL CHEMISTRY AND PHYSICO-CHEMICAL MECHANICS

Tashkent PRAVDA VOSTOKA in Russian 4 Jun 83 p 1

[Article: "(Results of) Scientific Research--Into Practice"]

[Text] The Eighth All-Union Conference on Colloid Chemistry and Physical Mechanics concluded its work yesterday in Tashkent. For four days scientists discussed urgent problems in research development that have great theoretical and practical importance.

"More than 500 research workers, representing the largest science centers of Moscow, Leningrad, Kiev, Minsk, and many other cities of the country took part in the conference", said Academician Petryanov-Sokolov, department head of the Scientific Research Physical Chemistry Institute imeni L. Ya. Karpov, laureat of State prizes, commenting on meeting's results. "There is not one industry in the national economy that does not use the achievements of colloid chemistry and its new and important part--physico-chemical mechanics. A big contribution to this science is made by the chemists of Uzbekistan. Specifically I would like to mention the research that is conducted by scientists of the Tashkent Polytechnic Institute. The main direction of their work is utilization of industrial production waste; this has important scientific and industrial significance, and serves the good cause of environmental protection."

The conference accepted recommendations directed toward wider use of results of scientific research in all sectors of the national economy.

12422

CSO: 1841/307

DRYING OIL CONTAINING POLYMER DEVELOPED AT VOLGOGRAD

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jul 83 p 2

[Article by I. Mordvintsev, Volgograd: "Economical Drying Oil"]

[Text] A new technology for producing a drying oil has been mastered at the Volgograd chemical plant of the oblast administration of local industry. In this case a vegetable oil used as a raw material is partially replaced by a polymer resin.

The new technology permits a saving by year's end of 180,000 rubles' worth of a valuable edible product.

12410

CSO: 1841/332

## DRYING OF GASES AT HIGH PRESSURES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 15 Jan 81) pp 1162-1163

KOSYAKOV, N. Ye., IVCHENKO, B. I. and KRISHTOPA, P. P.

[Abstract] This work studied the limiting adsorption of moisture from hydrogen at 0°C at pressures from 10 to 100 atm by 4 adsorbents widely used in industry for the drying of gases--SKT carbon, KSL silica gel, NaX zeolite and active aluminum oxide. Hydrogen at the experimental pressure was passed sequentially through a bubbler with water at 0°C obtaining a saturated water solution in the compressed hydrogen, and the adsorber, also at 0°C. The gas leaving the adsorber was heated to room temperature, the output curve was measured, from which the adsorption of moisture at the experimental temperatures was determined. Temperature was maintained constant with an accuracy of 0.1°C. For all of the adsorbents studied the adsorption of moisture decreased with increasing pressure. The variation in adsorption as a function of pressure can be described by the empirical equation  $a_2 + AP^n$ , where  $a_2$  is the adsorption in milligrams per gram, P is the gas pressure, A and n are coefficients, the values of which are presented in a table for all of the adsorbents tested. Figures 2; references 2(Russian).  
[318-6508]

## SOLUBILITY OF PHOSGENE IN CERTAIN ORGANIC SOLVENTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 11 Jun 81) pp 1182-1184

TSIGIN, B. M. and GUSEVA, S. L.

[Abstract] The solubility of phosgene was determined in benzene, toluene, chlorobenzene, o-dichlorobenzene and carbon tetrachloride as a function of temperature. The experiments utilized phosgene containing no chlorine. The solvents used were dried and purified by distillation, and experiments were performed by placing 150-200 ml of dried solvent in a reactor with dry gaseous nitrogen. The contents of the reactor were heated to the assigned temperature

and gaseous phosgene was fed in after first passing it through concentrated sulfuric acid. When constant temperature was achieved the mixture was held for a half hour to allow achievement of equilibrium, samples of the solution were taken off to determine their content of phosgene. The results indicate that the solubility of phosgene in chlorobenzene and toluene are practically the same as those presented earlier, that the solubility of phosgene in toluene, chlorobenzene and o-dichlorobenzene is practically the same and greater than that for benzene and tetrachloromethane by a factor of 2. References 9:  
8 Russian, 1 Western.  
[318-6508]

## COAL GASIFICATION

### PRODUCTION, UTILIZATION OF METHANOL

Moscow KHIMIYA I ZHIZN' in Russian No 4, Apr 83 pp 11-13

[Interview by KHIMIYA I ZHIZN' correspondent M. Krivich with Dmitriy Yemel'yanovich Brazhnik, head of the All-Union Soyuzmetanol Production Association of the USSR Ministry of Chemical Industry: "How the Methanol Tree Grows"]

[Text] [Question] Last year, KHIMIYA I ZHIZN' printed an article, "The Methanol Tree," by Dr of Chemical Sciences I. I. Moiseyev. The article was illustrated with a picture of a mighty tree, on whose branches grew, instead of leaves and fruits, the formulas of organic substances which can be readily synthesized from methanol. How are things with the methanol tree today? Is it all grown up or is it still just a laboratory seedling that chemical researchers are nursing? [The "methanol tree" is illustrated in this article.]

[Answer] You couldn't call it a laboratory seedling by any means; methanol is one of the most high-quantity, large-tonnage products of basic organic synthesis. We'll have to wait and see whether this trend continues in decades to come. Our country alone now produces around 2 million tons of methanol per year, and by the end of the five-year period, the output will double. I would phrase the question differently: Has the methanol tree become as branched as in the picture in your journal? Not yet.

The heat of the passion for methanol reached its apogee in the 1970s, when the energy crisis was especially intense and the search for alternate energy sources became the number one problem. At that time, dozens of firms of Western countries undertook the development of new technologies using products of organic synthesis and began looking for new catalysts. According to the prognoses of that time, many branches of the methanol tree should have grown very rapidly. In particular, progress was expected in the production of products which were considered potential substitutes for oil (methanol especially was discussed as an alternate source of fuel). But most of these predictions have still not come true. Methanol is a product for which the demand changes frequently, the opinions about its future applications differ radically. For example, in the 70s it was suggested that by 1985 the chemical industry's worldwide demand for methanol (including that needed for the production of olefins, vinyl acetate, acetic anhydride, ethylene glycol, ethanol, and other products) would be 17 million tons; for energy needs--more than 50 million tons; and for the biosynthesis of protein--about 3 million tons.



Depending on the data used, the estimations of the total demand for methanol by 1985 varied greatly--from 90 to 200 million tons. Today these predictions have been corrected, you might say. The estimates have shrunk to a tenth or less.

You could say that the methanol boom of the 70s was largely due to the circumstances--the industrially developed countries were trying to use the simplest alcohol to reduce their dependence on countries which are oil suppliers. That is undoubtedly the reason why the prognoses were inflated. But it is necessary to emphasize the main thing that led to their radical re-evaluation--that is, the economy, which for the time being is not favorable to new processes, and also the difficulties involved with their insufficient technological effectiveness, the presently low selectivity of targeted products, and the poor availability of currently-used catalytic systems. For example, iodine compounds and rhodium--catalysts--are expensive and scarce. And they are still the only means for developing industrial processes of carbonylizing and hydrocarbonylizing methanol to obtain important products of organic synthesis.

Just the same, I am convinced that we will certainly arrive at greater methanol production.

[Question] On what do you base this belief?

[Answer] On an obvious fact--mankind cannot get along without an alternate energy source and alternate raw materials for organic synthesis. And the only serious alternative to oil and gas in the foreseeable future is coal.

Now the question is how to prepare for the use of coal. Two main directions are well known and widely discussed: 1) hydrogenization of coal, converting it into artificial oil, and then, using existing technology, to obtain energy sources and chemical products; 2) gasification of coal, resulting in the formation of synthesis gas (CO and H<sub>2</sub>), with subsequent synthesis of methanol, which can be used as an energy source and as raw material for organic synthesis. It is hard to say which of these directions will become the main route. That is not a question for this five-year period, or even this decade. So I can only speak of my own personal opinion. And that is as follows: gasification will win out, the schema of coal to synthesis gas to methanol. Why? Hydrogenization will inevitably entail difficult and ecologically unclean operations. Gasification is more technologically effective, more systematic, and cleaner. It is, I would say, more elegant. And using methanol to obtain other products means, all else aside, a sharp increase in excellent, economical, catalytic processes.

But industry--both domestic and foreign--is not yet ready for mass production of synthesis gas and methanol from coal, nor for industrial adoption of means of using methanol to obtain organic synthesis products. Above all, it is a scientific undertaking that is needed; moreover, it must involve not only sectors of industry but also academic institutes. Fundamental science can do a great deal in this direction. It is sufficient to mention, in this regard, catalysts based on high-silicic zeolites, which have found broad application

in the synthesis of organic products based on methanol. In addition, the industry of organic synthesis using methanol needs to develop and assimilate alloys based on tantalum, zirconium, and niobium, and also to assimilate the industrial production of chemical equipment made from these materials.

In short, rapid growth of the methanol tree requires an entire array of complex measures involving related ministries and departments and academic institutes, and so a special integrated program is necessary. In accordance with this program we should also be preparing to assimilate the most important technological schema of the future--coal to synthesis gas to methanol to the products of organic synthesis. I must be emphatic: the entire technical world is preparing for this.

[Question] Of what, in your opinion, should this preparation consist?

[Answer] I have already said that without the academic institutes, without metallurgists and machine builders, the problems cannot be resolved on the strengths of the chemical industry alone. But I will add that the chemical industry, in its turn, should expand the production of methanol as quickly as possible.

[Question] To return to our illustration, the point is to strengthen the roots of the methanol tree...

[Answer] Just so. By the year 2000 it will be necessary to increase the production of methanol by a factor greater than 10--for the time being, mainly on the basis of the traditional raw materials, of which, incidentally, we do have enough. Here the paths of development are well defined. First, the creation of energy-efficient aggregates with large unit capacity--up to a million tons per year. Second, the process of synthesizing methanol using highly-active and selective catalysts containing copper. Such catalysts are highly effective in processing raw carbon into methanol. We are starting up the first such production facility this year.

Millions of tons of methanol (or the equivalent amount of CO and H<sub>2</sub>) are needed to satisfy the needs of our agriculture. I mean the production of formic and acetic acid--effective feed preservatives--and also protein-vitamin concentrates which can be systematically obtained from methanol by microbiological synthesis.

When we can produce within a year, not two million, but tens of millions of tons of methanol, it will be possible to go beyond using it as raw material and on to the other branches of the tree--those which are already known as well as those which are only just being envisioned. For example, it is suggested that methanol be used as a means of transporting coal through pipelines. In present coal lines, a coal-water slurry is used (50 percent water, 50 percent coal). In a methanol slurry, there can be a greater amount of coal under certain conditions--up to 70 percent. But that is not the only advantage. It eliminates the need to drain the fuel, as methanol itself is a fine fuel. There is yet another advantage--methanol coal lines can be laid on the surface whereas water lines must be buried underground--water freezes in the winter.

According to the assessment of specialists from several firms, the specific outlays for transporting coal through methanol pipelines for distances up to thousands of kilometers amount in all to 35 percent of the expense of any other form of transport.

An even bigger consumer of methanol now is the industry of motor fuels. Methanol is used as an additive in gasoline and diesel fuel, and as raw material for obtaining synthetic gasoline and the effective high-octane additive methyl-tributyl ether. By the year 2000, the country's estimated requirement for methanol as a fuel source is 15 million tons.

[Question] Let's have some more details about this, if possible. In the press there are reports that in Brazil there are already hundreds of thousands of automobiles fueled by ethyl alcohol from plants. There are also reports about a methanol fuel which is being widely tested in the FRG. What are we doing in this line?

[Answer] The situation in Brazil is unique. An absence of domestic oil, a great deal of land, and inexpensive vegetative raw material, for example sugar cane. Hardly any other countries will be taking Brazil's path. But methanol is another matter. It can be added to motor fuel in amounts of up to 3-5 percent without affecting the operation of the engine or requiring special adjustment of motors. Adding methanol to gasoline lowers fuel consumption, decreases the output of carbon monoxide, and makes it possible to dispense with tetraethyl lead. Certain problems arise when the percentage of the additive in the gasoline reaches 12-15 percent. At low temperatures the fuel begins to separate, and new additives--stabilizers--are required.

Our country has organized the production of a gasoline-methanol mixture containing 15 percent methanol. This mixture is being tested in motor transport in Moscow, Gorkiy, Pskov, the Ukraine, Latvia, Azerbaijan, and Kazakhstan. On the whole it is successful. For example, in Mosstroytrans Auto Combine No 2, hundreds of trucks are running on the gasoline-methanol mixture. They have traveled hundreds of thousands of kilometers. True, in some truck-fleets there is talk that the methanol smells bad, that it would be better all around to get along without that poison--you never know--someone could drink it.

Methanol is poisonous--everyone knows that. But electricity in unskilled hands is no less dangerous, in fact more. Current can also kill. But we're not giving up electricity, we're too used to it. Widespread use of methanol requires preventive measures and health education. The experience of producing and using methanol in large quantities in the chemical industry proves that such measures can reduce the risk to nothing. Transportation workers need to get used to methanol too, to learn how to work with it. Clearly, the psychologically most painless way of introducing it in motor transport is to convert to testing a thousand automobiles running on a fuel mixture with a 15 percent methanol additive and hundreds of thousands of automobiles with a 3-5 percent additive. And this will also be preparation for converting to the new energy source--coal.

[Question] Discussing coal as an alternate energy source and alternate raw material for heavy organic synthesis inevitably leads to the problem of Siberian coal and the Kansk-Achinsk Field. What place does Siberian coal have in our plans for methanol?

[Answer] That is a very interesting and important problem. It is unprofitable to transport coal from the Kansk-Achinsk Field for a long distance. So there is no disadvantage to plans for processing it right there. For example, to burn it in boilers in thermal electric-power stations, then send the electricity thousands of kilometers to other regions of the country.

The methanol version of effective use of the Kansk-Achinsk coal includes several possibilities. I have already discussed one of these--the use of methanol as a transport medium for sending coal through pipelines. The economic indicators for pipeline transport using methanol obtained by chemically processing part of the coal at the site of extraction are sharply improving. For example, in the United States, transporting 5 million tons of coal a year through a pipeline extending 440 kilometers is cheaper than producing electricity in the vicinity of the coal mine and then sending it through electrical power lines.

Another possibility must be considered--to obtain gasoline through methanol from coal at the extraction site, using zeolites as conversion catalysts. Although at present gasoline from coal is one and a half to two times more expensive than gasoline from oil, we can predict that due to improved technology of gasification and the rising cost of oil fuel, the economic indicators of the two processes will be closer together by the end of this century.

It is technically worthwhile to process coal at the extraction site in order to obtain synthesis gas by steam-acid gasification in large-capacity gas generators. (There is an unquestionable ecological advantage to this method--no nitric oxides get out into the atmosphere, which is inevitable in using synthesis gas made from natural gas or gasoline.) The methanol obtained from this synthesis gas can be transported through pipelines, carried in tank cars and ordinary oil tankers, and stored in fuel tanks constructed from carbon steel.

Finally, methanol from coal can be used as an ecologically clean fuel for electric power stations, a source of reducing gases for the needs of metallurgy, and to obtain hydrogen and synthetic methane by simple techniques.

So, instead of the expensive transportation of solid fuel, it will be possible to transport methanol through pipelines to other regions of the country--like gas or oil. This will require thousand-kilometer methanol lines, which in time will replace gas and oil lines.

That's how it will be, if the methanol schema becomes the main direction of coal processing. And, I repeat, I am convinced that it will.

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HYDROPURIFICATION OF COAL LIQUEFACTION PRODUCTS IN THE PRESENCE OF  
ZEOLITE CATALYSTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 3-5

KRICHKO, A. A., MEGED', N. F., KHOR'KOVA, N. N., YULIN, M. K., GALKINA, A.A.,  
and MEZHLUMOVA, A. I., Institute of Fossil Fuels, Grozny Petroleum Institute

[Abstract] Low pressure hydrogenization of coal can produce liquid products which can be converted to fuels by methods used in oil refining--hydrocracking and reforming. Preliminary hydropurification is required because of the rigid requirements for sulfur and nitrogen content of raw materials for hydrocracking and reforming. Synthetic crystalline aluminosilicates called zeolites are promising catalysts. This article reports on the development of a group of NaY zeolite catalysts for hydrogenization enrichment of coal distillates. The catalysts were produced by the method of intermediate heating between ion exchange stages with solutions of ammonium or metal nitrates. Seventy-three to 97% removal of phenols is achieved by all zeolites tested. The possibility has been demonstrated in principle of hydro-purification of a broad 50 to 300°C fraction from products of liquefaction of coal in the presence of zeolite catalysts. References 11: 9 Russian, 2 Western.  
[327-6508]

## INFLUENCE OF INHIBITORS ON COMBUSTION OF POLYACRYLONITRILE MATERIALS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 9 Jun 80) pp 1107-1111

VILKOVA, S. A., PANOVA, L. G., VILKOV, V. A., ARTEMENKO, S. Ye. and  
VILESOVA, M. S., Saratov Polytechnical Institute; State Institute of Applied  
Chemistry

[Abstract] A study was made of the possibility of increasing the flame resistance of composite materials by introducing chlorine-containing polyacrylonitrile fibers based on copolymers of acrylonitrile with vinyl chloride--Kanekalon and Verel. These fibers are used in the production of artificial fur. The waste formed in finishing the fur, sectors 0.2 to 3 mm in length, make up as much as 24.5% of the raw material expended in the production of the fur and at present no useful application of this waste has been found. The comparative effectiveness of encapsulated DBPP [tris-(2,3-dibromylpropyl)-phosphate], introduced to the composition as a mixture with powdered binder and liquid DBPP introduced to the composition by spraying on the PAN fiber was studied. The insufficient effectiveness of DBPP as a combustion inhibitor of polyacrylonitrile composites requires additional introduction of chlorine-containing polyacrylonitrile fibers. When these fibers are used, DBPP is more effective in decreasing flammability of the composite materials, and its effectiveness depends on the content of chlorine in the composition, which increases with an increasing quantity of chlorine-containing fibers. Composites reinforced with chemical fibers are found to correspond quite effectively to a combustion inhibitor contained in the composition of the reinforcing fiber in comparison to additives introduced to the composite. This also provides a useful application for the fibers. Figures 5; references 7: 6 Russian, 1 Western.  
[318-6508]

## CONDUCTIVITY OF HETEROGENEOUS SOLID ELECTROLYTE-POLYMER STRUCTURES

Moscow ELEKTROKIMIYA in Russian Vol 19, No 6, Jun 83  
(manuscript received 10 Jun 82) pp 834-838

BUKUN, N. G., VAKULENKO, A. M. and UKSHE, A. Ye., Institute of New Chemical Problems, USSR Academy of Sciences, Moscow; Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] An experimental study is presented of the behavior of solid electrolyte-polymer mixtures in an alternating current. Studies were performed on  $\text{Ag}_4\text{RbI}_5$ -polyethylene with silver electrodes by heating the  $\text{Ag}_4\text{RbI}_5$  in argon at  $160^\circ\text{C}$  for 5 to 6 hours and careful mixing, after which it was screened through a  $40\ \mu\text{m}$  screen and mixed with polyethylene powder, preliminarily dried at  $90^\circ\text{C}$  and also screened. Mean powder particle diameter was about  $6\ \mu\text{m}$  for the electrolyte, about  $14\ \mu\text{m}$  for the polyethylene. The mixture of powders was pressed in a cylindrical organic glass mold at 250 MPa, then electrodes made of silver foil 99.99% pure pressed onto them under a spring pressure of about 100 MPa. Peaks of conductivity and capacitance were observed, resulting from boundary effects and related to the impedance of the metal/heterogeneous structure junction. The ac measurements agreed with previous measurements. The addition of polyethylene to  $\text{Ag}_4\text{RbI}_5$  was demonstrated to lead, under certain conditions, to accelerated relaxation of the binary layer, an increase in capacitance and acceleration of the silver charge ionization process. The effects observed are similar to known phenomena of extremal growth in conductivity of ordinary ionic crystals when mixed with dielectric materials. Figures 4; references 8: 2 Russian, 6 Western.  
[329-6508]

## FERTILIZERS

### PRODUCTION, APPLICATIONS OF LIQUID FERTILIZERS

Moscow KHIMIYA I ZHIZN' in Russian No 4, Apr 83 pp 44-45

[Report by KHIMIYA I ZHIZN' correspondent V. Batrakov on conversation with A. A. Novikov, general director of the Minudobreniya Scientific-Production Association: "Flowing Fertilizer"]

[Text] One of the most important tasks that the Food Program sets for chemists is the further increase in production of mineral fertilizers and raising their effectiveness and quality. In order to obtain plentiful, steady harvests, it is necessary to put into the soil everything which it will give to the plants, especially nitrogen, phosphorus, and potassium compounds.

In our country, creating new forms of phosphorus mineral fertilizers and developing and assimilating the technology to produce them is the business of workers in the Minudobreniya Scientific-Production Association, created in 1980 using the facilities of the Scientific-Research Institute of Fertilizers and Insecto-Fungicides imeni Ya. V. Samoylov [NIUIF]. Minudobreniya Scientific-Production Association General Director A. A. Novikov talked to KHIMIYA I ZHIZN' correspondent V. Batrakov about one of the new developments-- liquid mineral fertilizers.

Historically it has turned out that mineral supplements have always been used in the form of solid products--bulk or granular; only in hydroponic farms were plants given nutrients in solutions. But why shouldn't it be possible in the fields as well to use not solid nutrient mixes but solutions, except in highly concentrated form rather than diluted as in hydroponics?

Several years ago chemists suggested beginning production and use of liquid combined fertilizers--in brief ZhKu. At first, agricultural workers greeted this idea with some suspicion. But a very short time passed, and now facilities producing ZhKu sometimes cannot afford to stop for repairs, so great is the demand for this product.



Just what are ZhKus, and what is their advantage over ordinary mineral fertilizers? A liquid fertilizer, by the nature of the thing, is a concentrated water solution of ammonium phosphates. To prepare this solution, three components are needed: ammonia, 70 percent superphosphoric acid, and, of course, water; the result of the interaction of these substances, taken in fixed proportions, is a standard liquid fertilizer, containing 45 percent nutrients.

The maximum simplicity of this final stage of liquid fertilizer production makes it possible to locate production facilities in factories close to the consumer. Such facilities are already operating in the Baltic region, Krasnodar Kray, and the Ukraine. In addition, the composition of liquid fertilizers can be adjusted flexibly: they can be supplemented locally with the necessary proportions of potassium, trace elements, herbicides, and other needed additives--and the operation of the mixers--does not require a large staff of highly-qualified personnel. And since each soil and each agricultural crop needs highly individual supplementation, it is liquid fertilizers that make it possible to use nutrients with maximal effectiveness.

It is no accident that technologists would rather deal with liquids than solids. In working with liquids, all technological processes lend themselves easily to full mechanization and automation--all operations relating to transferring flowing material can be carried out by pumps, whose operation is not difficult to control. In the case of solids, it is impossible to get along without a shovel...

Liquid fertilizers are prepared from liquid components. And they are used as liquids, being sprayed on fields. It turns out that already-existing equipment, intended for putting ammonium hydroxide into the soil, can be used to do this; to speed up the field work, liquid fertilizers can be sprayed from airplanes as well. Belorussia and the Ukraine are now assimilating large-scale technology especially designed for work with liquid fertilizers.

At first, questions of corrosion were causing apprehension: wouldn't work with liquid fertilizers require tanks made from special metals and tubes from scarce plastics? As it turned out, however, these apprehensions were unfounded. Liquid fertilizers are completely neutral (they can even prevent corrosion), they can be freely transported and stored in any metal containers, and ordinary rubber hoses can be used to pump them. And of course, when liquid fertilizers are stored, nothing happens to them--they are always ready for use.

But do liquid fertilizers have any advantages beyond technical ones, are there any agricultural ones? Yes, many. As has already been stated, in liquid fertilizers it is very easy to maintain the necessary proportions of nutrients; furthermore, these substances can very easily be assimilated by plants. It is still early to calculate the final results, but here is a shining example: two years ago, in the fields in Krasnodar Kray where liquid fertilizers were being used, a normal harvest was obtained despite a severe drought.

Liquid fertilizers have also shown promise in the ecological sphere. Since the phosphate contained in them is in polymer form, it bonds with the soil and is not washed away by rains, polluting the reservoirs, as often happens, unfortunately, when solid mineral fertilizers are used.

The volume of ZhKu now produced in our country is not more than 2-3 percent of the entire output of chemical fertilizers. In the near future, it appears that this fraction will rise to 10-12 percent.

If liquid fertilizers promise such benefits to agriculture, why is their production growing relatively slowly?

The main reason is that agriculture is still simply not ready to use ZhKu instead of the customary solid mineral fertilizers. The necessary tanks for storing ZhKu are lacking, as well as the mechanisms for putting it into the soil. There are also other reasons impeding rapid conversion to ZhKu in all places.

The factories which produce fertilizers work all year round. But the fertilizers are used and hauled directly to the fields only during definite time periods, often quite brief. Naturally, the shorter the period when the fertilizer can be used, the greater the amount of the product that has to be stored, and the more packing required (if it is solid mineral fertilizer) or tanks (if it is ZhKu). That is why, whereas solid mineral fertilizers can be transported to the fields almost year round, liquid fertilizers can be brought in for no more than two months a year, chiefly in the spring and fall. Consequently, there is a severe gap between the steady output of the product and the seasonality of its use.

Liquid fertilizers cannot be transported great distances--this is counter-productive, because why transport water? That is one of the reasons why facilities producing ZhKu should be built near the farms which will be using it; for example, calculation shows that a facility producing ZhKu can profitably serve an agricultural area in a radius of 400 kilometers. Transporting liquid ammonia and superphosphoric acid is not as bad, because these substances contain nitrogen and phosphorus in the most concentrated form. And that simply is the limit of economically feasible distances.

A perfectly natural solution suggests itself: produce the ammonia and superphosphoric acid on location as well. But this is impossible. While there is sufficient raw material for producing ammonia in any region of the country, the territorial distribution of phosphorite deposits is extremely inconvenient, and their quality is such that phosphoric acid of the necessary concentration cannot always be made from them...

Staff members of NIUIF were assigned the task of developing a way to obtain domestic superphosphoric acid and liquid fertilizers based on it. This task was successfully resolved, and this spring the first superphosphoric acid production facility began work. In the future, plans call for developing the production of ZhKu using acid with a concentration of 63 percent, which will have an economic effect of about two million rubles a year per production

facility. So in the near future we will provide agriculture in the European part of our country with a sufficient quantity of liquid fertilizers.

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CSO: 1841/305

## IMPROVEMENT OF OPERATION OF AZOT INDUSTRIAL ASSOCIATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Jun 83 p 2

[Article by V. Semenov, head of department of metallurgical and chemical industry of Tula CPSU Obkom in column "SOTSIALISTICHESKAYA INDUSTRIYA 'Mail Boxes' Follow-up": "Leaders not Pushers"]

[Text] One year ago the editors of SOTSIALISTICHESKAYA INDUSTRIYA together with Tula CPSU Obkom organized a meeting of the workers of Novomoskovsk Azot Industrial Association with the responsible officials of the ministries, departments, the oblast and the city. The day before, that paper received and analyzed 400 letters and comments that were collected by its "mail box" from workers of this largest chemical enterprise.

At the time the meeting took place the leader in the chemical fertilizer industry, Novomoskovsk Azot, noticeably moved back from its leading position and according to some production indicators even turned out to be among the lagging. That was why the conversation about the use of internal reserves, which the paper started, basing itself on the wide opinion of workers, was accepted as the beginning of a big organizational work to strengthen work and state discipline at all levels.

And here are the concrete results. In the first quarter of this year for the first time in the last five years Novomoskovsk Azot became a winner of All-Union socialist competition. The association increased production output by 8% as compared to the corresponding period of the last year. For the first time all main products were awarded the state Emblem of Quality certificate. More than three million rubles of profit were produced. And all this was achieved without introducing any additional production capacity, through better use of raw materials, energy and supplies. Also, such a thing as plan correction was completely eliminated.

It could be said quite definitely: the "mail box" of SOTSIALISTICHESKAYA INDUSTRIYA has worked quite well for the lagging enterprise. Many acute conflicts have been settled; difficult production and social questions are solved better and faster; there is a strengthened connection between the ministries, the Central Committee of the industrial trade union and the association.

No special conditions were created by the industry headquarters for the operational activity of Novomoskovsk Azot. It was done without "tolkach's" (pushers). The efficient organization of operations to eliminate the uncovered shortcomings and the increased responsibility for the execution of accepted resolutions was brought to the foreground in the subsequent work.

Here is a concrete example. In the paper's mail there were several dozens of letters about breaches in delivery schedule and unsatisfactory work of the railroad. Specific reproaches were caused by non-punctual marshalling and (poor) technical condition of the mineral carrier cars. This is a most modern and highly productive technological transport, but the mineral carriers were used inefficiently. Many enterprises, without taking into account the interests of the whole industry, "strangled" by one another. There also was no proper control over the car marshalling schedule on the railroad.

Reporting to the ministry about upsetting of the fertilizer delivery plans, the enterprises requested increasing the number of the mineral carriers. The same suggestions were received by the editors "mail box" from Novomoskovsk Azot workers. They forced the heads of the industry and the chemical enterprises to rise above this concrete fact of mismanagement and to see the whole thing. First of all, the ones guilty of delivery schedule violations were revealed and severely punished. After the paper spoke out, Novomoskovsk Azot worked out a program of measures for the proper use of mineral carriers. On its initiative, with support from the ministry, an agreement based on efficiently elaborated standards was concluded between the related enterprises and the railroad. The mineral carrier problem is now completely eliminated from the agenda. And not a single additional car was required for that. Furthermore, the question was solved not only for a single enterprise but for the whole industry. This, especially-favorably, brought about fulfillment of the export delivery plan and quality of export carbamide.

Analyzing the Novomoskovsk mail the editors also did not pass over such a question--left unsolved for years--as lagging of production logistics at the Azot association. In our opinion, here the paper came across a large problem of national economic significance. In recent years a lot has been said about unsatisfactory work of the railroad transport. But often the roots of the deficiencies have to be looked for directly at the industrial enterprises, in the technical state of their warehouse, repair and rail equipment. Reconstruction of Azot association was half done some time ago. The main production capacities were developing much faster than auxiliary services which have become unable to provide for the increased production volume.

Chief engineer of the North and West Railroad Construction Main Administration of Mintransstroy (Ministry of Transportation Construction) O. Nartsissov and chief administrator of "Mostransstroy" (Moscow Transportation Construction) trust S. Kolokol'tsev were present at the meeting with the workers of Novomoskovsk Azot. They assured the chemical workers that they would undertake concrete measures to improve work of the construction train No 252 engaged in reconstruction of the Azot's auxiliary services. The promise was not broken. The personnel collective of the transportation construction workers received additional staff during the last year, its management and

party organization were strengthened. On their side, Novomoskovsk CPSU Gorkom and Ispolkom of the city soviet undertook serious measures to improve the work and living conditions of the construction workers; additional living space was allocated. All this affected the association reconstruction work accomplishment volume. True, there still is lagging behind the plan targets of the auxiliary services construction. But now, good prerequisites are created on these sites to reach the planned work schedule before the end of the year.

The SOTSIALISTICHESKAYA INDUSTRIYA "mail box" received many comments and suggestions on improvement of the work safety and the health protection, on the environmental protection of the city of Novomoskovsk. These suggestions were taken into consideration during the drafting of the collective agreement at the enterprise; putting them into effect is under special control of the ministry, the Central Committee of the industry trade union and the Ispolkom of the city soviet. The program of work safety and environment developed by the enterprise management actually has become a new stage of the reconstruction. During the past year five obsolete and technically-imperfect production operations within the association were closed down.

We notice with special satisfaction the fact that the Ministry of Chemical Fertilizer Industry allocated all necessary material resources to completely demolish the substandard housing, and also the residential buildings that, because of the enterprise development, are now in the sanitary protection zone. This year more than 17,000 square meters of housing should be introduced for the enterprise workers. This is a big addition to the housing available at the association. But for the party not to be postponed to a later date, the collective of the association must provide help to the city construction workers and to contract the finishing work at the housing construction sites. The enterprise also develops construction by using its own resources. This year, tenants will move into a section of the 60-apartment building which is being erected together with the construction-installation train No 252.

During the past period of time a program of further development of the association's subsidiary farms also has been clearly defined. Land was allocated. A pig farm where 250 piglets are raised was built; a 1,100 pig farm construction was started. Collection of food waste was organized. A large capacity unit, first in the oblast, for production of vitamin-fortified hay flour was built. And now neither lawn grass nor weeds are wasted.

Among the questions asked at the meeting in the paper's "mail box" were also such that did not get a positive answer. They were related to benefit pays and increases, to bonus pay, to specifics of chemical workers pensions.

All requests were closely scrutinized by qualified consultants. To each an answer was given. In the majority of cases people requested establishment of additional pay and benefits not provided for by statutes and regulations. This was publicly explained to the authors of the letters. The explanations were correctly understood. And it is important to note the following. An efficient, qualified answer put an end to a stream of complaints, to all kinds of misunderstandings and grievances. On the whole, as the analysis has shown,

complaints, from blue and white collar workers of this many-thousand collective, to central authorities about social, legal and production questions have also stopped. Work mood, practical approach and moral climate in the work collective itself have noticeably improved.

Also such a phenomena has been noticed: a lot of letters from collectives of other Novomoskovsk enterprises with a reference to SOTSIALISTICHESKAYA INDUSTRIYA "mail box" started coming to the party committees of the oblast and city. This tells us that the work with the letters and complaints of workers at the Azot association during the last year became an attractive example for other labor collectives. And we will widely use this experience in the future because, as was underlined at the June Plenum of CPSU Central Committee, such methods of work with people raise interest to propaganda, allow carrying on a confidential dialog with the audience and assist in increasing the labor activity of masses.

12422

CSO: 1841/307

## QUALITY IMPROVEMENT IN FERTILIZER PRODUCTION

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 83 p 4

[Article by N. Manuylov, Kemerovo: "Competition of Chemists"]

[Text] Not so long ago in one of the production subsections of the Kemerovo Nitrogen Association the following situation occurred. There was a flow of complaints from shredder workers and some other consumers about two forms of production.

One could have discarded the unsatisfactory products of the technological line which had been built (errors were still tolerated in the project). However, this would have led to virtual shutdown of production.

The chemists did not wish to settle for such a position. "How can it be? One can't leave 200 consumers without raw material." This problem was examined anxiously at the workers' meetings and at deliberations of specialists and efficiency experts. Thus by united effort it was possible to overcome the difficulties rapidly and to find a method to liquidate the defective goods. The flow of good quality chemical products was improved and now they are closer to a higher category of quality.

In the current year the association collective is competing under the motto "A million tons of mineral fertilizers ahead of time." The reaching of this goal is accompanied by an improvement in quality.

Now the caprolactam production workers are leading. They give nine-tenths of all production put out by the association, with the pentagon of honor. Under conditions of uninterrupted growth of production volume, the restoration of existing and the introduction of new capacities, 71 percent of the mineral fertilizers and other production bears the State Emblem of Quality.

But today it is stated that in the association collective that the level achieved is far from the limit. Decisions of the June 1983 Plenum of the CPSU Central Committee require further mobilization of reserves.

Extension of the experience of the leading brigades, shifts and uchastoks is being strengthened. The leaders include the first shift of the lactam-2 plant, where V. Konenko is Party Group Organizer. The educational work and



professional preparation here is subject to the rule: know positively the particulars of the work not only in one's own workplace, but also at one's neighbors' and strictly observe technological discipline in the production routine. And, it is no coincidence that the shift is putting out 95 percent of its production with the highest category.

The methods for organizing the campaign for quality are being adopted in three production subsections which have not yet left the field of mastering technology, formation of a collective. For example, in shop No 13, by overcoming the difficulties of the starting period is improving the quality of the ammonium nitrate.

In a word, in the Association, there is someone to compare to. In factories it has become the rule to analyze quality characteristics daily. "Quality days" are spent in a business-like way.

12410

CSO: 1841/332

VOSKRESENSK FERTILIZER PRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Jul 83 p 1

[Article: "First According to the Collective Plan"]

[Text] The Voskresensk Mineral Fertilizer Association Collective, the largest supplier of "fertilizer vitamins" for agriculture, is entering the second half of the five-year plan without lowering their work tempo. Socialist commitments are clearly being fulfilled; the production is being shipped to agricultural workers at an accelerated schedule.

Labor productivity is growing steadily and product quality is improved. Since the beginning of the five-year plan the very high quality production volume has risen 2 percent and has now reached 54.2 percent. This is one of the best indexes in the industrial sector.

The chemists know how to use raw materials and other materials, fuel and electrical energy: every third ton of above-plan mineral fertilizers is manufactured from economized resources. Production wastes also enter into the work. Thus, the production complex is showing a profit on its output of structural components made from phosphogypsum, a material which for many years accumulated in dumps.

12410

CSO: 1841/332

NOVO-SOLIKAMSK FERTILIZER PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Jul 83 p 2

[Article by V. Ukolov, Perm Oblast: "Happy Birthday, Plant"]

[Text] Under a friendly "Hurrah" the first mineral fertilizer granules lay on the conveyer belt of the Novo-Solikamsk potassium plant. Finishing work is still going on, and construction workers and operators are more expensive by the working minutes. It is understandable how the first batch of finished production filled them with enthusiasm.

The production brigade of B. Golubev won the honor of obtaining the first tons of ore. Boris Vasil'evich and his coworkers did this masterfully, in a rapid production routine. At the enriching factory, personnel of the shift of V. Avdyukov and S. Yakush brought the cycle to the end. The light pink powder which they obtained is the fertilizer salt. The first order of priority is 374,000 tons of fertilizer per year, the delivery date for which is set for September, and this will double the annual production volume.

12410

CSO: 1841/332

SULFURIC ACID FOR FERTILIZERS PRODUCED AT ORDZHONIKIDZE

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 83 p 3

[Text] A sulfuric acid complex constructed at the Electrozinc plant in Ordzhonikidze has been developed at a rated capacity. Annually, 220,000 tons of raw material for production of complex mineral fertilizers will be manufactured here.

12410

CSO: 1841/332

CARBAMIDE-ZINC SULFATE FERTILIZER

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jul 83 p 2

[Article by P. Laptev, Dushanbe: "New Fertilizer"]

[Text] The personnel at the Vakhsh nitrogen fertilizer plant has started industrial output of a new fertilizer.

The "fertilizer vitamin" is a combined fertilizer-carbamide with an additive of zinc sulfate. Before the new product was approved it was used on the fields of Kurgan-Tyubin oblast, where it was highly effective in the cultivation of fine-fibered varieties of cotton. Addition of trace quantities of zinc sulfate raises the heat-resistance of the crop and inhibits mass falling off of buds and flowers during a hot period, which ordinarily leads to a lowering of the yield. Now, however, on the contrary, there is an increase of up to 100 kg of cotton per hectare.

The manufacturing technology was developed by the plant collective in collaboration with scientists of the Tajik Agricultural Research Institute.

12410

CSO: 1841/332

FOOD TECHNOLOGY

YEFREMOV GLUCOSE PLANT BEGINS PRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jul 83 p 2

[Article by E. Mokhorov, Yefremov, Tula Oblast: "First Production"]

[Text] The Yefremov glucose-molasses combine has begun its first production. With the output at the projected capacity of this large-scale enterprise, glucose production in our country will increase by a factor of 1.5.

In addition to glucose 3500 tons of corn oil will be produced annually as well as valuable feeds for animal husbandry.

12410

CSO: 1841/332

INORGANIC COMPOUNDS

UDC 546.791.185

URANIUM PHOSPHATES

Moscow USPEKHI KHIMII in Russian Vol 52, No 6, Jun 83 pp 897-921

KOBETS, L. V. and UMREYKO, D. S., Scientific Research Institute of Applied Physical Problems imeni A. N. Sevchenko, Minsk

[Abstract] This review of the Soviet and western literature attempts to systematize the available data on uranium phosphates. The intention is to present a more complete picture than earlier works on the same subject. Both uranium orthophosphates and condensed phosphates of uranyl and uranium (IV) are discussed. Methods of production, stability in solution and in solid phase and composition are analyzed. The problem of polymerization of the phosphate anion in the process of thermal decomposition is discussed. The study of thermal decomposition shows that the behavior of the compounds in these processes is determined by their structure, method of bonding of the phosphate anion to the water molecule. When mobile water molecules and protons are present in uranium phosphates, complications are observed in the processes of decomposition, such as polymerization of the phosphate anion, liberation of  $H_3PO_4$  and others. Figures 2; references 199: 80 Russian, 119 Western.

[323-6508]

KINETIC CHARACTERISTICS OF TYPE MA-41 ANION EXCHANGE MEMBRANES

Moscow ELEKTROKIMIYA in Russian Vol 19, No 6, Jun 83  
(manuscript received 9 Apr 82) pp 826-828

SHAPOSHNIK, V. A., DROBYSHEVA, I. V. and KOTOV, V. V., Voronezh Agricultural  
Institute imeni K. D. Glinka

[Abstract] A contact difference method was used to study membranes with various concentrations of equilibrium solution in various ionic forms. Measurements were performed so that the electrodes and membrane were immersed in a cylinder with an equilibrium solution connected to an ultrathermostat. Equivalent conductivities were calculated as the ratio of specific conductivities to volumetric capacities of the membranes in the corresponding ionic forms. Equivalent conductivities were measured in the 20 to 40°C temperature interval and used to calculate the activation energy. The MA-41 anion exchange membrane, containing 65% highly basic anion exchange agent AV-17, has a number of advantages over previously used types of membranes for desalination of natural water containing anions of weak acids. The kinetic characteristics of the membrane was presented for a number of anions in tabular form. A graph shows the variation of equivalent conductivity as a function of equilibrium concentration in solutions of the sodium salts of formic, acetic, propionic, butyric, capric and oxalic acids. Figure 1; references 6: 5 Russian, 1 Western. [329-6508]



NITROGEN COMPOUNDS

UDC 538.27+541.123.52+547.128+546.55

REACTIONS OF HYDROPEROXIDES WITH AMINES AND AMINO ALCOHOLS IN AQUEOUS SOLUTIONS IN PRESENCE AND ABSENCE OF METAL IONS

Moscow USPEKHI KHIMII in Russian Vol 52, No 6, Jun 83 pp 936-952

GRIGORYAN, S. K., Yerevan State University, Department of Chemistry

[Abstract] This review examines the kinetics and reaction mechanisms of cumene and tert-butyl hydroperoxides with amines with and without  $M^{2+}$  ions present in aqueous solutions. Studies were undertaken to determine the mechanism of decomposition of hydroperoxides in aqueous media; to select amino compounds and their complexes for the performance of reactions with assigned direction and products; to select the necessary systems consisting of amines with  $M^{2+}$  complexes for use as adhesive latex and rubber stabilizers. The results produced also allow an explanation of the positive effect of copper and cobalt cations and monoethanol amine on the organisms of animals and man. Intermolecular interactions were studied in the hydroperoxide-amine systems and hydroperoxide-amine- $M^{2+}$  systems in aqueous media. The kinetic regularities of the reactions are discussed, as are the reaction mechanisms. References 57: 48 Russian, 9 Western.  
[323-6508]

UDC 547.491.6.26'118

INTERACTION OF CYANOPHOSPHINES WITH ALDEHYDES AND KETONES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 16 Jun 82) pp 1211-1213

PUDOVIK, A. N., ROMANOV, G. V. and NAZMUTDINOVA, V. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] The interaction of dialkylcyanophosphites with carbonyl compounds yields  $\alpha$ -cyanoalkylphosphites. The introduction of 2 and 3 electron-acceptor cyano groups to the phosphorus atom greatly increases the speed of the reaction. This article presents a study of the influence of alkyl and aryl substituents at the phosphorus atom on the reactivity of the cyanides. Introduction of catalytic quantities of triethylamine allows the reactions of diethyl-, ethylphenyl-, and diphenylcyanophosphines with acetaldehyde, benzaldehyde, isobutyric aldehyde and acetone to occur at room temperature, yielding tertiary  $\alpha$ -cyanoalkylphosphine oxides. The NMR and IR spectra are described. The spectra indicate that intermediate compounds are formed corresponding to phosphinites. References 5: 4 Russian, 1 Western.  
[325-6508]

UDC 547.26'118

REACTION OF PHOSPHORUS DITHIOACIDS AND SilyLDITHIOPHOSPHATES WITH PHOSPHORUS-CONTAINING ISOCYANATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 13 Jul 82) pp 1213-1219

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

[Abstract] The interaction of S-trimethylsilyldithiophosphates with compounds containing a carbonyl group differs significantly from similar reactions with phosphorus dithioacids. The attachment of O,O-dialkyl-S-trimethylsilyldithiophosphates to alkylisocyanates leads as a result of S $\rightarrow$ N migration of the thiophosphoryl group to phosphorylated silylthiocarbamates. The reaction with aromatic heterocumulenes forms products with 2:1 composition. The presence of

the trichloroacetyl substituent at the isocyanate stabilizes the dithiophosphate structure of the adduct. Silyl esters of cyclic dithioacids of phosphorus react with isocyanates by the O,S exchange path. This present work studies reactions of phosphorus dithioacids and silyldithiophosphates with isocyanates containing heteroorganic groups. The dithiophosphoric acids easily split the Si-N bond of trimethylsilylisocyanate and as a result of O,S exchange, form O,O-dialkyl-S-thiocarbonyldithiophosphate and the silyl ester of thiophosphoric acid. In contrast to silyldithiophosphates, the interaction of dithioacids of phosphorus with isocyanatophosphites involves both electrophilic heteroocumulene centers: the carbon of the isocyanate group and the phosphorus atom. The differences in the chemical behavior of systems with S-Si and S-H bonds is clearly manifested in reactions of isocyanatophosphites with phenylsilylsulfide and thiophenol. Replacement of cyclic substituents at the phosphorus atom of isocyanatophosphites by an alkoxy group significantly complicates the nature of their interaction with dithiophosphates. Isocyanates of four coordination phosphorus acids do not react with O,O-dialkyl-S-trimethylsilyldithiophosphates, even at 90-100°C. Dithiophosphoric acids energetically attach to isocyanatophosphates, but the reaction is an equilibrium 1. The electron acceptor phosphono group in the isocyanate, like acyl substituents, thus destabilizes the products of attachment of dithioacids of phosphorus and silyldithiophosphates to heteroocumulene, leaving only the O,S exchange reaction thermodynamically favored. References 8 (Russian).  
[325-6508]

UDC 547.26'118

REACTIONS OF PHOSPHORUS CONTAINING TRI- AND TETRASULFIDES: INTERACTION OF BIS(DIALKOXYPHOSPHORYL- AND THIOPHOSPHORYL)TRI- AND TETRASULFIDES WITH DIAZOACETIC ESTER

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 23 Jun 82) pp 1219-1222

KHASKIN, B. A., TOLMACHEVA, N. A. and KOROLEVA, T. I., All-Union Scientific Research Institute of Chemical Means of Plant Protection, Moscow

[Abstract] Continuing works on the study of the reaction of phosphoric polysulfides with diazo compounds, a study was made of the interaction of bis(dialkoxyphosphoryl- and thiophosphoryl)tri- and tetrasulfides with diazoacetic ester. It is shown that with an equimolar relationship of the components, 1-ethoxycarbonylmethylene group is introduced to the P-S bond of the tri- and tetrasulfides. With an excess of diazoacetic ester, products of simultaneous desulfuration and introduction of ethoxycarbonylmethylene group at the P-S and S-S bond of bis(dialkoxyphosphoryl- and thiophosphoryl)polysulfides occur. The reaction is performed with oiling in a medium of absolute benzene or with no solvent at 90 to 100°C in the presence of catalytic quantities of copper powder. The structure of the compounds was confirmed by IR and PMR spectroscopy. References: 5 (Russian).  
[325-6508]

CARBOIMIDOPHOSPHENES--COMPOUNDS CONTAINING TWO-COORDINATION PHOSPHORUS  
ATOM IN A HETEROCUMULENE SYSTEM

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 8 Jul 82) pp 1226-1233

KOLODYAZHNYI, O. I., Institute of Organic Chemistry, Ukrainian SSR Academy  
of Sciences, Kiev

[Abstract] A two-coordination phosphorus atom was introduced to a hetero-  
cumulene system for the first time, producing compounds which are called  
carboimidophosphenes (I) by analogy with carbodiimides. Among the compounds  
synthesized, the most stable is di-tert-butylcarboimidophosphene, a mobile  
yellow fluid which is easily oxidized in air. It is readily distilled in a  
vacuum and can be stored at room temperature. The stability of the carboimido-  
phosphenes is determined by steric factors, the presence of the voluminous  
tert-butyl group at the phosphorus atom being important. Di-tert-butylcarbo-  
imidophosphene attaches butylamine at the P=C bond and enters into [2+2]cyclo-  
attachment reactions with isocyanates, diphenylcarbodiimide and diphenyl-  
ketenes. References 17: 3 Russian, 14 Western.  
[325-6508]

DEHYDROCHLORINATION OF TERT-BUTYLFLUORENYLCHLOROPHOSPHINE: TERT-BUTYL-  
FLUORENYLIDENE PHOSPHENE DIMERS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 15 Jun 82) pp 1233-1237

KOLODYAZHNYI, O. I., SHEVCHENKO, I. V., KUKHAR', V. P., CHERNEGA, A. N.,  
BOLDESKUL, I. Ye., ANTIPIN, M. Yu. and STRUCHKOV, Yu. T., Institute of  
Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Dehydrochlorination of alkylchlorophosphines synthesizes  
phosphenes  $RP=CR_2$ . This article studies the behavior of tert-butyl-  
fluorenylchlorophosphine when exposed to various bases--lithium hexamethyl-  
disilazane, triethylamine and diazabicycloundecene. Chlorophosphine (I) is  
easily dehydrochlorinated upon exposure to lithium hexamethyldisilazane or  
even triethylamine. The main product of the reaction of lithium hexamethyl-  
disilazane with chlorophosphine (I) in tetrahydrofuran is 1,2-diphosphetidine  
(III) formed as a result of dimerization of tert-butylfluorenylidene phosphene  
(II). Phosphene itself is unstable and easily dimerized under the reaction con-  
ditions. The interaction of lithium tert-butyltrimethylsilylphosphide (IV)  
with fluorenone occurs similarly, confirming the possibility of forming (III)  
from (II). Dehydrochlorination of (I) is studied. References 5: 1 Russian,  
4 Western.  
[325-6508]

## FREE RADICAL REACTIONS OF DIALKYLPHOSPHONOACETALS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 23 Jun 82) pp 1238-1242

ROL'NIK, L. Z., PASTUSHENKO, Ye. V., LIVANTSOV, M. V., PROSKURNINA, M. V.,  
ZLOTSKIY, S. S. and RAKHMANKULOV, D. L., Ufa Petroleum Institute, Moscow  
State University imeni M. V. Lomonosov

[Abstract] A study is made of free-radical isomerization of linear and cyclical dialkylphosphonoacetals. When the acetals are heated with tert-butyl peroxide to 140°C, reaction time 3 hours, molar ratio 10:1, the conversion is 36 to 46%, selectivity formation of esters 74 to 84%. Bromination of the linear phosphonates with N-bromosuccinimide occurs smoothly with heating, yield 80-85% of the corresponding dialkylalkoxycarbonylphosphonates and bromoalkanes. The free radical reactions of linear and cyclic phosphonoacetals with polyhalogen alkanes or N-halogen succinimide are thus convenient methods of synthesizing alkoxycarbonylphosphonates. References 9 (Russian).  
[325-6508]

UDC 547.241'298

## INTERACTION OF ISOCYANATODIPHENYLPHOSPHINITE WITH AROMATIC ALDEHYDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 6 Jul 82) pp 1249-1254

TARASOVA, R. I., DVOYNISHNIKOVA, T. A., ZYKOVA, T. V., ALPAROVA, M. V. and  
SHCHEDRINA, L. N., Kazan Institute of Chemical Technology imeni S. M. Kirov

[Abstract] The interaction of isocyanatodiphenylphosphites with aldehydes in the presence of proton-donor reagents leads to the formation of C-phosphorylated carbamates. Continuing earlier studies on the subject, the authors investigated the behavior of more nucleophilic isocyanatodiphenylphosphinite in reaction with aromatic aldehydes. The isocyanate (I) reacted with benzaldehyde similarly to isocyanatodiethylphosphite when water was absent, yielding 1,3-cycloadduct (II), [2-phenyl-3-diphenyl-5-oxo-1,4,3-oxazaphosphol-3-ine], a crystalline product difficultly soluble in tetrachloroethane and insoluble in most other organic solvents. The reaction product undergoes reversible decomposition to the initial reagents in solution. Neutral hydrolysis of 1,4,3-oxazaphospholines leads to C-(diphenylphosphinyl, aryl)methylcarbamates. References 7: 5 Russian, 2 Western.  
[325-6508]

## INTERACTION OF TRIVALENT-PHOSPHORUS ACID MONOISOCYANATES WITH UNSUBSTITUTED ACETIC AND HALOGEN-ACETIC ALDEHYDES

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 9 Nov 82) pp 1254-1257

TARASOVA, R. I., DVOYNISHNIKOVA, T. A., SINITSYNA, N. I., ZKOVA, T. V.  
and ALPAROVA, M. V., Kazan Institute of Chemical Technology imeni S. M. Kirov

[Abstract] The reaction of 1,3-cycloaddition with the participation of phosphorus-containing reagents allows synthesis of new heterocyclic systems and their derivatives. Continuing earlier studies, the authors investigate the interaction of dialkylphosphorous and diphenylphosphinous acid isocyanates with monochloro-, trichloro- and unsubstituted acetic aldehydes. These reactions occur with the formation of 1,3-cycloadducts (I). Interaction of isocyanatodiethylphosphite with chloral at 0°C in a dry atmosphere forms 2-trichloromethyl-3,3-diethoxy-5-oxo-1,4,3-oxazaphosphol-3-ine with a yield of 60%. Similar 1,3-cycloadducts are also liberated from the reaction of isocyanates of other phosphorous acids with chloral. It is shown that 1,4,3-oxazaphospholines are thermally and hydrolytically unstable. The neutral hydrolysis of 1,4,3-oxazaphospholines forms C-(dialkoxyphosphone, alkyl)methyl-carbamates. References 4 (Russian).  
[325-6508]

## SULFOPRENYLATION OF TRIBUTYL-, TRIPHENYLPHOSPHINES AND TRIPHENYLARSINE AT HIGH PRESSURES

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 27 Sep 82) pp 1260-1261

MOISEYLENKOV, A. M., ZAKS, I. M. and EL'YANOV, B. S., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] A study is made of sulfoprenylation (by sultone) of certain derivatives of phosphorus and arsenic, smoothly occurring at 5-14 kbar pressure forming the corresponding sulfobetaines (III). Long holding of equimolar mixtures of sultone and the most nucleophilic of the P and As derivatives, viz., tributylphosphine for 3 months at about 25°C yields sulfobetaine with a yield of not over 5%. The thermolability of sultone (I) indicated that the reaction could be accelerated by the use of high pressure. At 5 kbar in 6 hours at 60°C the yield of sulfobetaine increases up to 77%, and at 14 kbar it becomes practically quantitative. References 3: 2 Russian, 1 Western.  
[325-6508]

PHOSPHORYLATION OF METHYLENEQUINONES, PART 3: INTERACTION OF 2,6-DI-TERT-BUTYL-4-CYANOMETHYLIDENE-2,5-CYCLOHEXADIENE-1-ONE WITH TRIALKYLPHOSPHITES AND TRIPHENYLPHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 27 Sep 82) pp 1265-1268

KOLESNIKOV, V. T., KOPEL'TSEV, Yu. A., KUDRYAVTSEV, A. A. and SHERMOLOVICH, Yu. G., Lvov Polytechnical Institute imeni Lenin Komsomol

[Abstract] Phosphorylation of p-quinoid systems by trivalent phosphorus derivatives, in most cases, follows 1,6-attachment with initial formation of betaines, further transformation of which is determined by the substituent at the phosphorus atom, and, in the case of methylene quinones, by the substituents at the carbon atom of the methylene group as well. In a study of the reaction of 2,6-di-tert-butyl-4-ethylidene-2,5-cyclohexadiene-1-one (I) with trialkylphosphites it was assumed that stabilization of the betaine (II) formed occurs by migration of hydrogen from the carbon atom of the methylene group to the oxygen. The phosphonium ilide (III) formed, containing a phenylol substituent at the carbanion center, is unstable and undergoes regrouping to phosphonate (IV) under the experimental conditions. Phosphorylation of 2,6-di-tert-butylphenols containing the ilide phosphorus atom has not been previously known. The presence of a nitrile group significantly facilitates occurrence of the interaction of 2,6-di-tert-butyl-4-cyanomethylidene-2,5-cyclohexadiene-1-one with trivalent phosphorus derivatives. References 5 (Russian). [325-6508]

PHOSPHORUS-CONTAINING DERIVATIVES OF DIENE-DIOL FORM OF ACETYLACETONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 28 Apr 82) pp 1274-1281

MUKHAMEDOV, F. S., STEPASHKINA, L. V., deceased, KORSHIN, E. Ye., SHAGIDULLIN, R. R. and RIZPOLOZHENSKIY, N. I., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] There was interest in synthesizing phosphorus-containing molecules in which the C=O group of the ketoalcohol group occupied a spatially similar position to the phosphorus position. It was expected that with certain substituents at the phosphorus atom the intramolecular interaction would lead to the formation of cyclic molecules. Acetylacetone was reacted with certain tri- and pentavalent phosphorus acid chlorides in the presence of triethylamine. The experiments showed that when alkylphosphorous, dialkylamidophosphorous, alkylphosphonous, alkylphosphoric, alkylphosphonic and alkylthiophosphonic acid dichlorides were used, the substances yielded, according to elemental

analysis and the integral intensity of peaks in PMR spectra, did not contain any chlorine atoms and had only one acetylacetonate group. These data allow the end products of the interactions to be assigned the structure of two-substituted 4-methylene-6-methyl-1,3,2-dioxaphosphorine-5-ene--phosphorus containing derivatives of diene-diol form of acetylacetonate. Figures 4; references 15: 12 Russian, 3 Western.  
[325-6508]

UDC 547.241

#### INTERACTION OF $\alpha$ -AMINOALKYLPHOSPHONATES WITH ORTHO ETHER

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 27 Sep 82) pp 1281-1285

PROKOF'YEVA, A. F., ALESHNIKOVA, T. V., NEGREBETSKIY, V. V. and MEL'NIKOV, N.N.  
All-Union Scientific Research Institute of Chemical Means of Plant Protection,  
Moscow

[Abstract] This article deals with a previously-unstudied reaction of  $\alpha$ -aminoalkylphosphonates with ortho ether. When ortho esters interact with substances containing an amino group, depending on the reaction conditions, structure and relationship of components, various products are produced. Acid catalysts are usually used. The interaction of  $\alpha$ -aminoalkylphosphonates (I) with ethylorthoformate was performed in a four-times-excess of ethylorthoformate over a period of several hours at a bath temperature of about 230°C with distillation of the excess ortho ether and alcohol formed. P-toluene sulfochloride was used as the catalyst. The result of the reaction was products of formylation at the nitrogen atom. The structure of the O,O-diethyl- $\alpha$ -(formylamido)-alkylphosphonates formed (II) was confirmed by elemental analysis, NMR and IR spectroscopy. The use of boron trifluoride as a catalyst allows the production of bis-phosphorylated amidines in this reaction. N-formylated aminoalkylphosphonates exist in solution as an equilibrium mixture of two stereo isomers, resulting from inhibited rotation around the amide C-N bond. References 4: 3 Russian, 1 Western.  
[325-6508]

UDC 547.26'118

#### NEW 8-MEMBERED HETEROCYCLES CONTAINING PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 19 Nov 82) p. 1426

TERENT'YEVA, S. A., PUDOVNIK, M. A. and PUDOVNIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences.

[Abstract] The interaction of N-acetyl-N-( $\beta$ -hydroxy)-isopropylaminophenol with ethyldichlorophosphine in the presence of triethylamine in benzene at 0 to 10°C produces 6-acetyl-4,5-benzo-8-methyl-2-ethyl-1,3-dioxo-6-aza-2- $\lambda^3$ -



phosphocane (I). Its IR spectrum contains the absorption band of the carbamide group. The PMR spectrum also contains the doublet of the methyl group at position 8 of the ring. Other characteristics of the spectrum are described.  
[325-6508]

UDC 547.26'118

#### TRIFLUOROACYLPHOSPHITES IN STAUDINGER'S REACTION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 6, Jun 83  
(manuscript received 10 Dec 82) pp 1427-1428

MIRONOV, V. F., OFITSEROV, Ye. N., KONOVALOVA, I. V. and PUDOVNIK, A. N.,  
Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] Reactions of trivalent phosphorus derivatives with phenylazide lead to imidophosphorus compounds. These can undergo imide-amide regrouping, the ease of occurrence of which is determined by the capability for migration of the group from the oxygen to the nitrogen atom. The ethyleneglycol and pyrocatechin trifluoroacylphosphates studied have reduced activity for phenylazide. The interaction occurs at 60 to 85°C and leads immediately to products of imide-amide regrouping, the structure of which has been confirmed by physical and chemical methods. The amidophosphates formed are hygroscopic, easily attracting water to form hydrates. The process of formation of diols is observed when NMR spectra are recorded in  $\text{CH}_2\text{Cl}_2$ . Migration of the acyl group in trifluoroimidophosphates thus occurs more rapidly than its formation. References 2 (Russian).  
[325-6508]

UDC 547.341

#### REACTION OF UNSATURATED COMPOUNDS, PART 112: ENALLENE PHOSPHONATES IN REACTION WITH AMMONIA

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 17 Feb 83) pp 225-230

VOSKANYAN, M. G., DANGYAN, Yu. M., PANOSYAN, G. A. and BADANYAN, Sh. O.,  
Institute of Organic Chemistry, Armenian SSR Academy of Sciences, Yerevan

[Abstract] Results are presented obtained in studies of the interaction of enallene phosphonates with ammonia. It was found that in contrast to the reactions of vinyl allene phosphonates I with primary and secondary amines, during the course of which only products of 1,4-attachment are formed, interaction with ammonia leads to several compounds. Study of this reaction in an NMR ampule showed that in the case of excess ammonia products of both 1,4- and 1,2-attachment, II and IV, are formed in approximately equal quantities.

It was established that the product of 1,2-attachment, IV, is converted with time to the product of 1,4-attachment, II, which is in turn converted to the enamine III. The reaction is completed within 4 to 5 days at room temperature. Thus, the experimental data confirm the previously stated assumption of 1,2-attachment of amines to vinyl allene phosphonates, I, with subsequent prototropy. Figures 2; references 8: 5 Russian, 3 Western.  
[294-6508]

## PESTICIDES

### DEVELOPMENT OF VIRAL INSECTICIDES DISCUSSED

Moscow KHIMIYA I ZHIZN' in Russian No 5, May 83 pp 40-41

[Article by N. Yefremov: "Arrow Aimed at Target"]

[Text] Microbiological preparations for protecting plants against injurious insects are now used more widely. Their number and production volume are growing. In 1982, KHIMIYA I ZHIZN' [Chemistry and Life] published an article on bacterial insecticides. This article is a continuation of this topic: viral insecticides are discussed by Candidate of Biological Sciences Yevgeniya Vladimirovna Orlovskaya, Laboratory Head of the All-Union Scientific Research Institute of Microbiological Plant Protection and Bacterial Preparations of the USSR, Glavmikrobioprom [Main Administration of the Microbiological Industry].

Virins are viral insecticides based on viruses which affect exclusively insects of a particular species.

An important characteristic of our preparations is their strict selective action. Let us take Virin-KhS against the boll worm as an example. This insect infests the boll of the cotton plant. It constantly ruins part of the crop and causes tremendous losses. Chemical insecticides used in cotton fields, together with the boll worm, also kill bees and silkworm moths (mulberry plants are usually planted around the fields) and other useful insects. On the other hand, Virin-KhS kills only the boll worm and does not affect any other insects.

Of course, all virins are thoroughly tested for harmlessness to man, animals and fish. They are not permitted to be used without that. Not only their acute toxicity is checked, but also their long-term effects: pathogenic, mutagenic and carcinogenic.

The first virin approved for use in the national economy was Virin-ENSh against gypsy moths. This insect is a dangerous pest of forests. In the fall, the butterfly leaves on the tree trunk an ovipositor, a small felt pad which can contain from 300-1000 eggs. In the spring, caterpillars are hatched from them and begin to devour the foliage. If they are deposited once, it is already a menace to the tree, but if they are laid four, five times, then its foliage will be totally destroyed.

By autumn, the caterpillars would go through all stages of their development and turn into butterflies. New deposits of eggs will appear in the neighboring trees. Moreover, newly born caterpillars, which are light and covered with fluffy hair, can excrete cobwebs which the wind will carry at a distance of several kilometers. The entire neighboring area will be affected the following spring.

The harm from the gypsy moth is not limited to damaging the forest. The filaments of the hair of the caterpillars easily break off and are carried by the wind, causing allergies in most people. In 1981, in the northeast of the U.S.A., caterpillars of the gypsy moth drove out from the area first the vacationers, and then the local residents. They destroyed the foliage of the forest and gardens in an area of nine million acres. The material loss amounted to tens of millions of dollars.

Formerly, gypsy moth invasions were periodic, 11 years apart. This was connected with the solar activity. However, due to the frequent use of chemical insecticides, this rhythm was disturbed. Therefore, our foresters inspect trees every autumn for possible deposits on them. They report in advance where an invasion by caterpillars is expected. Members of our laboratory make trips to such areas and collect egg deposits: the production of Virin-ENSh begins with propagating the insects, since viruses cannot live in an artificial medium. In the future, we hope to cultivate them in a tissue culture, but now it would be more expensive.

We grow caterpillars from egg deposits, and then, at a particular age, infect them with the virus: add virus granules to their food. The first signs of the disease appear in the caterpillars one week after infection, and they die toward the end of the second week. They are used to prepare virin. There are several methods: for example, caterpillars are dried, ground, filtered, and the necessary additions are introduced, such as carbon, which protects the viruses against ultraviolet radiation which is fatal for them.

A great advantage of viral insecticides over bacterial insecticides is the fact that they are not damaged by the addition of foreign microorganisms. Moreover, when microbiologists grow strains of bacteria in an artificial medium, there is a possibility that the bacteria will lose their virulence -- the strength of their pathogenic effect on insects. Viral preparations, do not lose their virulence when they are "grown" in the insects themselves.

However, there are also some problems here. You cannot have enough green food for caterpillars for the whole year. It is necessary to prepare artificial nutrient media. Formerly, they were prepared from food products, for example, beans. Now, they are prepared from agricultural and food wastes.

There is also another problem. Bacteria multiply in fermenters, closed containers, which is simpler than to keep a "staff" of insects. We have to create custom-made equipment, specialized bioplants, with steadily maintained conditions to which the insects are accustomed in nature: particular temperature, humidity, illumination.

We have developed several specimens of equipment, but we cannot find an organization which would undertake its series production. Therefore, we are now

producing fewer preparations than needed. For example, the demand for Virin-ENSh is two or three times greater than we can satisfy. If there will be a big outbreak of the development of gypsy moths, we will not be able to help it. It is not difficult to guess what losses can result. It is necessary to set up the production of equipment as soon as possible in order to produce virins in the needed quantity, even more than the annual need: it is not bad to have the preparations in reserve in the case of a big outbreak. They will not be wasted: viruses can be stored up to eight years.

Let us discuss the applications of Virin-ENSh. The diluted preparation can be sprayed in forests from the ground or from the air, just as with chemical insecticides. This is the least labor-consuming method, however, it takes a relatively large amount of the preparation -- from 100 to 200 grams per hectare. The ground focus method is more economical. The deposits of the moths are manually saturated with the preparation with the aid of the ordinary tampon on a stick. When caterpillars come out of the eggs, they eat part of the cover, chewing out a window for themselves, and the viruses get into their stomachs. Caterpillars feed themselves in the crown of the tree for a while, then they die and viruses are spread by the wind in the surrounding area, infecting other caterpillars. With this method, it is sufficient to treat only 5% of the forest; consumption of the preparation is 1-2 grams per hectare.

One of the characteristics of Virin-ENSh is that surviving caterpillars whose organism could cope with the virus leave a sick posterity. Occasionally foresters send us egg deposits, we study them and give them our conclusion that there will be no outbreak in that area because the eggs are already infected by the virus. To be fair, it should be said that this happens even without a virin because the virus is natural and sometimes it quenches the outbreak without our help (usually in the third year).

In 1981, we exchanged viral insecticides against gypsy moths with the U.S.A.: they gave us their "Dzhipchek", and we gave them Virin-ENSh. Both of these preparations were tested in our country and in the United States. In Moldavia, our tests ended in failure: Virin-ENSh was washed off by a shower because it did not have an adhesive. Tests in Kazakhstan were successful. Our virin had a better effect.

At the present time, besides the viral insecticides discussed above, Virin-EKS against cabbage worms was developed and tested. Tests are in progress on Virin-GYaP against the apple worm and Virin-OS against the turnip moth which erodes the roots of cereal crops, cotton and many other plants. Work is in progress on a preparation against the American white moth. It is unique in some respects: it will include two viruses in order to increase its effectiveness. It is still too early to talk about the details. It is better to return to this subject in a few years.

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10,233  
CSO: 1841/306

NEW PROTECTIVE MASK FOR PESTICIDE WORK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Jun 83 p 4

[Article: "For Body Protection"]

[Text] Designers of the Dzerzhinsk Zarya chemical equipment plant have created a new special kit for work with pesticides in orchards. It includes a protective mask and a plastic box with filtering materials that help to protect the respiratory organs and the face.

12422

CSO: 1841/307

UDC 665.733.4.038

USE OF ETHERS AS HIGH OCTANE GASOLINE COMPONENTS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 6-8

GUREYEV, A. A., KOROTKOV, I. V., LEVINSON, G. I. and BARANOVA, G. N.,  
All-Union Scientific Research Institute of Oil Refining; Moscow Order of  
Labor Red Banner Institute of Petrochemical and Gas Industry imeni  
Academician I. M. Gubkin

[Abstract] A study is made of the possibility of using methyl-tert-amylether (MTAE) as a motor-vehicle gasoline component, both in pure form and mixed with MTBE (methyl-tert-butylether). Studies were performed on gasoline consisting of 80% reforming gasoline and 20% straight run-62°C gasoline, containing 50.5% aromatic hydrocarbons, 49.1% paraffin-naphthenic and 0.4% olefin hydrocarbons. The saturated vapor pressure was 47.5 kPa. Effectiveness of the ethers as high octane components was studied by their addition to the gasoline at 7 and 11% by mass. Knock-resistance as a function of concentration of the additives was found to be linear, with MTAE having the best antiknock qualities. The octane rating by the motor method was higher for the mixtures than for the pure ethers. The additives had little influence on viscosity of the gasolines as a function of temperature between -40°C and +20°C. Introduction of 11% ether decreases the heat of combustion of the gasolines tested by 1.7%. The use of MTAE decreases toxicity of the gasoline and of exhaust gases in comparison to organometallic antiknock additives. Figures 2; references 9: 3 Russian, 6 Western.

[327-6508]

UDC 665.637.6.092:665.761.6

HYDROCRACKING OIL AS RAW MATERIAL IN PRODUCTION OF WHITE OILS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 8-9

POTANINA, V. A., DREMOVA, T. I., ZLOTNIKOV, V. Z. and PONOMAREVA, T. P.,  
All-Union Scientific Research Institute of Oil Refining

[Abstract] A technology has been developed in the Soviet Union for the production of high quality oils by hydrocracking of heavy distillate in available high pressure apparatus. Neutral oil and hydrocracking oil as well as their

mixtures were purified with fuming sulfuric acid, neutralized in 65% ethyl alcohol and contact purified to produce white oils. The yield of acid oils was 82 to 85% after three or four stages of treatment with fuming sulfuric acid. The oils produced are colorless and pass the test for organic impurities, the standard of purity in terms of aromatic hydrocarbon content. Hydrocracking oil was found to be a qualified raw material for the production of perfume oils and vaseline oils. References 2 (Russian).  
[327-6508]

UDC 661.715.7:665.644.66.097.3

#### REFORMING 62-105°C FRACTION ON POLYMETALLIC CATALYST

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 11-12

FEDOROV, A. P., SHKURATOVA, Ye. A., KOSYAKOVA, V. N. and KITAZOVA, A. A.

[Abstract] The purpose of this work was to produce a quantitative estimate of the possible increase in benzene and toluene yield upon reforming of the 62-105°C fraction as the pressure is decreased to 1 MPa. The studies showed that decreasing the pressure below 1 MPa sharply decreases the stability of the polymetallic catalyst. The results of reforming of this fraction show that in the temperature interval used, polymetallic catalyst type KR-106 has high aromatizing activity. At 480°C the yield of aromatic hydrocarbons is 35.2% by mass, including 11.6% benzene and 21.9% toluene. At 500°C the yield of aromatics increases to 40.5%, including 14.8% benzene and up to 24% toluene. Decreasing the pressure from 2 to 1 MPa increases the yield of benzene by 10-12 mass %, of toluene by 8-10 mass %. Figure 1.

[327-6508]

UDC 661.183.002.2

#### PURIFICATION OF AROMATIC HYDROCARBONS FROM UNSATURATED COMPOUNDS ON A-4M ADSORBENT

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 12-14

KUVAYEVA, M. M., KALININA, L. I. and ALEKSEYEVA, R. V., Krasnodar Branch, "Leneftekhim" Scientific-Production Association

[Abstract] The authors' association has developed a technology for producing A-4M adsorbent and a process for purifying aromatic hydrocarbons on this adsorbent, removing unsaturated hydrocarbons. This article presents an effective means of using A-4M based on laboratory studies in a 20 mm-diameter, 320-mm-high, 100 cm<sup>3</sup> continuous flow adsorber at temperatures up to 200°C, pressures up to 2 MPa, adsorbent charge 50 cm<sup>3</sup>. Purification is best performed in the liquid phase without preliminary dewatering of the adsorbent at 200-230°C, gage pressure 1.7-2.5 MPa, space velocity of raw material 0.5-1.2 hr<sup>-1</sup>. Figure 1; references 12: 10 Russian, 2 Western.

[327-6508]



## DECREASING POUR POINT OF SYNTHETIC LUBRICATING OILS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 16-17

ALIMOV, A. P., KAGAN, L. Kh., NIKONOROV, Ye. M. and SHCHEPKINA, R. S.,  
All-Union Scientific Research Institute of Oil Refining

[Abstract] The possibility is demonstrated of decreasing the pour point of products based on 1,10-decanedicarboxylic acid by treating its di-2-ethylhexylester with tert-butylperoxide. The pour point of products of the interaction of di-2-ethylhexyl-1,10-decanedicarboxylate with tert-butylperoxide is significantly decreased: in one example, from  $-50^{\circ}\text{C}$  to below  $-70^{\circ}\text{C}$ . The viscosity of the end products is higher than that of the initial diester, varying with the consumption of peroxide. The thermal oxidative stability of the products was determined at  $200^{\circ}\text{C}$  with antioxidant additives, experimental duration 10 hours, specimen size 50 ml, air flow rate 50 ml/min. The results indicate that thermal oxidative stability of the products was greater than that of diisooctylsebacinate. The products are equal to diisooctylsebacinate in lubricating properties. References 5: 3 Russian, 2 Western.  
[327-6508]

UDC 665.521.3:518.4

## VISCOSITY-TEMPERATURE PROPERTIES OF JET FUELS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 19-20

GORENKOV, A. F., LIFANOVA, T. A., KLYUYKO, I. G. and SALEYEV, V. A.

[Abstract] The viscosity of jet fuel may vary by more than a factor of 10 with the extreme variations in temperature to which the fuel is exposed in flight. This article presents a nomogram (fig. 2) for determination of the viscosity of jet fuel and jet fuel mixtures as a function of temperature. The nomogram can also be used to determine the viscosity of individual jet fuel fractions. The maximum viscosity at  $-40^{\circ}\text{C}$  as standardized for TS-1 and RT fuel, "not over  $8 \text{ mm}^2/\text{s}$ " is never achieved in practice. It is noted that foreign standards set only one standard value for jet A-1 fuel at  $20^{\circ}\text{C}$ , "not over  $8 \text{ mm}^2/\text{s}$ ." This fuel, although its actual viscosity is greater than that of TS-1, has been used in Soviet jet aircraft in international air service with no complications. Figures 2; references 6: 4 Russian, 2 Western.  
[327-6508]

## HYDROLYTIC STABILITY OF SYNTHETIC OILS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 20-22

YECHIN, A. I., NOVOSARTOV, G. T. and KONDRAT'EVA, T. B.

[Abstract] A study is presented of the hydrolytic stability of synthetic ester-based oils. A special method was developed for the study. A mixture of 75 g of oil with 25 g distilled water was carefully homogenized, until a homogeneous emulsion was produced, and held in the presence of a copper plate in a sealed stainless steel vessel at  $100 \pm 2^\circ\text{C}$  for 48 hours. The quantity of precipitate insoluble in isooctane, acid number of the oil, pH and acid number of the water, viscosity of the oil at  $-40^\circ\text{C}$  and corrosion of the copper plate were determined. It was established that the copper plate did not influence the hydrolytic stability of the oils. Diisooctylsebacinate, pentaerythrite and diethylene glycol esters of synthetic fatty acids in the  $C_5-C_9$  fractions and synthetic oils based on these esters were studied. The results of the studies showed that upon hydrolysis, the oil acid number, pH and aqueous extract acid number were most likely to change, a result of the chemistry of the hydrolysis process, the end products of which are acids and alcohols plus products of hydrolysis of additives. The method described can be used to estimate the hydrolytic stability of synthetic oils. The hydrolytic stability of diester oils needs improvement. Figures 2; references 5: 4 Russian, 1 Western.

[327-6508]

UDC 62.75.542.943:541.127

## OXIDIZABILITY OF FOREIGN JET FUELS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 83 pp 22-25

KOVALEV, G. I., GOGITIDZE, L. D., KURANOVA, V. I. and DEKISOV, Ye. T.  
Central Institute of Aviation Machine Building imeni P. I. Baranov

[Abstract] Oxidizability of foreign jet fuels including jet A-1 and BP jet fuel was studied. The fuel was oxidized by oxygen at 120 and  $130^\circ\text{C}$  in the presence of dicumylperoxide as an oxidation initiator. Two types of oxidation initiation kinetic curves were found. In some fuels, including jet A-1 from Angola, jet A-1 and JP-5 (Shell Oil), PL-6 (Czech) and ATK (Iraq) the oxidation rate became constant after an induction period, indicating the presence of oxidation inhibitors. In another group of fuels including jet A-1 from Mobil Oil, jet A-1 and Avcat (British Petroleum), the oxidation kinetics showed a period of induction caused by the presence of effective inhibitors, then oxidation at a constant rate, after which it slowed again, indicating that products were formed by oxidation which had an inhibiting effect on further oxidation. This second group of fuels showed somewhat greater effectiveness of oxidation inhibitors, probably as a result of the cooperative influence of the inhibiting oxidation products. Figures 3; references 4 (Russian).

[327-6508]

UDC 615.462:678].03:617

PHYSICAL-CHEMICAL PROPERTIES AND DEVELOPMENT OF METHODS OF STERILIZING AND PACKING TWO-LAYER POLYMER SELF-ADHESIVE FILMS

Yerevan ARMYANSKIY KHMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 22 Feb 83) pp 259-262

CHUKHADZHYAN, G. A., GAZARYAN, A. V., GEVORKYAN, I. Kh., KARAPETYAN, S. A.  
and GABRIYELYAN, E. S., Yerevan Medical Institute

[Abstract] At present there are no standards for polymer materials for use in medicine. The authors used the general requirements placed on polymers for use in packaging food products, in which specimens are treated in water and 4% acetic acid at 60° for 30 minutes and the content of phenol, formaldehyde, heavy metals, potassium permanganate, residue after evaporation of the solution are determined. The permanganate test is used to determine oxidizing organic compounds in the material. The films produced satisfy the requirements of the standard. The physical and mechanical properties of the films were also studied. Difficulties arose in selecting methods of sterilization, since the films are partially soluble in both alcohol and water. Methods of UV sterilization, introduction of substances to the film to give them bacteriostatic properties (phenol, sorbic acid, eurotropin, etc.) were tested. After many tests it was concluded that the combination of properties of the films is best retained by radiation sterilization using a <sup>60</sup>Co source in air with doses of 2.5, 5 or 10 Mrad. Doses below 5 Mrad do not influence the properties of the film. References 6: 1 Russian, 5 Western.

[294-6508]

STUDY OF THERMAL AND VISCOELASTIC PROPERTIES OF PHOSPHORUS-CONTAINING URETHANE BLOCK-COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83 (manuscript received 30 Jun 81) pp 1149-1155

VILENSKIY, V. A., KERCHA, Yu. Yu., SHAPOVAL, R. L., GONCHAROVA, L. B. and GREKOV, A. P., Institute of High Molecular Weight Compound Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] A study is presented of the influence of phosphorus-containing fragments of rigid blocks of various structures on the thermal, thermo-mechanical and viscoelastic properties of block-copolyurethanes (BCU). The BCU were synthesized in two stages, by production of macrodiisocyanates from oligotetramethyleneglycol and 4,4'-diphenylmethane diisocyanate, then lengthening of the macrodiisocyanate with 1,4-butanediol, isophthalic acid dihydrazide or bis-(hydroxymethyl)phosphinic acid. A 20% solution of the BCU in DMF was used to produce films, which were dried in a vacuum at 333K to constant mass and then studied by DTA, thermomechanical methods and the method of stress relaxation at constant deformation of 10% and temperature of 298K. A flat zigzag chain conformation is suggested for BCU-5, differing from the rigid domain model of Stewart. The constant density of BCU observed is explained, by the authors, by the surface characteristics of the rigid domains, in that there are niche defects on their surfaces which may be filled by the segregated flexible phase forming microscopic areas within the domains rather separate from the associated rigid blocks since there is no physical interaction between them. The new model of BCU-5 indicates that some of the rigid blocks form a well-packed nucleus, whereas some, due to steric hindrances caused by the presence of diethylphosphite radicals, explain the strength and plasticity of the blocks. Figures 5; references 12: 10 Russian, 2 Western.

[321-6508]

## KINETICS OF REACTION OF ISOCYANATES WITH POLYOXYPROPYLENEGLYCOLS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83  
(manuscript received 8 Dec 81) pp 1169-1172

KOMRATOVA, V. V., GRIGOR'YEVA, V. A., OL'KHOV, Yu. A., GORBUSHINA, G. A. and  
BATURIN, S. M., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] This work is a portion of a continuing study to determine the influence of oligomer diol chain length on reactivity of terminal OH groups and the relationship of oligomer diol MMD with the properties of linear and cross-linked polyester urethanes. This article reports a study of the kinetics of the interaction of polyoxypropyleneglycol (POPG) of various molecular masses with *m*-chlorophenylisocyanate (CPI) and 2,2-bis-(4-isocyanatophenyl)hexafluoropropane (HFDI) in the 303-343K temperature interval. The variation in  $k_n$  as a function of POPG molecular mass is found to be related to a change in the relationship between the associated and solvated terminal OH groups with increasing molecular mass and the influence of macromolecule chain-length, manifested as a change in equilibrium constants of formation of -OH...O-complexes. Figures 4; references 14: 9 Russian, 5 Western.  
[321-6508]

UDC 541.64:542.954

## SYNTHESIS AND PROPERTIES OF CERTAIN POLYCYANOAMIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83  
(manuscript received 18 Jan 82) pp 1204-1208

SERBIN, A. V., FLEROVA, A. N., YAROSH, V. N., VOZNESENSKAYA, N. N.,  
TELESHOV, E. N. and PRAVEDNIKOV, A. N., Scientific Research Physical-Chemical  
Institute imeni L. Ya. Karpov

[Abstract] Aromatic diaminonitriles of a new structure were obtained and the possibility was studied of the synthesis of polycyanoamides, as well as the properties of polycyanoamides and polyamidoquinazolones based on them. The possibility was also studied of synthesizing heterocyclic thermally-stable polymers by interacting imide oligomers containing *o*-aminonitrile end groups with aromatic dichlorides and diisocyanates. *N,N'*-bis-(4-amino-3-cyanodiphenyloxy)diimide(I) was used as the reactive oligomer in the work. Polycondensation of I with 4,4'-diphenyloxy dicarboxylic acid dichloride or 4,4'-diisocyanate diphenylmethane was used to synthesize polyimidocyanamide and polyimidocyanourea. Thermal cyclization of these prepolymers produced polyimidoquinazolones of various structures. Thermomechanical testing of the polymers produced showed that the softening point of the polycyanoamides (PCA) is below 250°C. Above 300°C, where thermal cyclization of *o*-aminonitrile sections of the polymer chains to rigid quinazolone cycles begins, deformation

of the specimens is greatly reduced. The bright yellow prepolymer powders were heat treated in a vacuum, causing the nitrile group absorption band at 2230 cm<sup>-1</sup> to disappear from their IR spectra almost completely and absorption bands related to the formation of quinazolone structures to appear. This indicates isomerization cyclization of o-cyanoamide and o-cyanourea sectors of the polymer chains and the formation of polyimidoquinazolones. Figure 1; references 6: 3 Russian, 3 Western.  
[321-6508]

UDC 541(64+14)

#### CONCENTRATION DEPENDENCE OF EFFECTIVENESS OF LIGHT-PROTECTIVE ACTION OF ANTIOXIDANTS IN POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83 (manuscript received 19 Jan 82) pp 1209-1215

IVANOV, V. B., YEFREMKIN, A. F., ROZENBOYM, N. A. and SHLYAPINTOKH, V. Ya., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] The concentration variation is studied for the most important cases: when an antioxidant, breaking the oxidation chain by interacting with free radicals, is resistant to the effects of light and absorbs light to some extent, and when the antioxidant is unstable, decomposing to form radicals initiating oxidation of the polymer and absorbs light slightly. The equations obtained are compared with those from the literature and the authors' own experimental data. Relatively simple cases are studied, but they are the ones most frequently encountered in practice. More complex systems are also possible in which the inhibitor cannot be considered either strongly or weakly absorbing or in which initiation with the participation of the inhibitor makes a relatively slight contribution. The concentration dependences for such systems would consist of some superimposition of the dependences for the extreme cases studied in this article. Figures 4; references 16: 8 Russian, 8 Western.  
[321-6508]

UDC 541.64:542.943

#### THERMAL OXIDATIVE DESTRUCTION OF COMPOSITIONS BASED ON AROMATIC POLYAMIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83 (manuscript received 17 Feb 82) pp 1270-1276

PAVLOVA, S.-S. A., GRIBKOVA, P. N., BALYKOVA, T. N., POLINA, T. V., KOMAROVA, L. G., BEKASOVA, N. I. and KORSHAK, V. V., Institute of Hetero-organic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences

[Abstract] The authors had earlier studied destructive transformation of compositions based on aromatic polyamide containing from 0.5 to 50 wt.%

PA-K polyamide with m-carboran fragments in the chain, demonstrating that 0.5% PA-K is an inhibitor of decomposition of aromatic polyamide in the 523-573K area. This article presents a study of the behavior of analogous compositions under thermal oxidation conditions, examining thermal oxidative destruction of polyamides as well as compositions based on PA containing 0.5, 3, 10, 25 and 50 wt.% PA-K polyamidocarboran. The experimental data indicate that upon oxidation of carboran-containing polyamide the oxygen is primarily expended in oxidation of carboran fragments, forming B-OH and B-O-B bonds, followed by nonvolatile compounds of boron such as  $B_2O_3$  and  $H_3BO_3$ . Experimental data produced in thermal oxidation of compositions based on PA show that the quantity of absorbed oxygen and total quantity of oxides of carbon liberated depend on the content of PA-K in the composition in a manner which is nonlinear and nonmonotonic. Two concentration areas are found in which the inhibition mechanism is different. At 0.5 to 3 wt.%, PA-K acts to inhibit radical chain processes; at concentrations over 10 wt.%, PA-K stabilizes the aromatic polyamide by nonchain inhibition. This is the reason for the unusual shape of the curve. Figures 4; references 18: 17 Russian, 1 Western.  
[321-6508]

UDC 541.64:539.2

STRUCTURE AND PROPERTIES OF POLYBUTYLMETHACRYLATE OBTAINED BY POLYMERIZATION  
In PRESENCE OF AEROSIL

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83  
(manuscript received 22 Feb 82) pp 1277-1282

ASLAMAZOVA, T. R., MOROZOVA, Ye. M., AFANAS'YEVA, N. V., BORISOVA, T. I. and  
YELISEYEVA, V. I., Institute of Physical Chemistry, USSR Academy of Sciences;  
Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] A study was made of the influence of aerosil concentration in polymerization of butylmethacrylate (BMA) on the molecular mass of the polymer formed, segmental mobility of its chains, physical and mechanical properties, as well as film structures. Polymerization was performed in ampules at 333K. The polymers produced were segregated by dissolving PBMA in acetone with subsequent reprecipitation in methanol. Molecular mass was determined by viscosity measurement. Four percent aerosil was found to reduce the molecular mass of the polymer slightly, but reproducibly. The minimum polymer MM at this aerosil concentration can be explained by the superimposition of two oppositely acting factors: the increase in initiation rate and a possible decrease in breaking rate constant. Polymerization of aerosil filled butylmethacrylate was shown to produce a polymer system similar to a two phase system. Adsorption of PBMA macromolecules on the aerosil particle surface causes this system to consist of a compact dispersed phase and a more friable polymer matrix, significantly improving some practically important properties of the polymer such as strength and water resistance. Figures 6; references 14: 12 Russian, 2 Western.  
[321-6508]

## STUDY OF RHEOLOGIC BEHAVIOR OF AQUEOUS POLYMER DISPERSIONS AND ANALYSIS OF SEDIMENTATION STABILITY OF FILLED COMPOSITIONS BASED UPON THEM

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 19 Nov 82) pp 1029-1034

ANTONOV, V. M., BOGDANOV, V. V. and YEKIMOV, A. G., Leningrad Institute of Technology imeni Lensovet

[Abstract] This work has studied the rheologic properties of certain aqueous dispersions of polymers over a broad range of shear speeds (stresses), and also to analyze the sedimentation stability of filled suspensions based on their behavior in deformation. The objects of the study were aqueous dispersions of a copolymer of acrylic acid with polyallylpentaerythrite esters (sakap) which have recently been used in industry and are promising raw materials for the production of effective cutting fluids. The studies were performed on a Trapeznikov elastoviscosimeter operating by the method of constant shear stress. At medium and higher speeds a Weissenberg rheogoniometer and "rheotest-2" instrument were used, operating by the method of constant shear speed. Recommendations are presented for the creation of sedimentation stable systems and conditions for the assurance of this stability, as well as determination of the rate of sedimentation under storage and usage conditions. Figures 4; references 4 (Russian).

[318-6508]

## POLYMERIZATION OF PROPYLENE ON A MODIFIED INDUSTRIAL CATALYST

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 83 pp 8-9

SHEPEL', V. M., PETROVA, G. I., BELOZEROV, V. V., MAYER, E. A.  
BURMISTROVA, T. I. and VOLOSHIN, I. A.

[Abstract] It is known that the most effective modifiers for catalytic systems for polymerization of propylene are methylmethacrylate, methylacrylate and dimethyldiethylene glycol. The effect of these modifiers was compared in polymerization of propylene under identical conditions on an industrial catalyst--diethylaluminum chloride--and the optimal sequence of introduction of the components was determined. The experiments were performed in a reactor which had been evacuated at 65°C for 1 hour, blown through with propylene. Nitrogen pressure was used to load a heptane fraction with the calculated quantity of titanium trichloride and diethylaluminum chloride. After these components were loaded the temperature was set at 65°C, propylene was introduced and the process conducted at 0.44 MPa for 1 hour with no hydrogen. The reaction was stopped by stopping the propylene feed, the system was cooled and the calculated quantity of isopropyl alcohol solution was introduced in the heptane fraction. Decomposition of the catalyst residue, neutralization and washing with water were performed at 57°C for one half hour. The content of



isotactic polypropylene was determined. It was found that with preliminary treatment of the  $TiCl_3$  suspension with electron donor compounds the best effect of decreased yield of low molecular fractions was achieved by the use of methylacrylate. Participation of the electron donor in coordination requires consideration of its interaction with each of the reaction system components and structural characteristics. Therefore, depending on the type of modifier, the sequence of its introduction to the reaction system must be varied. References 6 (Russian).  
[330-6508]

UDC 678.5:539.531:66.018

#### ESTIMATE OF CHEMICAL STABILITY OF POLYMER MATERIALS BASED ON MICROHARDNESS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 83 pp 28-29

LOBANOV, Yu. Ye., BOGATYREVA, Ye. A., SUBBOTKINA, A. A. and SHTERENZON, A. L.

[Abstract] A study was made of the possibility of estimating chemical stability of polymer materials on the basis of their microhardness. Measurements were performed using a series-produced type PMT-3 microhardness meter by determining the dimensions of an imprint produced by a diamond pyramid observed under UV light. The objects studied were sheet polypropylene PP-3, type ED-20 epoxy resin, cured polyethylene polyamine, high pressure polyethylene and faolite in rectangular solid specimens. Determination of microhardness was found to be a sensitive method of recording changes in the properties of polymers in corrosive media such as nitric acid. The method cannot replace determination of changes in strength properties in engineering calculations, but can be used successfully to determine the chemical resistance of materials, particularly as a rapid method. The microhardness method also allows changes in distribution of microhardness with depth in the specimen over time to be determined, predicting the effectiveness of the material when used in products. The results of the tests are insensitive to the presence of surface defects and can be used to test a single specimen with a portable instrument. Figures 2; references 8: 6 Russian, 2 Western.  
[330-6508]

UDC 678.742.3.044:54-386

#### REMOVING CATALYST RESIDUE FROM POLYPROPYLENE BY COMPLEX-FORMING AGENTS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 83 pp 38-39

YEVSYUKOV, Ye. I., KOLESNIKOV, Yu. N., SHESTAK, N. P., PRONEVICH, Ye. A., IVANENKO, E. V., STUPAKOVA, O. K. and PLESHENEVA, V. N.

[Abstract] A study was made of some problems of purification of polypropylene obtained on a highly effective microspherical catalyst, VMS, with high activity

and stereospecificity. Catalysts studied included titanium trichloride reduced by aluminum and VMS catalyst types I and II. Polymerization of propylene was performed on these catalysts with  $\text{Al}(\text{C}_2\text{H}_5)_2\text{Cl}$  in the hexane fraction of gasoline at 1 MPa, 70°C, 2 hours. The polypropylene was washed from the catalyst by deactivation of the catalyst with acetylacetone and simultaneous neutralization of the hydrogen chloride with propylene oxide, subsequent extraction of the products of deactivation formed and neutralization with gasoline. The use of acetylacetone and propylene oxide to remove catalyst residue was found to have significant advantages over washing with alcohol and water. It allows a decrease in corrosion of equipment, a decrease in the content of ash and of chlorine in the polypropylene. The content of deactivated additives is also maintained at the level of the consumption coefficients and requires no regeneration. Figures 2; references 6: 3 Russian, 3 Western.  
[330-6508]

UDC 677.494.745.32.021.12.017

#### INFLUENCE OF FORMATION CONDITIONS ON BRITTLINESS OF NONORIENTED POLYMER FILMS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 3, May-Jun 83  
(manuscript received 19 Mar 82) pp 12-13

BEDER, N. M.

[Abstract] Polyacrylonitrile was used to determine whether changes in formation conditions using the same polymer solutions can produce nonoriented fibers and films with significantly-different brittleness. Since the properties of oriented polymer specimens are determined largely by the properties of the initial materials in the nonoriented state, studies were performed for other polymers as well. Films were formed from equiconcentration (12%) solutions of industrial polymers by pouring a known quantity of solution onto a glass substrate where it was always distributed over the same area. The substrate and solution were then placed in a desiccator with vapors of a precipitating agent, precipitation bath or desiccator with  $\text{CaCl}_2$ . In the first two cases gel-form films were produced which were washed with water removing the solvent and dried at room temperature. The dry-formed films were studied without additional treatment. Amorphous and amorphous-crystalline films were studied. The experimental data indicate that the regularities observed for polyacrylonitrile were characteristic for most other polymers as well: formation of films without removal of a sufficient quantity of solvent leads to the production of brittle specimens. Polyvinyl chloride is an exception. Dry formation produces films with low brittleness in almost all cases (polystyrene is an exception). Wet formation yields an intermediate result. One factor in the differing brittleness of films produced from the same polymer solution is therefore the difference in the number of intermolecular strong bonds between supermolecular elements formed at the contact zone between these elements as a result of neutral diffusion of macromolecular segments. References 10 (Russian).  
[331-6508]

## TRINARY OXIDATION-REDUCTION SYSTEMS AS INITIATORS OF GRAFT POLYMERIZATION OF POLYCAPROAMIDE WITH DIMETHYLAMINOETHYLMETHACRYLATE

Moscow KHIMICHESKIYE VOLOKNA in Russian No 3, May-Jun 83  
(manuscript received 27 Jul 82) pp 16-17

KISLYUK, M. S., GABRIELIAN, G. A., ALEKSEYEVA, M. V. and GAL'BRAYKH, L. S.

[Abstract] A study was made of the influence of the type of reducing agent on the activity of an oxidation-reduction system consisting of  $\text{Cu}^+$ -cumene hydroperoxide, a reducing agent, in the reaction of initiation of graft polymerization of dimethylaminoethylmethacrylate with polycaproamide. Ascorbic, citric, tartaric and oxalic acids as well as hydrazine, hydroquinone and formaldehyde sodium sulfoxylate (rongalite) were tested as reducing agents. The reducing agents have varying activity in the graft polymerization reaction in the presence of  $\text{Cu}^+$  and cumene hydroperoxide. They differ significantly from each other. Where ascorbic acid is present above the optimal quantity, it participates in a chain-breaking reaction. Rongalite increases the rate of the grafting reaction as does ascorbic acid in the proper quantities, but requires a significantly higher concentration in the reaction medium. Hydroquinone, an effective radical process inhibitor, has reducing properties at low concentrations. At very low concentrations it accelerates the reaction of graft polymerization. Ascorbic acid and rongalite are most effective in initiating the grafting reaction, producing graft copolymers at high speeds under continuous conditions. Figure 1; references 4 (Russian).  
[331-6508]

UDC 678.675-404.5:532.783[678.675:536.495]-404.5.  
678.675-19.678.675.042

## STUDY OF MIXED POLYMER LIQUID CRYSTAL SYSTEMS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 3, May-Jun 83  
(manuscript received 6 Aug 82) pp 19-21

VOLOKHINA, A. V., KULICHIKHINA, T. A., KOFANOVA, G. A., TIKANOVA, L. Ya., KALMYKOVA, V. D., KORETSKAYA, A. I. and KUDRYAVTSEV, G. I.

[Abstract] Disruption of the regularity of crystal systems is used to reduce the melting point of mixed liquid crystal systems obtained by dissolution of copolyamides or mixtures of poly-p-phenylene-terephthalamide with other polyamides in sulfuric acid or mixed solvents. This article utilized copolyamides containing 90% PPTA and 10% amine links or acid links, as well as poly-p-benzamide links. Structural formulas are presented. Proper selection of copolymers, mixtures of polymers or mixed solvents can vary the transition temperature of the systems from solid to liquid over broad limits. For example the addition of 15% chlorosulfonic acid of the mass of the solvent decreases the melting point of concentrated PPTA, as does the introduction of a copolymerizing monomer. Figures 4; references 5: 2 Russian, 3 Western.  
[331-6508]

## SYNTHESIS AND POLYMERIZATION CAPACITY OF 1-ACRYLOYL- AND 1-METHACRYLOYLPYRAZOLES

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 16 Feb 83) pp 230-234

DARBINYAN, E. G., POGOSYAN, A. S., ELIAZYAN, G. A. and ASRATYAN, G. V.,  
Institute of Organic Chemistry, Armenian SSR Academy of Sciences, Yerevan

[Abstract] Continuing studies on the synthesis of monomers and polymers with azole rings, this article presents synthesis and studies the polymerization capability of new acrylic monomers containing pyrazole groups obtained by the interaction of the corresponding pyrazoles with acryloyl- and methacryloyl-chlorides. Interaction of 3(5)-methylpyrazole with acrylic and methacrylic acid chlorides results in the formation of two possible isomers--1-acryloyl-3(5)-methyl-(Ia) and 1-methacryloyl-3(5)-methylpyrazole-(Ib). The presence of the isomers was established by the chemical shifts in methyl protons of the rings in positions 3 and 5. The authors also described compound Ic which, according to the literature, cannot be isolated due to its great reactivity. The monomers produced are easily polymerized colorless liquids. Polymerization of the monomers was performed in dimethylformamide and acetone in the presence of radical polymerization initiators. Exclusively linear soluble polymers were formed. Polymerization of the same monomers in mass leads to insoluble products with high yield. References 9: 7 Russian, 2 Western.

[294-6508]

## SYNTHESIS OF CERTAIN POLYARYLATES BASED ON 2-PHENOXY-4,6-BIS(4'-CARBOXY-PHENYL)-SYMM-TRIAZINE CHLORIDE

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 4 Aug 82) pp 237-242

POGOSYAN, G. M., AVANESYAN, E. S. and ZAPLISHNYY, V. N., Institute of  
Organic Chemistry, Armenian SSR Academy of Sciences, Yerevan

[Abstract] There was interest in synthesis of polyarylates with new bis phenols in order to study the influence of the structure of bis phenol on the properties of the polymers produced. The polymers were synthesized by inter-phase polycondensation in a system with an organic solvent and water. A study was made of the influence of various factors on the polycondensation process. It was found that the optimal quantity of alkali is 40% excess, the best organic phase is benzene, the optimal process temperature 20-25°C, reaction time 20-30 minutes. As the polyreaction time is increased to 60 minutes or more, an infusible, insoluble polyarylate is formed, and the yield of this three-dimensional product increases with time. Under optimal conditions the known polyarylate based on diene and CPCT is obtained with good yield, high molecular

weight, good thermal stability. All polymers produced are powders primarily white in color, soluble in m-cresol, nitrobenzene, DMFA and dioxane. The influence of adding 2-phenoxy-4,6-bis-(4'-carboxyphenyl)-symm-triazine chloride polyarylate and diene (PPTD) on the properties of an epoxy composition based on ED-20 epoxy resin cured with phthalic anhydride was studied. As was to be expected, small quantities (5 to 10 mass%) of PPTD increased the thermal stability of the cured composition significantly in comparison with the control without decreasing strength or impact toughness. Figure 1; references 11: 9 Russian, 2 Western.  
[294-6508]

UDC 547.316:318

#### SYNTHESIS AND PROPERTIES OF POLYMERIZABLE OLIGOESTERS WITH TERMINAL VINYLACETYLENE GROUPS

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 29 Oct 81) pp 243-246

GRIGORYAN, S. G., ARZUMANYAN, A. M., MATNISHYAN, A. A. and MATSOYAN, S. G.,  
Armenian Branch, All-Union Scientific Research Institute "IREA", Yerevan

[Abstract] The purpose of this work was to synthesize and study the properties of new easily-cured oligomers capable of forming conjugation blocks. The studies showed that vinyl ethinyl carbinol is a suitable telogen for the synthesis of such oligomers under condensation telomerization conditions. A method was therefore developed for production of vinyl ethinyl carbinol consisting in the condensation of vinylacetylene with paraform in the presence of powdered caustic potash in a medium of dimethylsulfoxide. The synthesis of oligoesters was performed in the presence of catalytic quantities of sulfuric or p-toluene sulfo acid in benzene with azeotropic distillation of the reaction water. However, for phthalic anhydride due to the great saponification of the reaction mass the oligoester was obtained through the acid chloride using pyridine as the hydrogen chloride acceptor. The oligomers produced are viscous colored liquids soluble in benzene, acetone, chloroform and dioxane. The IR spectra are reported. The oligoesters polymerize at 70 to 80°C in the presence of benzoyl peroxide or at 120-150°C to form three-dimensional infusible and insoluble polymers. The polymers produced are superior in thermal stability to polymers based on oligoesters with terminal triple bonds. The polymers are paramagnetic, with a narrow EPR signal with g factor similar to the value for free electrons and an intensity of  $10^{17}$ - $10^{18}$  spins per gram. IR spectra are reported. Figure 1; references 5 (Russian).  
[294-6508]

## CYCLOLINEAR COPOLYMERIZATION OF ACETYLENE COMPOUNDS

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 16 Feb 83) pp 247-250

AKOPYAN, L. A., AMBARTSUMYAN, G. V., GEVORKYAN, S. B. and OVAKIMYAN, E. V.,  
Institute of Organic Chemistry, Armenian SSR Academy of Sciences, Yerevan

[Abstract] A study is presented of the joint polymerization of mono- and diacetylene monomers. Two pairs were selected--dipropargyl aniline-propargyl alcohol and dipropargyl melanic ester-diethylpropargylamine. Synthesis conditions are reported. All of the cyclolinear copolymers produced are dark-colored powders. Their IR spectra contain no  $C\equiv CH$  groups, indicating that the isolated diacetylenes participate in copolymerization by a cyclic mechanism, since otherwise we would have to expect formation of three-dimensional insoluble copolymers. Due to the polyconjugate system the cyclolinear copolymers produced are paramagnetic and yield an EPR signal with  $g \approx 2$ . The concentration of unpaired electrons is  $10^{16}$ - $10^{17}$  spins per gram, signal with 4.5-7.7 Oe. The conductivity of the copolymers is less than would be expected. Figure 1; references 6 (Russian).

[294-6508]

UDC 615.462:678].03:617

## PRODUCTION OF BIOCOMPATIBLE SELF-ADHESIVE TWO-LAYER POLYMER FILMS

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 22 Feb 83) pp 255-259

CHUKHADZHYAN, G. A., GEVORKYAN, I. Kh., KARAPETYAN, S. A. and GABRIYELYAN, E.S.,  
Yerevan Medical Institute

[Abstract] A method is developed for producing a two-layer biocompatible self-adhesive polymer film based on polyvinyl alcohol derivatives with the addition of a plasticizer. The technology of production is such that it can combine both hydrophilic and hydrophobic properties. The plasticizer for the hydrophilic plasticized layer is polyethylene glycol with molecular mass 100 to 40,000. It acts not only as a plasticizer, but also as a plasticizing ingredient capable of diffusing the hydrophilic layer into the hydrophobic layer so that it has identical affinity for both polymers and acts as an immunostimulator and antistatic. The hydrophobic portion is based on polymers of 2-oxyethylmethacrylate modified with 0.001-1% ethylene glycol dimethacrylate or p-divinylbenzene, or its copolymers with vinylpyrrolidone, vinylacetate or styrene. The plasticizer for the hydrophobic layer is oxyethylated derivatives of higher fatty acids and alcohols and oxyethylated derivatives of sorbitan. Toxicologic testing of the product was performed at Yerevan Medical Institute indicating that the films have no general toxic effect, do cause slight irritation at the point of implantation, not extending beyond a reaction to a foreign assimilated body. References 15: 10 Russian, 5 Western.

[294-6508]

## FLAME RESISTANT EPOXY COMPOSITIONS

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 36, No 4, Apr 83  
(manuscript received 16 Feb 83) pp 268-269

DARBINYAN, E. G., MATSOYAN, M. S., SAAKYAN, A. A. and ELIAZYAN, M. A.,  
Institute of Organic Chemistry, Armenian SSR Academy of Sciences, Yerevan

[Abstract] A study was made of the possibility of using molecular complexes of variable valence metal salts with 3(5)-methylpyrazol (MP) as flame-resistant additives to epoxy compositions based on diglycidyl ester of diphenylpropane (DGEBA) cured with n,n'-diaminodiphenylmethane (DDM). It was found that the introduction of metal salt complexes with MP (2.6-3.07 mass parts per 100 mass parts DGEBA) increased flame resistance as well as thermal stability in comparison to compositions cured with DDM without adding these complexes. The greatest flame retardant effect was observed in compositions containing complexly bound salts of cobalt and manganese, the least in compositions containing salts of nickel. The physical and mechanical properties remained at a high level. References 6: 4 Russian, 2 Western.  
[294-6508]

## IONIC FLOTATION OF URANIUM (VI) FROM CARBONATE SOLUTIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 20 Jan 81) pp 1049-1053

PAVLENKO, S. N., LEGENCHENKO, I. A., MENCHUK, V. V.

[Abstract] An earlier work by the authors studied the process of flotation separation of uranium from mine water by means of secondary aliphatic amines. This work is a continuation, intended to determine the regularities and mechanism of the process of flotation separation of uranium (VI) by means of N-alkylpyridinium bromide salts. The collectors contained 10 to 16 carbon atoms in the alkyl chain and were introduced to the uranium-containing solutions as 0.4% alcohol solutions. The most effective was found to be hexadecylpyridinium bromide, so most of the studies were performed using this sorbent. Special experiments were performed on the influence of agitation, before flotation, on the amount of extraction. The results show that regardless of the content of sorbent the upper product always contains two mols of sorbent per mol of colligend. The ratio of carbonate to colligend in the upper product is also always 2:1. The sorbent is therefore introduced to the sublute in protonated form and the internal sphere of the complex should have two negative charges, corresponding to a carbonate complex of the composition  $[\text{UO}_2(\text{CO}_3)_2(\text{H}_2\text{O})_2]^{2-}$ .

A reaction scheme is presented for the formation of the sublute. The process occurs slowly and is accelerated in the area of the phase division boundary. Figures 2; references 2 (Russian).

[318-6508]



MECHANISM OF ACTION OF TRIETHANOLAMINE TRIMETHACRYLATE IN SALT VULCANIZATION OF ELASTOMERS WITH REACTIVE ESTER GROUPS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 6, Jun 83  
(manuscript received 1 Dec 81) pp 1164-1168

ZIMIN, E. V., VOLKOV, V. P., KURLYAND, V. D. and NEL'SON, K. V., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] A study is made of the activating effect of triethanolamine trimethacrylate (TEATM) on salt vulcanization of elastomers with ester groups, on the structure of the vulcanizates and their properties. A copolymer of butadiene with 10% isopropoxycarbonylmethylmethacrylate (BEF-101) was used, obtained by emulsion polymerization at 5°C. The vulcanizing agent used was  $\text{Ca}(\text{OH})_2$ , 10 parts by weight per 100 parts by weight elastomer. Vulcanization was performed in a press at 160°C with subsequent cooling under pressure after vulcanization was completed. The mechanical properties were studied by standard methods. The experiments established that TEATM is an effective salt vulcanization accelerator for elastomers with reactive ester groups. Control experiments on structuring of the elastomer without functional groups (emulsion polybutadiene) by a system containing 10 parts by weight TEATM and 10 parts by weight  $\text{Ca}(\text{OH})_2$  were also performed to determine the nature of covalent bonds formed upon vulcanization of elastomers with ester groups. It was found that at 160°C this system does not structure emulsion polybutadiene, thus indicating that without radical type initiators, homopolymerization of TEATM and its grafting to the rubber do not occur. Figures 4; references 3: 2 Russian, 1 Western.  
[321-6508]

## STUDY OF EPOXIDATION OF ETHYLENE-PROPYLENE RUBBER BY SUPERFORMIC ACID BY METHOD OF PATTERN RECOGNITION

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 13 Aug 81) pp 1116-1122

RYABOVA, M. S., SAUTIN, S. N., VOLIN, Yu. M., LAZAREV, S. Ya. and SHIBAYEV, V. A., Leningrad Institute of Technology imeni Lensovet

[Abstract] Results are presented from studies of epoxidation of ethylene-propylene rubber (type SKEPT) with superformic acid at the moment of liberation (in situ). The introduction of epoxy groups to the ethylenepropylene rubber, having a valuable combination of physical and chemical properties, is intended to improve their adhesive characteristics. The SKEPT rubber had the following composition (mol.%): propylene-41, ethylene-55.9; ethylidene norbornene-3.1., molecular mass 8000, viscosity 360 Pa.s. The study by the method of pattern recognition allowed factors and their combinations most greatly influencing the depth of epoxidation (temperature and reagent ratio) to be recognized. Optimal conditions were found providing for the production of a polymer with 50 to 70% epoxidation: temperature 20-35°C, ratio of hydrogen peroxide to double bonds 3:1, ratio of formic acid to hydrogen peroxide 1:1 or 2:1, polymer concentration in the  $\text{CCl}_4$  solution 0.15-0.20 g/ml, reaction time about 5 hours. Figure 1; references 12: 8 Russian, 4 Western.  
[318-6508]

EXTRACTING URANIUM FROM  $\text{LiF-BeF}_2$  MELT BY A BISMUTH-LITHIUM ALLOY

Leningrad RADIOKHIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 19 Mar 82) pp 301-305

SILIN, V. I., MYASOYEDOV, B. F., LEBEDEV, I. A., PEREVALOV, S. A. and YAKOVLEV, G. N.

[Abstract] A special device for high-temperature extraction was used in a study of extraction of uranium containing  $^{233}\text{U}$  from an  $\text{LiF-BeF}_2$  melt in a Bi-Li alloy at 600-655°. The  $\text{UF}_4$  concentration in the initial salt did not exceed 0.2 mol percent. In some experiments, in the salt phase,  $\text{CeF}_3$  with  $^{144}\text{Ce}$  or  $\text{NdF}_3$  with  $^{147}\text{Nd}$  was introduced in a concentration of no more than 0.15 mole percent. A linear dependence of coefficient of uranium distribution at 650° on the coefficient of lithium distribution with an angular coefficient of nearly three was found. Under uniform experimental conditions uranium was extracted much more readily than rare earth metals. At 600°, the value  $D_u$  reached  $2 \cdot 10^2$  at a lithium concentration in the alloy of nearly 1 atmosphere

percent, making possible separation of uranium from rare earth elements with a distribution factor of 100-200. The high-temperature extraction device is illustrated and described. Figures 3; references 12: 5 Russian, 7 Western. [339-2791]

#### EXTRACTION OF TETRAVALENT BERKELIUM BY NEUTRAL ORGANOPHOSPHORUS COMPOUNDS

Leningrad RADIOKIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 24 Apr 82; after revision, 16 Dec 82) pp 305-313

MALIKOV, D. A., MILYUKOVA, M. S., MYASOYEDOV, B. F. and KUZOVKINA, Ye. V.

[Abstract Isotopes  $^{249}\text{Bk}$ ,  $^{241}\text{Am}$ ,  $^{243}\text{Cm}$ ,  $^{232}\text{Th}$ ,  $^{95}\text{Zr}$ ,  $^{95}\text{Nb}$ ,  $^{152-154}\text{Eu}$ ,  $^{144}\text{Ce}$ ,  $^{137}\text{Cs}$ ,  $^{106}\text{Ru}$ , and  $^{90}\text{Cr}$  were used in a study of extraction of tetravalent berkelium from mineral acid solutions by tributylphosphate (TBP), trioctylphosphinic oxide (TOPO) and triphenylphosphinic acid (TPPA). The effect of concentration of the acids, extrahents, nature of the solvent and other factors on the distribution coefficient of berkelium (IV) was determined. It was found that TBP, TOPO and TPPA extract berkelium from mineral acid solutions under specific conditions. Berkelium (IV) was extracted most effectively from nitric acid solutions but was extracted from sulfuric acid and hydrochloric acid solutions only by TOPO solutions. Trialkylphosphinic acids were the best extrahents of the neutral organophosphorus acids because they have the highest basicity. Berkelium (IV) was extracted from nitric acid media in the form of a disolvate of berkelium tetranitrate  $\text{Bk}(\text{NO}_3)_3 \cdot 2\text{S}$  where S is TBP, TOPO or TPPA. Figures 6; references 18: 9 Russian, 9 Western. [339-2791]

#### EXTRACTION OF TETRAVALENT BERKELIUM FROM SULFURIC ACID SOLUTIONS BY PRIMARY ALKYLAMINES

Leningrad RADIOKIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 24 Apr 82; after revision, 16 Dec 82) pp 313-316

MALIKOV, D. A., MILYUKOVA, M. S., KUZOVKINA, Ye. V. and MYASOYEDOV, B. F.

[Abstract] A study of extraction of berkelium (IV) from sulfuric acid solutions by primary alkylamines and determination of the composition of the extracted compound were done with the use of radiochemically pure berkelium- $^{249}$  and  $^{241}\text{Am}$ ,  $^{243}\text{Cm}$ ,  $^{152-154}\text{Eu}$ ,  $^{137}\text{Cs}$ ,  $^{104-106}\text{Ru}$ ,  $^{90}\text{Sr}$  and  $^{95}\text{Zr}$ -- $^{95}\text{Nb}$ . The degree of extraction was determined radiometrically. The effect of the concentration of the acid, the oxidizing agent, the concentration of the extrahent and nature of the solvent on the coefficient of distribution of berkelium (IV) was

studied. It was found that berkelium (IV) is extracted most completely by decylamine in chloroform from solutions of 0.05-0.9 mole/liter of sulfuric acid, containing 0.5 mole/liter of  $\text{KBrO}_3$ . Berkelium (IV) may be reextracted from the organic phase by using 1 mole/liter of nitric acid. Berkelium (IV) Sulfate was extracted by primary amines in a disolvate form. A study of transplutonium, rare earth and fragmentation elements under optimal conditions for berkelium (IV) extraction showed that this system may be used to purify and separate berkelium (IV) from trivalent transplutonium, rare earth and some fragmentation elements. Figures 4; references 7: 5 Russian, 2 Western.  
[399-2791]

UDC 541.15

#### RADIOLYSIS OF TRIBUTYLPHOSPHATE IN PRESENCE OF PLUTONIUM AND URANIUM

Leningrad RADIOKHIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 14 Mar 82) pp 330-336

KULIKOV, I. A., KERMANOVA, N. V. and VLADIMIROVA, M. V.

[Abstract] Yields of formation of dibutylphosphoric acid (DBPA) and monobutylphosphoric acid (MBPA)+ $\text{H}_3\text{PO}_4$  (products of nitration and carboxylation) were determined during alpha- and gamma-radiolysis of a two-phase system (30 percent tributylphosphate (TBP) and n-paraffin plus 3 moles/liter of  $\text{HNO}_3$  in the presence of  $\text{Pu}^{(\text{IV})}$  and  $\text{U}^{(\text{VI})}$ ). Yields of formation of  $\text{Pu}^{(\text{IV})}$  complexes with DBPA and MBPA in the two-phase system were determined. Kinetic calculations of DBPA accumulated were presented and radiation gas liberation from the organic phase was discussed. Concentration of complexes of  $\text{Pu}^{(\text{IV})}$  with TBP, DBPA and MBPA in the organic phase were determined spectrophotometrically. It was found that, with an increase of  $[\text{Me}]$  from 0.01 to 0.3 moles/liter, G DBPA is increased from 1.9 up to 3.0 and G MBPA increases from 0.3 up to 0.45 mole/100 eV. Maximum yield of decomposition of TBP, equal to  $\sim 6.0$  moles/100 eV, was calculated on the basis of the experimental data. Figures 3; references 9: 4 Russian, 5 Western.  
[339-2791]

UDC 628.4:047:546.33'131

#### INTERACTION OF ROCK SALT WITH GLASSES, SIMULATING HARDENED RADIOACTIVE WASTES

Leningrad RADIOKHIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 12 Jan 82) pp 389-397

RODIONOV, Yu. I., KLOKMAN, V. R., KOVARSKAYA, Ye. N., KRIVOKHATSKIY, A. S., MAKSIMOV, V. F. and POTAPOVA, T. S.

[Abstract] A study was made of the process of burying radioactive waste, in glass containers, in solid rock formations. Interaction of phosphate glasses, simulating highly-active radioactive wastes, with NaCl and the behavior of the

radionuclides and of the enclosing rock itself in the rock cooling process were described and discussed. A study of the distribution of indicator amounts of cesium-137, strontium-89 and cerium-144, introduced into the phosphate glass between the glass and salt melts showed that the phosphate glass is only slightly soluble in the NaCl melt and its dissolution proceeds due to its interaction with the NaCl melt. Cesium passed almost completely into the salt melt from the glass while phosphates of cerium and strontium passed into the salt phase to a much lesser degree. Consolidation of the burial cavity was determined on the basis of data concerning distribution of rock salt admixtures at the time of its directional crystallization. Complete dissolution of the hardened radioactive waste in the rock salt produced uniform distribution of the radionuclides in it and the melt become spheroidal and produced concentration of the radionuclides and macrocomponents (phosphates and anhydrides) from the periphery to the center according to their coefficients of crystallization, in proportion to consolidation of the molten sphere. This concentrated the radionuclides in the core of the consolidating sphere. This central part of the consolidating melt was surrounded by a monocrystalline shell of salt which is stronger than the surrounding salt mass and this is an additional barrier to penetration of the radionuclides into the environment. Figures 7; references 11: 8 Russian, 3 Western.  
[339-2791]

UDC 546.96

#### BEHAVIOR OF RUTHENIUM-106 IN OCEAN WATER-BOTTOM DEPOSIT SYSTEM

Leningrad RADIOKHIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 15 Feb 83) pp 406-409

SHVEDOV, V. P. and PUSHLENKOVA, N. M.

[Abstract] Behavior of microquantities of nitroso-nitrate and chloro-complexes of ruthenium-106 in an ocean water-bottom deposit system in relation to the nature of the sorbent and the composition of the chemical complex of ruthenium was studied. Atlantic Ocean bottom deposits (carbonate sludge from a depth of 2906 meters and red clay from a depth of 5770 meters) were used as sorbents. Ruthenium-106 was added to standing ocean water in the form of nitroso-nitrate and chloro-complexes. Nitroso-nitrate complexes of ruthenium were firmly fixed by both sorbents and did not pass into solution even after the number of desorptions. Chloro-complexes of ruthenium were fixed less firmly to the bottom deposits and partially pass into solution but the major part (~ 80 percent) was irreversibly adsorbed by the bottom deposits studied. Thus both methods showed that the bottom deposits studied irreversibly fix ruthenium-106 found in the colloidal fraction of sea water; therefore it is readily trapped by the suspension. The study showed the possibility of ruthenium accumulation in bottom deposits, especially in the shelf zone. Figures 2; references 9: 8 Russian, 1 Western.  
[339-2791]

## USE OF NATIVE CLINOPTILOLITE TO REMOVE CESIUM AND STRONTIUM FROM WASTE WATERS

Leningrad RADIOKIMIYA in Russian Vol 25, No 3, May-Jun 83  
(manuscript received 10 Jan 82) pp 411-414

CHERNYAVSKAYA, N. B., KONSTANTINOVICH, A. A., ANDREYEVA, N. R., VOROB'YEVA, G. Ye and SKRIPAK, I. Ya.

[Abstract] A study of the possibility of use of native [Soviet] clinoptilolite to remove cesium and strontium radionuclides from solutions was performed with the use of clinoptilolite samples from the GSSR because these samples have the best sorption properties. It was found that clinoptilolite can be used effectively to remove cesium and strontium radionuclides from the solutions studied. Strontium adsorbed by the clinoptilolite can be desorbed by an ammonium nitrate solution with a concentration of 4 moles/liter. After desorption of cesium and strontium, clinoptilolite can be reused, although its cost makes single use possible. After proper treatment, clinoptilolite may be buried with the adsorbed radionuclides. Figures 5; references 5: 3 Russian, 2 Western.

[339-2791]

## ROLE OF PROTEIN-LIPID COMPONENTS OF NATURAL RUBBER IN STRUCTURE FORMATION PROCESSES

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 (manuscript received 17 Nov 82)  
pp 3-5

VOLGIN, V. A., TUTORSKIY, I. A., LAZAREV, Yu. A. and POLIVITSEV, O. F., Moscow Institute of Precision Chemical Technology imeni M. V. Lomonosov

[Abstract] Differences in resins based on natural and synthetic rubbers are apparently related to the presence of non-rubber components that affect the conformation and association of polyisoprene molecules and gel formation. The authors attempted to increase the cohesion of SKI-3 polyisoprene by mechanical addition of protein, without success. Somewhat better results came when protein with a covalent bond was added. Study of the development of ordered structures related to proteins and lipids in various types of polyisoprene by X-ray structural and calorimetric methods showed that in natural and synthetic polyisoprenes a mosaic-like membrane structure emerged. In production and storing of natural rubber films, the lipids formed a separate phase, while protein macromolecules or their fragments associated to form a protein-polyisoprene complex. Figures 3; references 6: 5 Russian, 1 Western.

[333-12131]

MOLECULAR WEIGHT DISTRIBUTION OF SKD-SR RUBBER AND TECHNOLOGICAL PROPERTIES OF MIXTURES BASED ON IT

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 (manuscript received 10 Jan 83)  
pp 5-7

GRECHANOVSKIY, V. A., ZABORISTOV, V. N., RAYSKIY, S. N. and CHISTYAKOVA, S. M. (with DOMOGATSKAYA, M. I. and KOVESHNIKOV, V. S.), Yefremov Synthetic Rubber Plant; All-Union Scientific Research Institute for Synthetic Rubber imeni S. V. Lebedev

[Abstract] SKD-SR butadiene with up 70-80% 1,2-links, used in asbestos, abrasive and resin industries in place of SKB rubber, can be improved by regulating its molecular weight distribution [MMR] during elastomer synthesis. The authors analyzed this parameter with a gel-penetrating chromatography method permitting collection of data under full production conditions. Statistical results showed that expansion of the MMR of SKD-SR rubber by introduction of low-molecular weight polymers gave improved technical characteristics. The error in determining mass did not exceed 5%, and in determining numerical MM values it was less than 10%. Figures 2; references 5 (Russian).  
[333-12131]

IMPROVING QUALITY OF SKD-SR RUBBER

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 pp 7-8

DINER, Ye. Z., ZABORISTOV, V. N., RYAKHOVSKIY, V. S. and KROL', V. A., Yefremov Synthetic Rubber Plant, All-Union Scientific Research Institute for Synthetic Rubber imeni S. V. Lebedev

[Abstract] To eliminate antiquated production processes for SKB synthetic rubber and provide modern corresponding products of analogous rubber with 50-70% 1,2-links and broad molecular weight distribution in the polybutadiene, the authors worked on improving process stabilization by removing destabilizing impurities and on selection of optimal formulas and mixing procedures. As a result of these improvements, the same equipment was able to produce more homogeneous rubber with improved viscosity spread, shrinkage and critical tolerance during rolling when filled with industrial carbon. Although the product has replaced previously-used SKB rubber in synthetic leather and electrotechnology, and has received wide use elsewhere, some technical characteristics have not been objectively evaluated. Applications of variants SKD-SRS and SKD-SRSM in construction and in products contacting human skin are cited. References 8 (Russian)  
[333-12131]

## PERMEABILITY OF RESINS FOR LIQUID COOLANTS

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 (manuscript received 31 Mar 82)  
pp 10-11

BONDARENKO, E. L. and UTLENKO, Ye. V., "DF" [expansion uncertain, perhaps:  
Far Eastern Branch], Scientific Research Institute for Rubber Production

[Abstract] Membranes for pressure equalizers in heat regulation systems should have minimal permeability. The authors studied production rubbers to measure this parameter for isooctane, polymethylsiloxane, distilled water, and ethanol and ethylene glycol in both pure and 40% solution variants. Tests in sealed glass containers that withstood 50% compression showed insignificant amounts of diffusion of aqueous solutions of ethanol and ethylene glycol after a 15-day regime of heating (up to 90°C) and cooling. Results for four rubbers are presented. References 7: 6 Russian, 1 Russian translation from English.  
[333-12131]

UDC 628.028.418:66.085.3/5

## DETERMINING DURABILITY OF BOND BETWEEN RESIN AND FABRIC IN RESIN-FABRIC SAMPLES RADIATED BY ACCELERATED-ELECTRON BEAM

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 (manuscript received 1 Jan 82)  
pp 13-14

FEDOSEYEVA, T. S., KAMZOLOVA, Z. A., TOMCHIN, L. B. and KUZ'MINSKIY, A. S.,  
Scientific Research Institute for Rubber Production

[Abstract] A previous study showed the use of radiation vulcanization for producing automobile roofs, but the durability of such laminates was not investigated (Kaplunov, M. Ya., et al., KAUCHUK I REZINA, No 4, 1963, pp 10-13). The authors studied SKMS-30ARK resin applied to TA-100 fabric in 0.3 mm thickness; the resulting laminate was folded and treated with 130°C and 0.45-2.8 MPa pressure. Next the laminate was irradiated with 1.5 Mev. Results indicated that a durable, high quality product was obtained by this procedure if the laminate was subjected to at least 1 MPa of pressure before irradiation. The high level of adhesion was attributed to a chemical bond between resin and fabric. Figures 2.  
[333-12131]



PRINCIPLES FOR CREATING ACTIVIZING SYSTEMS FOR EFFECTIVE ELASTOMER  
VULCANIZATION

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 (manuscript received 27 May 82)  
pp 16-19

SHERSHNEV, V. A., KHODZHAYEVA, I. D. and TARASOVA, Z. N., Moscow Institute  
for Precision Chemical Technology imeni M. V. Lomonosov

[Abstract] The authors studied the roles of oxides and metal salts in polymer cross-linking on the examples of disulfide-tetramethylthiuramidisulfides, dibenzothiazolyldisulfides, and dithiodimorpholines. Two categories of oxides were examined, those with little effect on kinetic patterns (magnesium, calcium, tin, gallium, indium, thallium, germanium, nickel and cobalt) and those which brought significant change in cross-linking degree (zinc, cadmium, mercury, lead and bismuth). The metal oxides activate vulcanization by localizing chemical reactions on their surfaces and forming increased numbers of lateral bonds near oxide particles. They are frequently used with sulfur-containing compounds due to their great sensitivity to localizing reactions of vulcanizing agents, since these agents, accelerators and chemically-absorbed elastomer macromolecules all become involved in reactions. Vulcanization of butyl rubber proceeded with nearly complete elimination of sulfur without a zinc oxide additive, while with it up to 50% of the sulfur was retained. Diethyldithiocarbamate was found to adsorb onto the zinc oxide surface. The role of surface-active zinc compounds in efficient vulcanization is also discussed. A quantitative description to topochemical reaction processes in the elastomer was generated. Vulcanizers with hexachloro-paraxylene were found to contain significant amounts of bound chlorine. The structures formed provided improved technical properties in the vulcanized elastomers produced. References 16: 14 Russian, 2 Western.

[333-12131]

UDC 678.049:N.765

NEW SYNTHETIC PLASTICIZER FOR BUTADIENE RUBBER

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 pp 19-20

ZABORISTOV, V. N., ANOSOV, V. I., PROKHOROV, N. I. and DOMOGATSKAYA, M. I.,  
Yefremov Synthetic Rubber Plant imeni S. V. Lebedev

[Abstract] A synthetic plasticizer, named SKD-NT, was developed for cis-1,4-butadiene rubber (SKD), which consisted of a highly aromatized oligobutadiene with high affinity for SKD. Production costs for SKD-NT were calculated to be less by a factor of 3-5 than for SKDN-N. The new plasticizer was also highly stable and simple to produce.

[333-12131]

## COPOLYMERIZATION OF BUTADIENE DIMERS AND TRIMERS AND USE OF RESULTING POLYMERS FOR PLASTICIZING BUTADIENE RUBBERS

Moscow KAUCHUK I REZINA in Russian No 6, Jun 83 pp 23-25

ZABORISTOV, V. N., ANOSOV, V. I., ANTONOVA, N. G. and DOMOGATSKAYA, M. I.,  
Yefremov Synthetic Rubber Plant imeni S. V. Lebedev

[Abstract] Stereospecific polymerization of butadiene-1,3 with titanium catalysts leads to side products that researchers have sought to eliminate without success. One of them, 1-vinylcyclohexene-3 (VCH), is known to polymerize in the presence of cation catalysts such as sulfuric acid and aluminum chloride. Both laboratory and production tests showed that with increased concentrations of oligomers in the initial mixture, copolymerization rates increased, and increasing temperatures to 200°C brought full trimer polymerization, reduced dynamic viscosity and lower molecular parameters. The temperature dependence of the iodine number was related to side isomerization and cyclization of, especially, VCH, but there were significantly fewer vinyl links in the copolymer than in VCH. Infrared and NMR spectra showed that the product obtained was a dimer-trimer butadiene with varying molecular mass and a high polydispersion coefficient. Its technical properties surpassed those of the initial butadienes and dynamic characteristics were improved with little loss in durability. Figures 2; references 8: 5 Russian, 3 Russian translations from Western languages.

[333-12131]

UDC 628.337:628.387

ELECTROCHEMICAL PURIFICATION OF EFFLUENT WATERS FROM PRODUCTION OF ORGANIC DYES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 25 Jun 81) pp 1167-1169

ENDYUS'KIN, P. N.; SELEZENKIN, S. V. and DYUMAYEV, K. M., Scientific Research  
Institute of Organic Intermediates and Dyes

[Abstract] This work studies the purification of waste water from the production of direct and active dyes in continuous-action electrolyzers with anodes of titanium covered with ruthenium and titanium oxides in the presence of catalysts. Laboratory one-liter electrolyzers used in the production of sodium chlorate, chlorine and caustic soda were tested. The influence of electrolysis conditions (pH, temperature, concentration and form of catalyst) on the degree of purification of waste waters of organic impurities was studied with a volumetric current density of 30A/l. The possibility was demonstrated of achieving deep degrees of purification of waste water from the production of direct and active dyes by electrolysis in the presence of catalysts, allowing organization of waste-free technology for production of dyes by returning the common salt obtained by evaporation of the purified waste to salting, the condensate to the synthesis of the dyes. Figures 2; references 4 (Russian). [318-6508]

UDC 628.344

PURIFICATION OF ZINC-CONTAINING EFFLUENT WATERS WITH PHOSPHORIC ACID

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 56, No 5, May 83  
(manuscript received 20 Jul 81) pp 1169-1172

KUDRYAVTSEV, A. I., PECHKOVSKIY, V. V. and PLYSHEVSKIY, S. V., Belorussian  
Institute of Technology imeni S. M. Kirov

[Abstract] The purpose of this work is to study the conditions of purification of zinc-containing waste waters by precipitation with phosphoric acid alone and to determine the composition and properties of the sediment formed. Studies were performed on waste waters from the production of chemical fiber containing  $ZnSO_4$ ,  $H_2SO_4$ ,  $Na_2SO_4$ ,  $Fe^{3+}$ , with pH 1.5-2.5 using phosphoric acid containing

29.3%  $P_2O_5$ , 2.29%  $SO_3$ , 1.9% F, 0.55% Ca and 0.3% Al. The experiments were performed by adding the phosphoric acid and an alkaline reagent (5% soda solution) to the waste water, agitating and separating the sediment. The use of phosphoric acid can increase the degree of purification of zinc-containing waste water to 99.97% zinc removal. The main factor influencing the purification process is the pH, plus the  $P_2O_5/Zn^{2+}$  ratio. Optimal parameters are pH=8.0, ratio=0.50. Study of the properties and composition of the sediment formed showed that zinc precipitates primarily as an amorphous orthophosphate  $Zn_3(PO_4)_2 \cdot 4H_2O$ . The sediment can be used as a concentrated zinc-containing, slow-acting fertilizer. Figures 4; references 6: 5 Russian, 1 Western. [318-6508]

UDC 541.182

#### CONCENTRATION OF ELECTROLYTES BY FILTRATION THROUGH POROUS DIAPHRAGMS

Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 5, No 3, May-Jun 83  
(manuscript received 26 Feb 82) pp 210-214

BORKOVSKAYA, Yu. B. and ZHARKIKH, N. I., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, UkSSR Academy of Sciences, Kiev

[Abstract] The possibility of increasing the concentration of a solution forced through a porous diaphragm during reverse osmosis was discussed. Three physical causes of concentration (special nature of surface forces leading to positive adsorption of the solute by the membrane, difference of coefficients of diffusion of anions and cations--non-symmetry of the electrolyte--and a mechanism which is also effective for a symmetric electrolyte) were discussed. The third mechanism was described in some detail and a formula for retention in cases involving large and small Peclet numbers was presented and discussed for this mechanism for a membrane of spherical particles. The maximal concentration was quite small but the effect of the mechanism can be observed experimentally upon compression of solutions with a concentration near that of a saturated solution. Figures 4; references 13: 11 Russian, 2 Western. [340-2791]

## CHARACTERISTICS OF ELECTROCHEMICAL PURIFICATION OF WASTE WATERS IN HIGH-FREQUENCY ELECTROMAGNETIC FIELD

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 5, No 3, May-Jun 83  
(manuscript received 24 Mar 82) pp 248-251

KOVALEV, V. V. and BAND, M. I., Design and Construction Technological Institute for Domestic Electric Motors and Devices, UkSSR Academy of Sciences, Kiev

[Abstract] The effect of application of a high-frequency electromagnetic field (HFEM) on electrochemical purification of waste waters, with the use of steel electrodes for activating electrode processes and increasing the effectiveness of purification, was discussed. The experiments were performed on a device consisting of a flow electrolyzer placed in the field of an inductor switched into a HFEM generator. The experiments showed the need for modification of this device by addition of a magnetic filter. A model solution was used which contained 50 mg/liter of hexavalent chromium and a variable amount of a surface active substance (sulfonol) within limits of 5-20 mg/liter. The studies showed that electrochemical processing of waste water with application of a HFEM field activates electrode processes and forms a ferromagnetic suspension which can be readily separated in a magnetic field with improvement of the efficiency of the purification process. Figure 4; references 8: 7 Russian, 1 Western.  
[340-2791]

## METHODS AND REAGENTS FOR DECONTAMINATING WATER PURIFICATION SEDIMENTS

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SHKAVRO, Z. N., KUL'SKIY, L. A., MEDVEDEV, M. I., ROMANENKO, N. A. and MUZYCHUK, N. T., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, UkSSR Academy of Sciences, Kiev; Institute of Medical Parasitology and Tropical Medicine, USSR Ministry of Health, Moscow

[Abstract] A review of the literature showed that procedures, used in practice and proven under laboratory and semi-industrial conditions to decontaminate sediments, include non-reagent and reagent methods. Non-reagent methods discussed include: the use of fermentation tanks, composting the sediment, thermal processing, irradiation, ultraviolet and ultrasonic exposure, use of electrohydraulic impact energy and use of an electric current. Reagent methods are included in a table listing 17 reagents, their purpose, dose used and exposure time. The effectiveness of decontaminating reagents and the capacity to change the pH of the medium being treated was discussed in considerable detail. Figures 4; references 35: 21 Russian, 14 Western.  
[340-2791]

PHYSICAL CHEMICAL PROPERTIES AND BIOLOGICAL ACTIVITY OF WATER SYSTEMS SUBJECTED TO RADIATION AND MAGNETIC ACTION

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BESKROVNIY, A. M., KOVPAK, L. A., KOTLYARENKO, I. P., SEVERIN, N. F.,  
SUKACHEVA, O. A. and KHASHCHINA, M. V., Kharkov Polytechnic Institute imeni  
V. I. Lenin; Kharkov Physicotechnical Institute, UkSSR Academy of Sciences

[Abstract] Mechanisms of formation of activated substances under conditions of a weak ionizing action upon aqueous solutions were studied in relation to electron absorption spectra, the Kerr effect and the biological activity of specific model systems containing organic-mineral or mineral components. It was found that physical chemical changes and the increase of biological activity of the aqueous solutions studied were caused by formation (under the effect of magnetic and electromagnetic action) of energy-saturated metastable complexes of transition metals with water-soluble organic and inorganic components and by the water itself, and, also, by a change of structure of solvates of ions of non-transition metals. Further study of these mechanisms is recommended. Figures 2; references 11 Russian.  
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