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# SCIENTIFIC INFORMATION REPORT

Chemistry and Metallurgy

(24)

Summary No. 4160

2 January 1963

Prepared by

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SCIENTIFIC INFORMATION REPORTChemistry and Metallurgy (24)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics, are issued monthly. The fifth series, Chinese Science, is issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every 6 weeks. Individual items are unclassified unless otherwise indicated.

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## I. Chemistry

Insecticides1. Cautious Use of Insecticides Urged To Avoid Killing Honeybees

Do Not Permit Destruction of Bees From Poisoning," by S. S. Nazarov, Candidate in Veterinary Sciences, Institute of Apiculture, in Rybnoye village, Ryazan Oblast; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 10, 1962, p 12-13

The article mentions damage done to honeybees by careless use of insecticides. A study of the problem shows polychlorcamphene to be relatively safe. Especially dangerous are hexachlorane, DDT, arsenic, and phosphorus compounds. Crop-dusting seems to be more deleterious to bees than sprinkling. Also, studies done by G. I. Korotkikh, A. M. Churakov, and A. G. Leskin in the Voronezhskiy and Belgorodskiy oblasts, in collaboration with the Institute of Apiculture, in Rybnoye village, Ryazan Oblast, show night sprinkling to be much less harmful than daytime.

2. Esters of Carbamic Acids Synthesized and Tested

"From the Field of Organic Insectofungicides LXVI. Synthesis and Insecticidal Properties of the Esters of Some Carbaminic Acids," by K. B. Shvetsova-Shilovskaya, M. M. Mel'nikov, Z. I. Maksimova, T. S. Zakharova, and L. P. Bocharova, Scientific Institute for Fertilizers and Insectofungicides imeni Ya. V. Samoylov; Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3230-3232

Carbaminic acid esters were recently proposed as active agents to combat plant pests. In many cases, these compounds are more active than organophosphorus compounds or halogen derivatives of hydrocarbons, while the 1-naphthyl ester of methylcarbaminic acid, otherwise known by its trade name of "Sevin," is successfully competing with DDT. Therefore, various esters of alkyl and aryl carbaminic acids were synthesized for the first time and their insecticidal activity tested.

Tests conducted on rice fields show that esters of aryl carbaminic acids are practically inactive, while esters of alkyl carbaminic acids are active, although the activity of the latter decreases with increasing size of the aliphatic radical bound to the nitrogen.

3. Accomplishments of Some Nikitskiy Botanical Garden Scientists Listed

"In the Nikitskiy Botanical Garden," by I. Z. Livshits, head of the Department of Entomology and Phytopathology of the State Nikitskiy Botanical Garden, and N. I. Petrushova, senior scientific co-worker; Moscow, Zaschita Rasteniy ot Vreditel'ey i Bolezhey, No 10, 1962, p 8-9

The occasion of this article is the 150th anniversary of the State Nikitskiy Botanical Garden. After discussing the achievements of its early years, it mentions recent accomplishments of this institution's scholars.

I. Z. Livshits, N. I. Petrushova, S. M. Galetenko, and V. N. Domanskiy have all done valuable work in the field of fruit protection.

Chemical protection methods worked out by F. N. Maksimov, A. T. Parfenov, G. M. Burov, Yu. A. Grevin, and S. A. Kisriev have raised fruit production from 50 to 87 centners/hectare, tripled the yield of high-grade fruit, and lowered worm damage of apples from 60 to 2% -- all in the past years. These scientists worked in conjunction with the Scientific-Research Institute for Fertilizers and Insectofungicides imeni Ya. V. Samoylov, the All-Union Institute for Plant Protection, the Kiev Institute of Labor Health and Professional Illness, the Ukrainian Nutrition Institute, and the Kiev Institute for Development of Doctors.

Works published from this institution include V. P. Valil'ev's and I. Z. Livshits's "Pests of Fruit Cultivation" (1958); "Protection of the Fruit Orchard From Pests and Diseases," by I. Z. Livshits and N. I. Petrushov; S. M. Galetenko's work on leaf-rollers; L. I. Vasil'eva's and S. A. Gutskevich's paper on fungus flora of ornamental vegetation on the south bank of the Crimea; etc.

4. New Pest Control Program Reported

"In Cooperation With Scholars of the Nikitskiy Botanical Garden," by L. G. Volkov, director of the sovkhos, and S. A. Kisriev, agronomist in the field of plant protection; Moscow, Zashchita Rasteniy ot Vreditel'ey i Bolezney, No 10, 1962, p 9-11

A new successful antipest method based on DDT, sulfonates, mercaptophos, methylmercaptophos, and methyl ethylthiophos has wiped out many insect pests in orchards of the sovkhos imeni V. P. Chkalov. The program was developed by scientists of the Nikitskiy Botanical Garden and Crimean Sovnarkhoz led by I. Z. Livshits, director of the division of entomology and phytopathology of the Nikitskiy Botanical Garden, and F. N. Maksimov, deputy director of management for food and light industry of the sovmarkhoz.

The sovkhos has also raised output by doing much of the market processing of the fruit, thus eliminating much of the damage to the fruit between orchard and market.

The antipest program planned by the sovkhos toxicology laboratory is being led by the head of the laboratory N. I. Petrushova, scientists S. M. Galetenko and V. N. Domanskiy, graduate student A. V. Kislyy, and senior laboratory worker D. A. Kolesova.

5. Proposed Alterations for ONK Spray-Pump

"Remodeling the ONK Spray-Pump," by V. N. Ilyushchenko, plant protection agronomist of Uzhgorod Rayon; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 10, 1962, p 18-19

The article describes proposed changes in the ONK combination sprayer.

A ventilator and a universal joint from the spraying device, without a rubber hose are used for spraying orchards, vineyards, and potatoes. In remodeling, the garden funnel will be shortened and fitted with a third sprayer at a different angle. The spray apparatus of the ONK dusting device, used for wetting powdered chemicals, will be redesigned for this. The angle of the outside sprayer with the central sprayer is 30-35°. At 10-20 atmospheres of pressure, the liquid is distributed to a height and breadth of 6-8 meters.

For potatoes, the sprayer is adjusted for greatest breadth (8 meters). An overlapping spray covers the path of the tractor.

A two-sided spray is proposed for vineyards.

These alterations should be easily accomplished and will increase the machine's efficiency.

6. New Aerosol Devices Described

"Future Development of Aerosol Equipment," by G. I. Korotkikh;  
 Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 10, 1962,  
 pp 16-17

"The following table describes machines recently put into use or which  
 have passed government tests.

	<u>AG-UD-2</u>	<u>AG-UD-2M</u>	<u>AG-OUN-4-6</u>	<u>BAG-15</u>	<u>"Raketa"</u>	<u>"Mikron"</u>
Motor	UD-2	U-D2	Tractor	Heli- copter	Tractor	Pulsating reactor
Horsepower	8	8	--	--	--	--
Weight (kg)						
Without fuel	200	210	200	80	283	19.5
With fuel	230	240	800	280	608	30
Capacity of tank for solution (liters)	No	No	600	338	290	12.5
Capacity of tank for fuel (liters)	30	30	30	No	35	2.5
Output of solution (liters/minute)*	9/6	18/26	10/10	10/10	9/10	0.5
Output of fuel (kg/hr)	18	18	12	12	18	2
Temperature of gases	380-580°	440-520°	380-580°	550°	535°	220°
Temperature of mixture	180-220°	80-100°	180-220°	180°	175°	110°
Operating personnel (besides driver or pilot)	1	1	--	--	--	1

\*Numerator, mist-spray; denominator, fine sprinkling.

"The AG-UD-2 generator has an autonomous air-cooled gasoline motor and can be mounted on any sort of vehicle for transporting. It is used for mist-spraying and for fine sprinkling. Modernization of this machine done by the All-Union Institute of Forestry and Mechanization will make it possible to increase this apparatus's spraying power to 26 liters/minute, after the changes pass government tests.

"Generator AG-16 can use spraying and dusting preparations OUN-4-6 and OTN-4-8 and is especially good for spraying young cotton plants.

"The L'vov State Special Design Bureau has developed a new tractor-mounted generator, "Raketa," and the smaller "Mikron," which can be mounted on a wheelbarrow or on a man's back. Both will soon go into production. The Raketa can be mounted on a 0.9- to 1.4-ton tractor and is reliable and simple, though some improvements are necessary. For example, flow of the working solution should be made freer by enlarging the connections, and gasoline supply taps in the combustion chamber should be replaced by jet nozzles. For the convenience of the driver, the control panel should be placed beside him (not behind), the indicator for the level of the working solution should be in the tank, and there should be a steering wheel for guiding the tractor through angular plantings. It should also have a separate 15-liter tank and mixing chamber for herbicides for use in chemical rinsing of seedlings.

"The Mikron will be used for pesticides in garden plots, to kill Colorado beetles on potatoes, for disinfecting living quarters, and for weed killers.

"The AG-D generator was built by the All-Union Institute of Forestry and Mechanization using a "Druzhba" motor (3.5 hp) and a centrifugal ventilator. It is adapted for forestry since it has a large mist-spraying capacity (8 liters/minute) and can be pulled easily through the forest by a horse team.

"The VAG-25 generator is suitable for helicopter use. The generator, made by the Siberian division of the Academy of Sciences USSR, using the TU-104 motor, has an output of 100 and more liters/minute.

"The use of aerosols is limited by a scarcity of toxicants which can be used as mist-sprays: industrial DDT and GKhtsG, 50%-polychlorpinene in diesel oil, 2,4-D esters, etc."

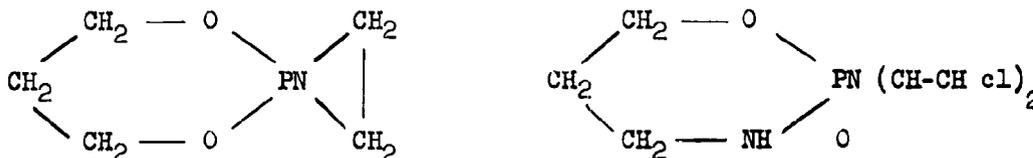
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Medicinal Chemistry7. New Cytostatic Agents Synthesized

"Glycolphosphorus Ethyleneamide Acids," by N. P. Grechkin and L. N. Grishina, Chemical Institute imeni A. Ye. Arbuzov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 146, No 6, 21 Oct 62, pp 1333-1334

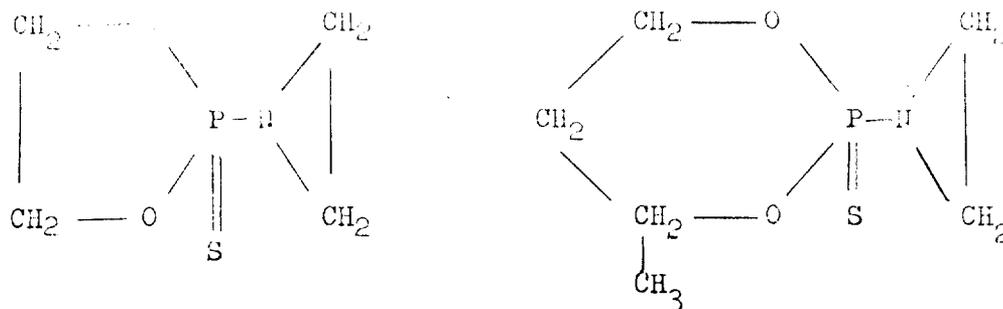
Esters of glycolphosphorus and phosphonous acids are now fully available and well-studied compounds. In a number of works, chiefly A. Ye. Arbuzov and his students, numerous such compounds were described and their properties studied. The authors of these works succeeded in showing that esters of glycolphosphorus acids engage in the Arbuzov rearrangement with or without opening up of the ether ring. It was also noted that certain esters are capable of polymerization. Later, both of these reactions were utilized for the preparation of phosphorus-containing polymers.

Glycolphosphorus acid amides have been studied to a much lesser extent, although these compounds have undoubted theoretical and practical interest, especially from the standpoint of their physiological activity. It seemed particularly interesting to us to study the cytostatic properties of the previously unstudied glycolphosphorus acid ethyleneamides and their derivatives with pentavalent phosphorus in connection with the presence of the ethyleneimine ring and to draw an analogy with di-(beta-chloroethyl)-amides of cyclic amido-esters of phosphorus acids of the cytoxan type (V-518) and others the cytostatic of which are well-known.



Undoubtedly, the presence of the reactive ethyleneimine ring provides additional interest to studying the chemical properties of glycolphosphorus acid ethyleneamides.

We synthesized a number of glycolphosphorus acid ethyleneamides by reacting ethyleneimine with acid chlorides in the presence of bases. The chemical properties of these compounds are being studied; it was established that similar to all compounds of trivalent phosphorus, they readily add sulfur to form glycolthiophosphorus acid ethyleneamides.



These compounds are also interesting as potential cytostatic agents

While this work was being prepared, a report appeared in the literature on the synthesis of glycothiophosphorus acid, ethyleneamide from ethyleneglycolthiophosphorous acid chloride, and ethyleneimine; we obtain this compound, as stated above, by addition of sulfur to the corresponding acid chloride; the melting points of the compounds prepared by us and those reported in the cited work are identical. The cytostatic properties of above-described compounds are being investigated, and further studies of their chemical conversions, for example, the Arbuzov rearrangement, ring opening, etc., are being continued.

#### 8. New Cholinolytic Agents Synthesized

"Research on the Formation of Polymethyleammonium Rings II. Synthesis and Conversion of Some Esters of Benzylic Acid," by D. V. Ioffe and S. G. Kuznetsov, Institute of Toxicology, Ministry of Health USSR; Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3237-3244

Several aminoethyl esters of benzylic acid containing a deltalchloro alkyl group on the tertiary nitrogen atom were synthesized. It was shown that in an alkaline medium these compounds are converted into quaternary derivatives of beta- (N-pyrrolidyl) ethyl ester of benzylic acid. Amino alkyl esters of benzylic acid, particularly the N-pyrrolidyl ethyl ester have rather pronounced cholinolytic activity.

Organophosphorus Compounds9. Acetoxy Esters of Trichloroethylphosphonic Acids Synthesized

"Synthesis of Some Esters of Alpha- Acetoxy- Beta, Beta, Beta-Trichloroethylphosphonic Acid," by K.V. Nikonorov and V.A. Nikonenko, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 10, Oct 62, pp 1882-1884

Dialkyl esters of alpha- acetoxy- beta, beta, and beta- trichloroethylphosphonic acid were prepared by treating corresponding dialkyl esters of alpha- hydroxy- beta, beta, and beta-trichloroethylphosphonic acid with acetic anhydride in the presence of a few drops of sulfuric acid. Certain representatives of this class of compounds are known to possess high physiological activity and are being proposed as insecticides and even medicinal preparations.

10. Optical Properties of Some Unsaturated Organophosphorus Compounds

"Raman Spectra and Ultraviolet Absorption Spectra of Some Unsaturated Organophosphorus Compounds," by Ye.M. Popov, Ye.M. Tsvetkov, Chang Jung-Yu, and T. Ya. Medved'; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3255-3260

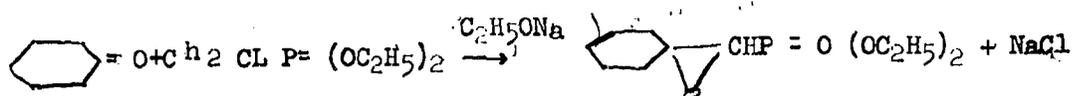
Measurements of both Raman and ultraviolet absorption spectra of allyl compounds of phosphorus failed to show any signs of interaction between the double bond and P=S, and trivalent phosphorus atom separated by methylene bridges. In the case of vinyl compounds of phosphorus, no increase in intensification of lines corresponding to C=C bonds was observed. When the phosphorus atom is bound directly to a C=C group, the Raman spectra shows a decrease in line intensity and frequency of the C=C bond as compared to 1-alkenes.

11. Organophosphorus Compounds Containing Epoxy Ring

"Darsan's Reaction With the Ethyl Ester of Chloromethylphosphonic Acid," by V.F. Martynov and V.Ye. Timofeyev, Leningrad State University; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, p 3449

"The Darsan reaction was never conducted with esters of chloromethylphosphonic acid. We conducted an experiment on the condensation of the ethyl ester of chloromethylphosphonic acid with cyclohexanone in absolute ether in the presence of anhydrous sodium

ethylate under the usual conditions of the reaction. The ethyl ester of chloromethylphosphonic acid used in the reaction was obtained from chloromethylphosphonic acid chloride. We obtained a colorless liquid in 31 percent yield which corresponded to the ethyl ester of epoxy-methylene-cyclohexanephosphonic acid according to analysis data.



"Infrared spectra showed an absorption maximum ( $843_{\text{cm}^{-1}}$ ), which may be ascribed to the oxide ring, and absorption maxima characteristic for the groups: P=O and P-OC. The structure of the product was proved by way of chemical conversion. Study of the product is being continued.

## 12. New Method for the Synthesis of Fluorophosphates

"Esters of Phosphorus Acids With Various Radicals IV. Synthesis of Alkylarylphosphites, Chloro- and Fluorophosphates," by F.L. Maklyayev, M.I. Druzin, I.V. Palagina, R.Ya. Aleksandrova, V.K. Prokhotseva, and R.A. Khamidulina; Moscow Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3421-3425

A new method was developed for the synthesis of fluorophosphates containing various radicals. The method is based on chlorination of mixed dialkyl (alkylaryl) phosphites and substitution of chlorine with fluorine. The product yield is 70 percent in some cases. Twenty-eight new compounds were synthesized by this method.

## 13. New and Simple Method for the Synthesis of Chlorophenyldichlorophosphine

"New and Simple Method for the Synthesis of Chlorophenyldichlorophosphine," by Ye. L. Gefter, Scientific-Research Institute for Plastics; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3401-3403

Chlorophenyldichlorophosphine was synthesized by the reaction of phosphorus trichloride with chlorobenzene in the presence of aluminum chloride. This method resulted in a yield of 75-80 percent. Infrared spectra show that the product consists chiefly of the para isomer, although small quantities of the meta isomer are also present.

14. Stereospecificity in Organophosphorus Compounds Studied

"Synthesis of Stereoisomeric Cyclic Organophosphorus Compounds III. Stereospecificity in Reactions for the Formation of Cyclic Phosphoramidate Esters," by I. Kh. Fel'dman and A.I. Berlin, Leninograd Chemical-Pharmaceutical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3379-3381

3,4-Dimethyl-5-phenyl-2-oxo-2-N'-bis(beta-chloroethyl)amine-2,1,3-phosphoxazolidine was synthesized from d-pseudoephedrine by reaction with phosphorus oxychloride to give 2-chlorophosphoxazolidine as an intermediate which was treated with N-bis(beta-chloroethyl)amine to give the above product. This synthesis route resulted in one of the two possible diastereoisomers and, therefore, demonstrated the possibility of stereospecificity

15. New Esters of Diaminosulphydrylmethylphosphonic Acid Synthesized

"Synthesis of Some Esters of Diaminosulphydrylmethylphosphonic Acid," by M.G. Imaev and M.M. Borisova, Ufa Petroleum Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3360-3362

Two new esters of diaminosulphydrylmethylphosphonic acid not previously described in the literature were synthesized. The esters were prepared by reaction of thiourea with dialkylphosphites.

Esters of diaminosulphydrylmethylphosphonic acid are physiologically active and may be used in the preparation of pharmaceuticals or as anti-oxidant additives to petroleum products.

16. Esters of Unsaturated Phosphonous Acids Synthesized

"Esters of Unsaturated Phosphonous Acids," by M.I. Kabachnik, Chang Jung-yu, and Ue.N. Tsvetkov, Institute of Elemento-Organic Compounds, Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii; Vol 32, No 10, Oct 62, pp 3351-3360

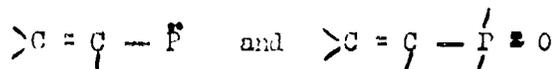
Esters of vinyl-, ethynyl-, allyl-, and p-styryl- and secondary vinylphenylphosphonous acids were synthesized by reaction of organo-magnesium compounds with dialkylchlorophosphites or their analogs. It was shown that esters of vinylphosphonous acid and certain of its analogs engage in reactions characteristic of derivatives of trivalent phosphorus, such as the Arbuzov rearrangement, oxidation, sulfur addition, hydrolysis, and reaction with chlorine. The monobutyl ester of vinylphosphonous acid polymerizes on contact with bases, the dinitrile of bis-azoisobutyric

acid, or on being heated; vinylphenylphosphonous acid polymerizes spontaneously in the absence of initiators. The polymerization is apparently a polyaddition mechanism and results in the formation of heterochain phosphoruscarbon polymers.

17. Behavior of Vinyl Group in Organophosphorus Compounds Studied

"Orientation of Addition and Reactivity of the Vinyl Group in Reactions of Secondary Amines With Vinyl Compounds of Tri- and Pentavalent Phosphorus," by M.I. Kabachnik, Ye.N. Tsvetkov, and Chang Jung-Yu; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3340-3350

A study was made of addition reactions of secondary amines, chiefly piperidine, to vinyl compounds of tri- and pentavalent phosphorus. A number of relationships concerning the reactivity of the vinyl group to the nature of the phosphorus-containing substituent were presented. For example, the addition of piperidine to vinyl groups in conjugated systems of types

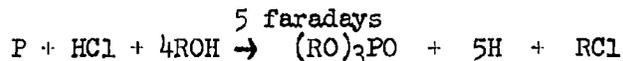


is independent of the valence of the phosphorus and the nature of the substituent in the beta-position.

18. Electrochemical Method for Making Trialkylphosphates Discussed

"Electrochemical Method for Making Trialkylphosphates," by S..L.. Varshavskiy, A. P. Tomilov, and Yu. K. Smirnov; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleeva, Vol 7, No 5, 1962, pp 598-599

The authors discuss their method for making trialkylphosphates. It consists of the electrolysis of an alcohol solution of hydrogen chloride with a suspension of red phosphorus; oxygen is produced at the cathode, and trialkylphosphate and alkyl chloride are formed at the anode. The mechanism of this reaction is not certain but can be expressed by the equation:



By this method, trialkylphosphate has been formed from methyl, ethyl, n-butyl, and n-amyl alcohols.

According to the authors, during electrolysis in allyl alcohol, phosphorus does not enter into the reaction, and the only product at the anode is dichloropropanol.

The authors state that "when isopropyl and tertiary butyl alcohol are used, phosphorus enters into the reaction, but products with high boiling points are formed which separate during distillation in a high vacuum. The nature of the formed products has not been determined.

The authors say that "from the observed facts, the authors recommend this method only for obtaining phosphoric acid esters from saturated primary alcohols of the aliphatic series."

19. Aluminum Derivatives of Organophosphorus Compounds Prepared

"The Reaction of Aluminum Isopropylate With Dialkyl Esters of Methylphosphonic Acid," by K.A. Andrianov and A.S. Shapatin, Moscow Institute of Fine Chemical Technology; Moscow, Izvestiya Akademii Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 10, Oct 62, pp 1753-1756

A study was made of the reactivity of alkoxy groups in esters of methylphosphonic acid in reactions with aluminum alcoholates. Reactants were chosen so that the alkoxy groups located on the phosphorus atom were different from the alkoxy groups located on the aluminum atom. Aluminum isopropylate reacts with diethyl and dibutyl esters of methylphosphonic acid to form simple esters, while the alkoxy groups in esters of methylphosphonic acid have varying degrees of reactivity. Thus, aluminum isopropylate reacts with diethyl and dibutyl esters of methylphosphonic acid to form ethyl and butyl isopropyl esters. Under certain conditions, the reaction may be controlled to form compounds containing methylalkoxyphosphonoxy groups on the aluminum atom. A new compound, methylethoxyphosphonoxy(diisopropoxy)aluminum, was prepared and identified.

Plastics20. Present and Proposed USSR Production Methods for Plastics

"Status and Developmental Prospects for Monomer Production,"  
by D. F. Kutepov; Moscow, Neftekhimiya, Vol 2, No 4, Jul Aug  
62, pp 426-435

Lower olefins, such as ethylene, propylene, butylene, amylene, and other hydrocarbons, are used as starting materials for the production of plastics, synthetic fibers, and synthetic rubbers. It is intended to produce the major portion of ethylene from liquid hydrocarbons obtained from petroleum refineries. Pyrolysis of hydrocarbon stock nets a wide assortment of products. Numerous methods have been developed for pyrolysis of straight-run and gaseous petroleum distillates which are characterized by definite degrees of thermal treatment of the raw material resulting from the preferential formation of particular olefins. According to experimental data, one ton of distillate yields 570-600 kilograms of chemical products, such as ethylene, propylene, isobutylene, benzene, and toluene. Furthermore, about 100 kilograms of gaseous and liquid fractions are also obtained. The gaseous fractions are used as fuel, while the pyrolysis tar is used for certain starting materials in the production of polymers. Therefore, it becomes important to determine an efficient method for the pyrolysis of hydrocarbon stock in order to have economical production of lower olefins.

At the present time, ethylene and propylene are obtained by pyrolysis of gaseous hydrocarbons obtained from petroleum refinery off-gases and well-head gases. This pyrolysis is carried out in tubular furnaces of 3 tons per hour through-put capacity, based on the feed. Ethylene and propylene are separated from the pyrolysis gases chiefly by absorption fractionation in units having a production capacity of 12,000 - 15,000 cubic meters per hour.

Since the tubular furnace still remains as the chief means for pyrolysis it is desirable to examine the possibilities of increasing its production output. At the same time, some of the more advanced production methods, developed at institutes of the Goskhimkomitet and other organizations, should be adopted. These include homogenous pyrolysis for simultaneous production of ethylene and acetylene, high velocity pyrolysis which gives high yields of ethylene and propylene, and oxidation pyrolysis. These processes are characterized by high productivity, relatively simple apparatus, and a concentrated pyrolysis gas which economizes production of olefins.

The capacity of individual units is very significant for the production economy of lower olefins. Typical units should have capacities of 60,000-70,000 tons of ethylene per year, while in some cases, where raw materials are readily available, 120,000 - 150,000 tons per year.

Divinyl and isoprene are used in the production of a great number of monomers. These monomers are used to produce synthetic rubbers of various types, such as divinylstyrene, divinylacrylonitrile, sodium-butadiene, rubbers having a regular structure such as butadiene and isoprene, and also some types of special rubbers such as divinyl-methylvinylpyridine, carboxylate, and various types of synthetic latexes.

Divinyl is the chief monomer for the production of synthetic rubber. It is presently produced by two methods: S. V. Lebedev's method of catalytic decomposition of ethyl alcohol and two-stage catalytic dehydrogenation of butane.

Production of divinyl from alcohol was started in 1933. As a result of much research and improvement of this process, high technical and economic indexes were obtained for this process. However, divinyl obtained from alcohol contains considerable quantities of pseudobutylenes and other impurities. To obtain high-quality synthetic rubber, especially divinyl rubber of regular structure, it becomes necessary to organize special units for concentrating and purifying divinyl obtained from alcohol.

In 1961, units were put on stream for the production of divinyl by a second method: two-stage catalytic dehydrogenation of butane. During the present year, two plants for producing divinyl from butane should be completed. This process is more economical, giving a lower-cost divinyl than that obtained from alcohol.

At the present time, other methods have also been developed for production of divinyl from butane. One such process is the single stage dehydrogenation of butane under vacuum over a stationary bed catalyst and in a fluidized bed. This makes it possible to simultaneously produce divinyl and butylenes. The butylenes may be used in various syntheses or for dehydrogenation to divinyl. These methods seem to have considerable advantages in cost and capital investment over the two-stage dehydrogenation method.

Isoprene is currently produced at one of the synthetic rubber plants by the condensation of isobutylene and formaldehyde to dimethyldioxane which is catalytically split into isoprene and formaldehyde. During the current Seven-Year Plan, two large production units for isoprene utilizing this method will be put into operation. Isoprene, produced by this method, has a high degree of purity and is useful for stereospecific polymerization.

Isopentane is being dehydrogenated into isoprene in a two-stage process in pilot plants similar to that for butane dehydrogenation. This method, however, requires special purification steps. During the Seven-Year Plan, three large-scale production units for isoprene from isopentane should be put into operation. According to calculations, the isopentane dehydrogenation method has certain advantages over the dioxane method.

## C-O-N-F-I-D-E-N-T-I-A-L

Work has begun on single-stage methods of oxidative dehydrogenation of butane and isopentane. Isoprene synthesis by dimerization of propylene followed by demethylation of the dimer presents great interest.

Vinyl chloride is a monomer produced in great quantities. It is used for the production of polyvinyl chloride resins and various copolymers. In the Soviet Union, there are two methods for producing vinyl chloride: dehydrochlorination of dichloroethane in caustic alcohol solution and vapor phase hydrochlorination of acetylene in the presence of a catalyst.

The dehydrochlorination of dichloroethane is a batch process which cannot be readily automated and requires heavy and complex equipment. The vinyl chloride, even after fractionation, contains undesirable impurities which considerably lower the quality of vinyl chloride polymer obtained from it. The hydrochlorination of acetylene process has several advantages, including lower cost and capital investments. It may be adapted to a continuous process with automation which will lead to a higher efficiency in stock utilization and yield a monomer of better quality.

Special attention should be paid to the development of new methods for producing vinyl chloride from ethylene, a cheaper raw material than acetylene. These methods include a combined method for preparation of vinyl chloride from ethylene and acetylene which is based on the utilization of hydrogen chloride that is formed during the reaction process, for subsequent hydrochlorination of acetylene; the method of oxidative chlorination of ethylene by means of which vinyl chloride is produced directly from ethylene and hydrogen chloride; and also the method of direct chlorination of ethylene. Unfortunately, work on the preparation of vinyl chloride by the new methods is proceeding slowly.

Styrene and alpha-methylstyrene are valuable monomers used in the large-scale production of plastics, divinylstyrene rubber, and latexes. At the present time, styrene is obtained by catalytic dehydrogenation of ethylbenzene in isothermal and adiabatic furnaces. The adiabatic furnaces have a three-times greater productivity than the isothermal furnaces, although steam consumption in the adiabatic furnaces is rather high. Alpha-methylstyrene is obtained by oxidation of isopropylbenzene followed by decomposition of the resulting hydroperoxide. Large-scale production units also exist for the preparation of alpha-methylstyrene by dehydrogenation of isopropylbenzene.

Production of styrene and alpha-methylstyrene must be increased by several times. This will require considerable intensification of efforts on improving methods for their synthesis and for the preparation of monomers having a higher degree of purity. It is also necessary to expand work on effective polymerization inhibitors for styrene to replace the presently used hydroquinone, which cannot be entirely removed by fractionation. Residual hydroquinone in styrene lowers the polymerization velocity of styrene during subsequent polystyrene production and lowers its quality.

## C-O-N-F-I-D-E-N-T-I-A-L

Acrylic acid nitrile is the starting material for the preparation of the synthetic fiber "nitron," a wool substitute, synthetic rubbers, plastics, and other polymers. Research was recently done on the synthesis of a graft polymer from acetyl cellulose and acrylic acid nitrile. Such a fiber has higher quality than fiber obtained from acetyl cellulose alone.

At present time, acrylic acid nitrile is being produced from ethylene oxide and hydrocyanic acid. Owing to the high cost of acrylic acid nitrile and the huge capital investment, this method will not receive further industrial development. Another method for the industrial production of acrylic acid nitrile that is based on cyanohydrogenation of concentrated acetylene with hydrocyanic acid will apparently also be discontinued. The most promising method for the production of acrylic acid nitrile appears to be direct synthesis from propylene and ammonia. Owing to the availability and low cost of the starting materials, the cost of acrylic acid nitrile and prepared by this method is half that as produced from acetylene and hydrocyanic acid. In the future, acrylic acid nitrile production from propylene and ammonia should become predominant.

Acetaldehyde is an important intermediate in the production of n-butyl alcohol, 2-ethylhexanol, acetic acid, and its anhydride. Work has begun on polymerization of acetaldehyde into polyacetaldehyde. At the present time, acetaldehyde is obtained by hydration of acetylene and dehydrogenation of ethyl alcohol. As already indicated, future industry will be oriented toward production of acetaldehyde by direct oxidation of ethylene. According to this method, acetaldehyde will cost half that as produced from acetylene.

Phenol and products derived from it are required in huge quantities by petroleum, pharmaceutical, perfume, and other industries. Phenol is also used in the production of phenolformaldehyde resins, caprolactam, etc.

In the USSR, there are three large-scale methods for the production of phenol: from benzene through sulfonic acid, from chlorobenzene, and isopropylbenzene (oxidation and subsequent decomposition of the hydroperoxide). The isopropylbenzene or comene method is the most efficient owing to comparative simplicity of process equipment and the possibility for simultaneous preparation of both phenol and acetone. Raw material for alkylation of benzene with propylene may be obtained from nonconcentrated propane-propylene fractions. It is proposed to produce 80 percent of the phenol by this method. For the present, it would be advantageous to start research on the development of new effective methods for phenol production by direct oxidation of benzene and by two-stage oxidation of toluene.

Formaldehyde serves as the starting material in numerous chemical productions. Formaldehyde is treated with phenol to obtain thermosetting and thermoplastic phenolformaldehyde resins. By condensation of formaldehyde with urea or melamine, urea resins are obtained. The latter are used to produce pheno- and aminoplastics. Formaldehyde is condensed with acetaldehyde, propionaldehyde, and n-butyraldehyde to give polyhydric alcohols, starting materials in the lacquer industry and in plastics production.

## C-O-N-F-I-D-E-N-T-I-A-L

Works on the preparation of polyformaldehyde are especially important. This polymer possesses very useful properties and may find broad application in the national economy. For the present time, formaldehyde is obtained by catalytic oxidation of methanol over a silver on pumice as catalyst. Formaldehyde preparation by oxidation of methane and by-product gases appears promising.

Vinyl acetate acquired broad significance in the production of polymers. Polymerization of vinyl acetate results in polyvinyl acetate which is successfully utilized in the production of lacquers, paint, and adhesives owing to its high adhesive properties. Polyvinyl acetate derivatives, such as polyvinyl alcohol, are used extensively. A synthetic fiber, vinol, is obtained from polyvinyl alcohol. This substance has high strength and good resistance to oxidation and is stable to various chemical reagents.

At the present time, vinyl acetate is obtained from acetylene and acetic acid in the vapor phase. Utilization of cheap acetic acid for vinyl acetate synthesis has important economic significance. The acetic acid will be obtained from ethylene via acetaldehyde and also by oxidation of butane or saturated  $C_4$ - $C_7$  hydrocarbons (gaseous or straight-run gasolines). A method is presently being developed for the production of vinyl acetate from acetaldehyde and acetic anhydride. In this case, all initial products may be obtained from ethylene. This method of vinyl acetate production deserves serious attention because ethylene, as compared to acetylene, is a more available and cheaper raw material.

Caprolactam is the initial monomer for the production of the synthetic fiber capron [nylon 6]. At the present time, caprolactam is being produced industrially by a multistage method from phenol. Production of caprolactam from cyclohexane (air oxidation of cyclohexane) and also through nitrocyclohexane is being realized industrially. Production of caprolactam from aniline is proposed. The most profitable industrial method for caprolactam production appears to be air oxidation of cyclohexane. A method based on toluene and nitrosyl-sulfuric acid appears promising.

The raw material resources for caprolactam production may be expanded by using cyclohexane contained in considerable quantities in some crude oils. A method for preparing caprolactam from toluene should also be developed. A method for preparing caprolactam by photosynthesis from cyclohexane and nitrosyl chloride creates interest. During the last few years, a method was developed for a preparation of the polyamide enant. Use of aminoenantiic acid for polyamide synthesis will allow expansion of raw material resources based on petroleum hydrocarbons for the production of this type of polymer.

Dimethylterephthalate is the starting material for the synthesis of the synthetic fiber lavsan. Present and apparently future production of dimethylterephthalate will be based on oxidation of p-xylene with air. Preparation of dimethylterephthalate from toluene appears interesting; research in this direction has been started.

Phthalic anhydride is the starting material for the preparation of plasticizers in plastics production, film-forming materials, alkyd and glyptal resins, and other products. Phthalic anhydride is produced by catalytic oxidation of naphthalene with air oxygen. It has been produced for the first time by oxidation of naphthalene in a fluidized bed catalyst. This process allows use of high-capacity units, simplified equipment, and high-finished product yields. Phthalic anhydride production by oxidation of o-xylene has been developed and will be introduced in the near future.

Ethylene oxide is one of the epoxides whose production would receive great development. Consumers of ethylene oxide are glycols, diglycols, surface active hydroxyethylated products, and many chemicals used in industrial organic synthesis, and it is also used for the production of the polymer polyethylene oxide.

Industrial production of ethylene oxide at the present time is being accomplished by hydrochlorination of ethylene followed by dehydrochlorination of ethylene chlorohydrin. This method is costly, cumbersome, and will not be developed in the future. Future ethylene oxide production will be developed along the lines of direct catalytic oxidation of ethylene. In the future, all ethylene oxide requirements will be met by construction of large-scale enterprises based on the method of direct oxidation of ethylene. Research on ethylene oxide production should be directed toward increased catalyst effectiveness, lower silver consumption for its preparation, perfection of the technological process, and increased degree of purity of ethylene oxide.

Propylene oxide is a promising product for industrial organic synthesis. At the present time, it is being used for the production of flotation agents, simple polyesters, and other products. Propylene oxide is obtained industrially from propylene chlorohydrin. This method has the same disadvantages as that of ethylene oxide production from ethylene chlorohydrin: loss of large amounts of calcium chloride solution and equipment corrosion. The development of methods for propylene oxide production by direct oxidation still remains. At the present time, new methods for propylene oxide production have been developed, and their introduction to large-scale industry should have great significance.

Methacrylic acid is required for the production of acrylic resins. For the present, acrylic acid is obtained from acetone cyanohydrin in the presence of sulfuric acid. However, this method is not suitable for production of large quantities of methacrylic acid.

A new method was developed for producing methacrylic acid by oxidation of isobutylene with air or oxygen into methylacrolein analogous to that of oxidation of propylene into acrolein. Methylacrolein, in turn, can be oxidized to methylacrylic acid. This method, which may be based on the sufficiently available isobutylene, should be developed more rapidly.

Chlorosilanes are starting monomers for the production of organosilicon polymers which possess high frost resistance and thermal stability in the temperature range of  $-70^{\circ}$  to  $+400^{\circ}\text{C}$  and higher. They have high hydrophobic and dielectric properties.

The basic types of chlorosilanes are produced by direct catalytic synthesis, based on the reaction of silicon with corresponding alkyl or aryl chlorides. However, this method results in a complex mixture of products requiring costly operations for separation and purification of individual monomers. Research on chlorosilane production must be conducted along lines of developing highly effective continuous processes which give monomers of high purity.

#### 21. Literature Review of Organophosphorus Monomers

"Literature Review of Organophosphorus Monomers," by M.I. Kabachnik, Ye. L. Geft'er, O. A. Moshkin, and T. Ya. Medved', Institute of Elemento-Organic Compounds, Academy of Sciences USSR; Moscow, *Neftekhimiya*, Vol 2, No 4, 1962, pp 637-651

A review on organophosphorus monomers covers those compounds which seemed most promising to the authors for future industrial synthesis. The syntheses and properties of beta-chloroethyl and vinyl derivatives of tri- and pentavalent phosphorus are presented. It is shown that these compounds may be prepared by relatively simple methods and may be used as starting materials for the synthesis of nonflammable polymers. The bibliography contains 44 references, including 33 of Soviet origin.

#### Rare Metals

#### 22. Separation of Rare-Earth Elements

"Study of Radioactive Isotope Separation of Rare-Earth Elements on a Mercury Cathode. II. Separation of Cerium and Promethium From Lutetium and Europium From Cerium and Lanthanum," by V. P. Shvedov and Fu I-Bey; Leningrad, *Radiokhimiya*, Vol 4, No 4, 1962, pp 457-461

Experimental procedures and specific conditions for separating isotopes by deposition on a mercury cathode are presented for separating  $\text{Ce}^{144}$  and  $\text{Pm}^{147}$  from  $\text{Lu}^{177}$  and  $\text{Eu}^{152-154}$  from  $\text{La}^{140}$  and  $\text{Ce}^{144}$ . It was assumed that metals of the cerium group could be separated from metals of the yttrium group with the exception of yttrium and ytterbium.

23. Ion-Exchange Chromatography of Metal Acetates

"Determination of the Composition and Stability of Complex Compounds by Ion-Exchange Chromatography," by L. I. Tikhonova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 4, Apr 62, pp 822-830

With the aid of chromatography the dissociation constants and compositions of complex strontium, yttrium, and cerium compounds were determined after reaction with organic acids.  $Sr^{+2}$  was reacted with citric acid, diethylenetriamine pentaacetic acid and ethylenediamine tetraacetic acid;  $Ce^{+3}$  was reacted with ethylenediamine tetraacetic acid and 2,2'-diaminodiethyl N,N,N',N'-tetraacetic acid;  $Y^{+3}$  was reacted only with ethylenediamine tetraacetic acid. In all cases the compound formed has a metal cation to organic radical ratio of 1:1.

24. Reactions of Protactinium-233 and Lactic Acid

"Investigation of the Complex Formations of Protactinium With Mono-, Di-, and Polycarboxylic Acids. I. Complex Formation of Proactinium With Lactic Acid," by I. Geletseanu and A. B. Lapitskiy; Leningrad, Radiokhimiya, Vol 4, No 4, 1962, pp 421-426

Behavior of protactinium in lactic acid solution was studied by ion exchange methods using isotope Pa <sup>233</sup>. Determination of the ionic charge was calculated after studying the complex formations of proactinium in lactic and perchloric acids.

Proactinium lactates were found to be quite unstable. In most cases, their stability is a function of acid concentration.

25. Nuclear Fission of Tantalum by Neutron Bombardment.

"Radiochemical Study of Deep-Splitting Reactions and Fission of Tantalum by Neutrons With an Energy of 680 Mev," by V. I. Baranovskiy, A. N. Murin, and B. K. Preobrazhenskiy; Leningrad, Radiokhimiya, Vol 4, No 4, 1962, pp 470-479

A radiochemical study is presented on the deep-splitting and fission of tantalum by neutron bombardment at 680 Mev in an attempt to obtain a better understanding of the reaction mechanisms.

Seventy-eight isotopes comprised of 30 elements were created and identified by deep-splitting. The nuclear cross sections of these isotopes were determined, from which it was found that an exponential relationship exists between the cross sections and mass number (A) for those isotopes with  $A > 115$ .

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Lack of a similar relationship for those isotopes with  $A < 115$  was deemed a result of experimental error. A more precise relationship was determined by mathematical derivation from which an expression was obtained for calculating the nuclear cross section.

Similar type relationships were found to exist for the fission of tantalum by neutron bombardment. From the results of this work, it was determined that the maximum particle yield will occur for those isotopes with mass number 79 and 80, with the most probable charge number for these isotopes being 34.5-35. Yttrium and thulium isotopes with mass numbers 158-160 were found to have the highest probability factor for nuclear fission.

26. Kinetics of Uranium Oxidation

"Kinetics of Uranium Oxidation by Air, Oxygen, and Carbon Dioxide," by A. F. Bessonov and V. G. Vlasov, Urals Polytechnic Institute; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Tsvetnaya Metallurgiya, No 4, 1962, pp 137-142

Purpose of this work was to study the kinetics involved in the oxidation of metallic uranium at various temperatures and pressures in the presence of air, O<sub>2</sub>, and CO<sub>2</sub>.

It was found that metallic uranium rapidly oxidizes to form a dense layer of UO<sub>2</sub>. Subsequent oxidation occurs in three intermediate stages: adsorption of O<sub>2</sub> molecules on the UO<sub>2</sub> layer; dissociation of molecular oxygen to atomic oxygen; and diffusion of these atoms through the UO<sub>2</sub> layer along the grain boundaries and microscopic crystalline fissures.

27. Adsorption of Radioactive Isotopes by Electrokinetic Phenomena

"Adsorption of Radioactive Isotopes on Non-Ion-Exchange Polymer Adsorbents. III. Adsorption of Cesium, Thallium, Silver, and Strontium on Fluoroplastic-4 and Polyethylene," by I. Ye. Starik, V. N. Shchebetkovskiy, and I. A. Skul'skiy; Leningrad, Radio-khimiya, Vol, 4, No 4, 1962, pp 393-398

The relationship of the adsorption on fluoroplastic-4 and polyethylene to the pH of solutions containing Cs<sup>137</sup>, Tl<sup>204</sup>, Ag<sup>110</sup>, and Sr<sup>90</sup> were studied by measuring isotope concentration on the surface of the adsorbent and in the solutions to determine the adsorption coefficient and by observing the effect of various cations on the electrokinetic potential of fluoroplastic-4 to obtain some indication of its adsorption capability.

The low degree of adsorption of monovalent elements and Sr<sup>+2</sup> in strong acid solutions (pH=3-4) was concluded to result from the electrical double-layer effect. As the pH of the solution increases (decrease in ionic strength), adsorption and subsequent precipitation occur more readily. Silver was found to be adsorbed most readily, followed by Sr, Tl, and Cs, respectively.

In the pH=3-10 range, the relationship of the electrokinetic (zeta) potential of fluoroplastic-4 to the pH of the solution is linear, and the expression for determining this potential is:

$$\text{Zeta Potential} = A - BpH$$

where the constants A and B are equal to 14 and 5.3, respectively.

28. Separation of the Yttrium Group of Rare-Earth Elements

"Study of Radioactive Isotope Separation of Rare-Earth Elements on a Mercury Cathode. I. Separation of Ytterbium and Lutetium," by V. P. Shvedov and Fu I-Bey; Leningrad, Radiokhimiya, Vol 4, No 4, 1962, pp 451-457

The separation of radioactive isotopes  $Y^{91}$ ,  $Yb^{169}$ ,  $Er^{169}$ , and  $Lu^{177}$  by using various acids and either sodium or lithium amalgam cathodes is described. A flow diagram shows the entire process of separating these particular rare-earth isotopes, including the electrolytes used and the mechanical processes involved. The final product in all cases is a rare-earth oxalate.

29. Coprecipitation of Indium-114 With Copper and Zinc Salts

"Coprecipitation of Traces of Indium With Basic Copper Salts From Copper Nitrate Solution and With Zinc Sulfide From Zinc Sulphate Solution," by V. T. Chuyko and N. P. D'yachenko, Ternopol' Medical Institute; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 62, pp 910-914

It was proposed that the precipitation of indium together with copper salts from copper nitrate solution proceeds by ion exchange according to the law of mass action. This postulate was based on the assumption that  $In^{+3}$  ions in the solution are absorbed by replacing copper ions in the precipitating salt.

Coprecipitation of indium with zinc sulphide was believed to occur by the same phenomena as described above; but in addition, it was believed that the compound.  $In_2S_3$  is formed by reacting with the excess  $H_2S$  in solution.

30. Coprecipitation of Selenium and Tellurium with Ferric Hydroxide

"Coprecipitation of Small Quantities of Selenium and Tellurium With Ferric Hydroxide. II. Coprecipitation of Tellurium," by V. M. Tarayan and Zh. M. Arstamyan, Chair of Analytic Chemistry, Yerevan State University; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Khimicheskiye Nauki, Vol 15, No 4, 1962, pp 329-335

Experimental data showed that tellurium and selenium can be coprecipitated with ferric hydroxide in the pH interval 6.0-9.7. Optimum iron content was found to be 300 mg, and tellurium content must not exceed 0.5 mg. Addition of ammonia at room temperature will give

improved results. Copper, zinc, lead, cadmium, or arsenic (up to 300 mg) present in solution do not affect the precipitation process, except that lead is partially precipitated with tellurium and later hinders colorimetric determination.

### 31. Separation of Rhenium From Molybdenum by Ion Exchange

"Ion Exchange Method of Separating Rhenium From Molybdenum, II. Separation of Rhenium From Molybdenum on a KU-2 Cationic Resin in the Presence of Thiocarbamide," by D. S. Gaybakyan and M. V. Darbinyan, Chair of Analytical Chemistry, Yerevan State University; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR. -- Khimicheskiye Nauki, Vol 15, No 4, 1962, pp 321-327

The sorption of molybdenum and rhenium on a KU-2 cation resin was studied as an ion exchange method of separating the two elements. Investigations of this method showed that in the presence of thio-urea and very low acid concentrations (0.00001-0.50N, HCl, H<sub>2</sub>SO<sub>4</sub>, and HNO<sub>3</sub>), the sorption of molybdenum was very high (up to 95%), while the sorption of rhenium remains at 5-7%. When the acid concentration exceeds 1N, rhenium sorption increases to 15%, while molybdenum sorption drops to 15%.

The theory of this particular sorption process was believed to be the formation of the  $[MoO_2(SCN_2E_4)_n]^{+2}$  and  $^{+1}$  complexes. Optimum conditions of the process as to length of ion exchange column and effluent discharge rate were determined. The possibility of using certain organic acids (oxalic, acetic, tartaric, and citric) as desorbents was studied.

### 32. Extraction of Uranium With Concentrated Tributylphosphate

"Extraction of Uranyl nitrate With Concentrated Tributylphosphate in Laboratory Columns," by A. V. Nikolayev, S. A. Durasova, and B. V. Levin, Institute of General and Inorganic Chemistry imeni N. S. Kurnakova, Academy of Sciences USSR, Institute of Inorganic Chemistry, Siberian Branch Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 6, 1962, pp 102-105

Extraction of uranyl nitrate from solution can be effected to a high degree (99.5%) using concentrated tributylphosphate in packed or pulsating column extractors. Laboratory tests using both extractors proved that the pulsating extractor is more efficient and requires a shorter mass exchange zone and fewer solution recycles. It was also found to be better suited for weak uranium solutions. The use of salting-out agents NaNO<sub>3</sub> or Mg(NO<sub>3</sub>)<sub>2</sub> does not necessarily increase the amount of uranium extracted.

Miscellaneous33. N. M. Popov's Electron Microscope-Electronograph Described

"Under the Microscope -- An Atom," by V. Gorelov; Moscow, Komsomol' skaya Pravda, 13 Oct 62, p 4

A 400-kilovolt electron microscope-electronograph enables scientists to observe and to determine the chemical composition of particles. Electrons are emitted from an incandescent metal filament, accelerated, and passed through the object under study. The scattering pattern of these electrons corresponds to the arrangement of atoms in the material they have passed through. A magnified image of the particle is produced by an electromagnetic lens set in the path of the scattering electrons. The 400-kilovolt accelerating voltage of the apparatus is stabilized correct to 10 volts.

One advantage of this device is that it permits observation of living materials. Microorganisms can be placed in a layer of air instead of in a vacuum, as in a conventional electron microscope. The apparatus also allows analysis of a substance in quantities as small as  $10^{-14}$  milligram.

With this apparatus, it was discovered that the density of a substance is lowered ten times if only one molecule of 1,000 is out of place. The device also makes it possible to determine precisely the molecular structure of clay minerals, to study crystal mosaics of metal foils, etc.

34. Polyacrylamide Used As Filtration Medium in Water Purification

"Use of Polyacrylamide for Purifying Drinking Water," by Yu. Beytser, candidate in chemistry; Moscow, Zhishchno-Kommunal'noye Khozyaystvo, No 8, 1962, pp 22-23

Polyacrylamide (known in the US as Separan 2610 or PAM and in the USSR as PAA or AMF) is a flocculant used to speed coagulation during water purification.

Methods for its use in water purification stations have been worked out by the Academy of Communal Economy. The Academy is studying its effect on very soiled and highly colored water. The sanitary effectiveness of PAA is being studied by the Central Scientific-Research Laboratories of the Hygiene of Water Transport. PAA is nontoxic but cannot be used without permission of the Ministry of Sanitation until tests have been completed.

In the Soviet Union, the industrial solution, 8% polymer, is diluted at the water stations to 1% -- a consistency which easily passes through the measuring device and is diluted to 0.25 or .025% in the water undergoing purification.

The apparatus used for preparing the PAA solution consists of a square or cylindrical tank with a mixer, transfer pump, service tank, measuring device, and ejector. The best mixer is one which does 800-1,000 revolutions per minute, with two flat blades and a protective disc to keep the PAA off the axle. A motor works the mixer either by a common axle or by a V-belt. The mixing tank has a capacity of 0.5-1.5 cubic meters. PAA must be mixed 20-25 minutes to obtain a homogeneous solution. It is important that PAA not be touched by air between the measurer and ejector, especially when it is being added to clarifiers with suspended precipitates and contact clarifiers.

PAA has been tested in both vertical and horizontal settling tanks in Leningrad, Taganrog, Tyumen', Ufa, and Yaroslavl.

For best results, PAA should be introduced no less than 30-90 seconds after the coagulant, just before the settling tank or the clarifier with suspended precipitate. It can also be put into the mixer or the flocculation chamber.

To avoid a lowering of the pressure during filtration, a coarse-grained, double-layered charge should be used.

PAA can also be introduced in small doses between the settling tanks and the filters to increase the rate of filtration and improve the quality of the purified water.

The article lists recommended doses and application methods of PAA for various types of water-purification systems.

35. Tests Show New Growth Substance To Be Very Cheap and Effective

"NRV Is on the Farms," by A. Aliev, Candidate of Biological Sciences and Deputy Director of the Azerbaydzhan Scientific-Research Veterinary Institute; Baku, Zarya Vostoka, No 169, 21 Jul 62, p 3

Test results for NRV (neftyanoye rostovoye veshchestvo, petroleum growth substance) have been so promising that the preparation is being called an elixir of fertility.

The Azerbaydzhan Scientific-Research Veterinary Institute tested NRV on the black cattle of the Baku meat combine. The substance increased the weight of calves 12-36%, and of grown cows, 5-7% as compared to control animals. Bull breeders found that semen treated with NRV retained its effectiveness for artificial insemination longer. NRV was also shown to increase the weight of young pigs and mature swine.

Other tests compared the effect of NRV with that of spleen emulsion and biovetin -- a preparation containing the antibiotic biomyxin. NRV was slightly less effective than both the others for young pigs, but more effective than either for calves. It is far cheaper than either other growth stimulant.

NRV is also effective on vegetables, increasing their weight and decreasing the expense of feeding them.

NRV increased both weight and egg production in chickens. The eggs of treated chickens were heavier, and the chickens hatched from them grew faster than other chickens. Down and feather yield increased, as did general health and viability.

Among the Azerbaydzhan research institutes studying NRV is the Veterinary Institute, which is attempting to explain the mechanism of NRV action on living organisms and is studying the effects of the stimulator in all branches of animal husbandry.

### 36. Cotton Defoliants Used in Uzbekistan

"So That the Leaves Will Fall Faster," by A. Imamaliev, Candidate in Biological Sciences in the Laboratories of the Physiology of Plant Defoliation and Dessication of the Institute of Power Engineering and Physiology of Plants of the Academy of Sciences Uzbekistan SSR; Tashkent, Pravda Vostoka, No 221, 19 Sep 62, p 1

Calcium cyanamide, free cyanamide, magnesium chlorate and calcium chlorate, and chloride are all used as cotton defoliants in Uzbekistan. The first is applied, mixed with sodium fluorosilicate in regions of heavy dew. The other substances are applied mixed with water. The preparations are most effective on mature plants whose leaves have just begun to fall. Since they also act more effectively at high air temperature, they should be applied no later than 24 September.

37. Silicons Protect From Heat, Cold and Rain

"Gods in Blue Robes," by S. Efimov, engineer; Moscow, Komsomol'skaya Pravda, No. 216, 15 Sept 62, p 4.

Kuz'ma Andrianovich Andrianov, corresponding member of the Academy of Sciences, USSR, was a leading scientist in the development of silicons. Also prominent in this field is L. M. Volkova, who developed the "stone-organic" polymer used as a heat-resistant base in the lacquer used in the insulation of locomotive engines. Silicons are used to make tire rubber and automobile lubricants resistant to low temperatures. They are also used to protect stone and brick from rain corrosion.

38. Organogermanium Compounds Synthesized

"Research on the Synthesis and Conversions of Oxygen-Containing Unsaturated Organogermanium Compounds XV. Synthesis of Mono and Dihydroxy Tertiary Gamma-Germanium Acetylenic Alcohols and Some of Their Derivatives," by I. A. Shikhiyev, I. A. Aslanov, and B. G. Yusufov; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 10, Oct 62, pp 3148-3150

Mono- and dihydroxy tertiary germanium acetylenic alcohols were synthesized by reaction of a corresponding organomagnesium derivative of the acetylenic alcohol with bi- and trialkylhalogenogermanium compound. A total of 13 new organogermanium compounds were prepared by this method. Physical constants are given in a table.

39. Synthetic Alcohol Plant at Kuybyshev Expands To Include Polyethylene Production

"The Plant Is Growing"; Moscow, Sovetskaya Rossiya, 11 Nov 62,  
p 2

The synthetic alcohol plant has for some time been using gaseous by-products of oil refining to make phenol and acetylene for the plastic industry and alpha-methylsterene for the synthetic rubber industry. It has also recently begun large-scale production of polyethylene for use in making machine parts and various other products.

40. Cold Cathode Tubes Developed by Soviet Physicist A. F. Ioffe

"Gaseous Semiconductors"; Moscow, Izvestiya, 28 Oct 62, p 4

"These new tubes developed by the outstanding Soviet physicist A. F. Ioffe are called both "gaseous semiconductors" and "cold cathode tubes." They are glass beads about the size of a sunflower seed and contain three electrode parts in an atmosphere of rarified neon gas. They use only a fraction of the energy of ordinary radio tubes and are cheap, long-lasting, and easy to make. They occupy only 1/7 the space of a conventional tube and are used in electronic computers and cybernetic controlling machines. In all, more than 400 Soviet industries are using these tubes."

41. Hungarian Method for Rapid Determination of Phosgene

"Procedure for the Determination of Phosgene," by Tibor Meisel and Iaszlo Mazor, Department of General Chemistry, Budapest Technical University; Budapest, Magyar Kemikusok Lapja, Vol 17, No 9, Sep 62, pp 421-423

The authors developed a rapid method of determining the composition of phosgene produced with oleum from carbon tetrachloride. Carbon monoxide was used as the test agent because it is nonacidic only slightly soluble in water, and is virtually inert. This makes it ideal for determination based on measurement of gas volume.

The thermal decomposition of phosgene was accelerated by placing silver wool in the thermal tube. Use of the silver made it possible to reduce temperature or increase gas velocity. When a layer of silver, a few centimeters long, was placed in the tube, no decomposed phosgene or chlorine was found in the gas mixture even though the experiment was conducted at 800° C, and the gas velocity was 100-120 ml/min. Carbon dioxide was used as a carrier gas for phosgene through the thermal tube.

If the phosgene gas contained no carbon monoxide nor oxygen, the effluent gas issuing from the tube contained carbon monoxide and carbon dioxide only. This mixture was led into a gas buret filled with a 50% solution of potassium hydroxide, here the carbon dioxide was completely absorbed. This made it possible to measure the volume of carbon monoxide, which equivalent to that of the phosgene from which it originated.

42. Asymmetric Tertiary Arsines Synthesized

"Asymmetric Tertiary Arsines III. Alpha-naphthylethylarsines and Their Derivatives," by Gil'm Kamay and Yu. F. Gati-  
lov, Institute of Organic Chemistry, Kazan Branch, Academy  
of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 32,  
No 10, Oct 62, pp 3170-3172

Grignard reagents of corresponding alkyl halides were treated with alpha-naphthylethylchloroarsines to prepare ethyl-alpha-naphthylchloroarsine and methylethyl-alpha-naphthylarsine. Allyl bromide was treated with alpha-naphthylethylmethylarsine to give methylethylallyl-alpha-naphthylarsonium bromide.

Conferences and Meetings

43. All-Union Conference on Polyolefins Held in Leningrad

"On the Notice for the Day -- Plastics"; Leningrad, Leningrad-  
skaya Pravda, 27 Nov 62, p 1

"The All-Union Scientific-Technical Conference on Problems of Polyolefin Processing" opened yesterday in Leningrad. It was convened by the State Chemistry Committee of the Council of Ministers, USSR, and the All-Union Chemical Society, imeni D. I. Mendeleev.

"The future of the Soviet plastics industry was discussed by S. V. Shchutskin, chief polyolefin chemist of the State Chemical Committee.

"Specialists from Moscow, Leningrad, Kiev, Riga, Gor'ky, Ufa, etc. are taking part in the 3-day conference."

44. Plant Protection Discussed at Meeting of Leningrad Rayon Committee

"The Institute Renders an Account to the Bureau of the Rayon Committee" Moscow, Zashchita Rasteniy ot Vrediteliy i Bolezney, No. 10, 1962, p 1-3

At the July 22 Meeting of the bureau of the Leningrad party October rayon committee the director of the All-Union Institute of Plant Protection (VIZR), I. M. Polyakov, reported on the measures taken by the Institute to carry out decisions of the March Plenum of the Central Committee of the Communist Party of the Soviet Union. The meeting was led by the first secretary of the rayon party committee, P. I. Kuznetsov, and was attended by 150 members of VIZR, VIR (All-Union Institute of Plant Cultivation), the Leningrad Agricultural Institute, the All-Union Institute of Agricultural Microbiology, the Institute of Zoology of the Academy of Sciences, USSR, the Leningrad Plant Quarantine inspectorate the oblast station of plant protection and representatives of a series of sovkhoses.

The report emphasized the need to increase the supply and use of chemical pesticides. To speed up this process, VIZR has set up 43 toxicology laboratories which, working in conjunction with several farms, have recommended 20 poisonous chemicals for production. They are now working on an effective entobacterin preparation.

F. F. Sidorov, deputy director of the VIZR, and Ya. P. Khudyakov, director of the All-Union Institute of Microbiology, discussed the necessity for developing crop varieties that are immune to pests. Vir is presently working in this field. Work is also being done on microbiological antirodent preparations.

S. P. Lebedev, secretary of the party rayon committee; Braun, member of the rayon committee commission; E. P. Tsyplenkov, secretary of the institute's party organization; Prof P. G. Chesnokov (VIR), I. Ya. Polyakov, N. S. Fedorinchik and K. Ya. Kalashnikov all discussed the problems facing VIZIR. They criticized the party organization for not taking the measures necessary for putting new discoveries into use. They also bemoaned the fact that leading scientists are studying second-rate problems, leaving major ones to graduate students. Also, they regret that there are not more doctors of philosophy among the heads of their laboratories.

45. Leningrad Chemistry Conference Discusses Rare Elements

"Conference on the Chemistry of Rare Elements," by A. A. Makarenya; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleeva, Vol 7, No 5, 1962, p 574-575

"In October, 1961, a conference on the chemistry of rare elements, organized by the Leningrad-area directors of the All-Union Chemical Society imeni D. I. Mendeleev and by the chemistry department of Leningrad University, met in Leningrad.

"The conference was an original scientific report of the University's general and analytical chemistry departments to the 22d Party Congress.

"Prof A. V. Storonkin opened the conference. Then Prof S. A. Shchukarev reported on the 'The Present State and Future Development of the Chemistry of Rare Elements,' emphasizing that mineral chemistry is presently in transition from the descriptive-classifying stage to the mathematical-theoretical. New theories and experimental techniques have expanded the number of elements and increased the demand for many, including some rare ones. He concluded by noting that 'our country has such inexhaustible supplies of inorganic materials that it should hold the leading place in general progress and should be able to meet the demand for any, even the rarest, elements.'

"Reports from the general chemistry department, directed by Prof S. A. Shchukarev, dealt with the physicochemical study of chlorides and of compounds of variable composition of a series of rare elements, mainly of supplemental subgroups.

"In a summary report, 'Gaseous Oxides of Elements in Supplemental Subgroups,' S. A. Shchukarev analyzed the large amount of experimental material on enthalpy of formation of molecules of the composition MO. He also mentioned several current ideas about chemical bonding. He discussed ideas about the unique influence of molecular field on the character of oxide molecules of IV, V, and VI group of elements, and of the importance of gaseous oxide condensation energy for stabilizing these molecules by a crystal field.

"In their report, 'Thermodynamic Study of Higher Chlorides and Oxychlorides of Molybdenum and Tungsten,' G. I. Novikov, A. V. Suvorov, R. B. Dobrotin, A. V. Tarasov, and V. K. Maksimov discussed the thermographic study of fusibility diagrams of the  $WO_2-WCl_6$  systems, the opticotensimetric study of sublimation, vaporization and dissociation of a series of chlorides and oxychlorides, and also the results of measuring the average heat capacity of  $WO_3$ ,  $WO_2Cl_2$ ,  $WOCl_4$  and  $WCl_6$  in the range of 25° 200 or 250°. The authors also calculated the heat and entropy of fusion and of phase transition, enthalpy of formation, entropy, and a series of other values for all the studied compounds. A method was proposed for calculating the enthalpy of formation of oxychlorides, derived from the enthalpy of formation of oxides and chlorides.

"N. I. Kolbin and A. N. Ryabov" in their report, "Anhydrous Compounds of Ruthenium with Chlorine, Bromine and Iodine," discussed thermodynamics of ruthenium halides.

"I. V. Vasil'kova, G. I. Novikov, et al. reported on double systems. They discussed results of studying the  $WCl_6$ -CsCl,  $MoCl_5$ -NaCl,  $NbOCl_3$ -KCl,  $NbOCl_3$ -NaCl and  $UO_2$ - $UCl_4$  systems. In these systems one or more compounds were disclosed and their thermodynamic properties studied. These scientists also presented results of a thermodynamic study of double systems of several lanthanide chlorides (La, Ce, Pr, Nd) with chlorides of potassium and sodium, during which the vaporization of several double chlorides was observed.

"G. M. Loginov and Ya. V. Vasil'ev examined facts about the magnetic susceptibility of titanium and vanadium sulfides and of titanium, vanadium and ferrous oxides as regards phase correlation in these systems and structural phases of variable composition.

"L. S. Lilich, in his report, 'Chemical Potentials of Components in the Solutions  $BeCl_2$ -HCl-- $H_2O$  and  $Be(ClO_4)_2$ - $HClO_4$ - $H_2O$ , discussed the chemical potentials of water and HCl in systems of the type  $MeX_2$ -HX- $H_2O$ , where X' is a halogen ion or  $ClO_4'$ , and  $Me^2$  are ions of elements of the main and supplemental subgroups of group II.

"V. A. Latysheva spoke about properties of lanthanum which showed up in a thermochemical study of solutions of the halides of group II elements.

"R. B. Dobrotin in his report, 'Electronegativity of Several Elements in Supplemental Subgroups,' tried to re-estimate the electronegativity values of a series of elements and to show the possible use of his method to show the features of chemical bonds (multiplicity for oxides and hybridization.)

"A special meeting dealt with the physicochemical study of glasses containing rare elements. S. K. Dubrovo, G. S. Tsekhomskaya, Z. D. Alekseyeva, and Yu. A. Shmidt, all scholars of the Institute of Silicate Chemistry, discussed new experimental facts about rubidium, cesium and gallio-silicate glasses. N. A. Toropov, R. N. Galakov, and I. A. Bondar' reported on 'Isomorphism in Silicate Systems with Rare Earth Oxides.'

"Electrode properties of triple system glasses were discussed by B. P. Nikol'skiy, M. M. Shul'ts, N. V. Peshekhonova, A. I. Parfenov, O. V. Mashchurin, V. S. Bobrov, and A. A. Belyustin of the Leningrad University physical chemistry department.

"A large group from the Leningrad Aluminum-Magnesium Institute discussed formation and purification of  $TiCl_4$ .

"Ya. I. Gerasimov, G. N. Rezhukhina et al. discussed thermodynamic research on alloys, oxides and salts containing rare and rare earth elements. One of the methods used was EMF, with solid and liquid electrodes.

"A series of reports by the analytical chemistry department of Leningrad University dealt with the separation and identification of several rare elements.

"M. N. Gordeyeva reported on 'Chromatographic Separation of Uranium from Impurities' and indicated the optimum conditions for separating several combinations on different sorbents.

"I. A. Tserkovnitskaya and A. K. Charykov in their report, 'The Relation of Organic Acid Thorium Salts to Extraction by Organic Solvents,' discussed the influence which the position and character of the substituents has on the capabilities of precipitates, formed by thorium with various displaced aliphatic-aromatic acids, to be extracted.

"K. B. Yatsimirskiy (Ivanovo), S. A. Shchukarev (Leningrad), Morozov (Moscow), Ya. I. Gerasimov (Moscow), El I. Krech (Khar'kov), L. S. Lilich, (Leningrad) and others took part in the discussion."

46. First General and Applied Chemistry Conference Held in Kishinev

"Paths of the Development of Chemistry in the Moldavian SSR," by Academician of the Moldavian Academy of Sciences A. V. Ablov and the candidate in chemical sciences D. G. Batyr; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleeva, Vol 7, No 5, 1962, pp 574-574

"The first Moldavian conference on general and applied chemistry took place in Kishinev in 1961. It was called by the Institute of Chemistry of the Academy of Sciences, USSR, the Kishinev of State University and the All-Union Chemical Society imeni D. I. Mendeleev to review the results of work done in the various research institutions and vuzes of the republic and to decide on the best direction for future work.

"One hundred seventy chemists were present, as well as 30 scholars from research institutions of the Soviet Union and Czechoslovakia.

"Four reports were heard at the first plenary sessions.

"A. B. Ablov, N. M. Samus', and O. A. Bologa in their report, "Dioximins of a Tri-Valent Cobalt Cis-Compound," discussed the chemistry of complex compounds, a rapidly developing field. The authors discussed research done on previously described cis-compounds of cobalt. The configuration of these compounds was found from the synthesis of glycine and oxalate complexes. Cis-dioximins of cobalt are less stable than trans-isomers, and can easily be isomerized to the latter by the continuous action of institutes and plants on plant resources of the republic. They are studying the composition of essential oils, terpenoids, alkaloid-bearing plants and vegetable protein. They have worked out efficient ways to use waste from industries using vegetable raw materials.

"N. A. Preobrazhenskiy (Moscow) discussed problems in the field of natural compound chemistry. Chemists should concentrate their efforts, he said, on synthesizing and explaining the structure of such vital compounds as vitamins, hormones, fats, etc.

"Yu. S. Iyalikov and R. M. Novik covered practical and theoretical problems in the use of solid electrodes in anode and cathode polarography.

"At the meeting of the inorganic chemistry section 20 reports were heard from Kishinev chemists on complex compounds, mainly of cobalt. A. V. Ablov, N. M. Samus', G. P. Syptsova, Ts. B. Konunova, G. G. Straton, B. A. Bovykin, V. N. Shafranskiy, and K. M. Palade reported on complex compounds of tri-valent cobalt with dimethyl glyoxime. They discussed research on reaction mechanisms in the internal coordination sphere. N. I. Lobanov talked on baromates, iodates and periodates of chromanies; G. A. Popovich discussed salts of trioxylglutaric acid with mono- and bivalent metals. A. V. Ablov and N. I. Belichuk reported on the interaction of diacetyloxime hydrazone and of several of its azines with salts of nickel and copper. N. V. Gerbeley covered products of the interaction between thiosemicarbazides and salts of bi-valent cobalt, nickel and zinc. N. M. Samus' described complex compounds of trivalent cobalt with thiosemicarabazide. The report of A. V. Ablov and V. G. Semina dealt with mixed tetramines of bivalent platinum and their interaction with hydrochloric acid; Z. P. Burnasheva and Ts. B. Konunova reported on thermochemical study of zinc halide anilicates. The report of P. K. Migal', E. G. Chikrysova, L. V. Nazarova, I. M. Reybel', A. Ya. Sychev, et al. dealt with complex formation and the stability of complexes in solution.

"Most of the reports heard in the physical chemistry section concerned polarographic analysis. Several suggested new designs for oscillograph and alternating current polarographs (A. A. Gabovich, V. I. Bordyu, Yu. S. Gorodetskiy, et al.) Yu. D. Sister, A. M. Gabovich, V. M. Ropota, and I. I. Vatamana reported on a new field of polarographic analysis -- alternating current and oscillograph polarography, and study of current force curves. P. K. Migal', M. A. Kerdivarenko, and F. M. Russu discussed problems related to adsorption. M. A. Kerdivarenko and G. A. Krenis suggested a new method for determining specific area. I. A. Garshkovich reported on the surface condition of the cobalt anode.

"Reports in the analytical chemistry section dealt with new ways of determining the components of wine and wine materials and of tanning agents, of detecting iron and aluminum, aldehydes, citric acid and others (B. V. Lipis, N. V. Vasil'kovskaya, O. A. Timofeyeva, L. G. Madan et al.), A. T. Makha (Odessa) reported on the relations between organoleptic indicators and chemical change in food products. A. I. Kokorin, N. A. Polotebnova et al. suggested the use of heteroploy compounds for identifying several metals. Yu. I. Usatenko and A. M. Arishkevich discussed the analytic use of a new reagent -- dimercaptothiopyrone. L. S. Kopanskoy reported on semiconductor system analysis using indium, antimony and tellurim. A. M. Derzhi reported on detection of minute quantities of copper by measuring the rate of the catalyzed reaction. Theoretical problems in the adsorption of tartaric acid on anionites were covered in the report of Yu. S. Khariy (Odessa.)

"Sixteen reports were read on the chemistry of natural compounds. B. A. Rudenko, A. V. Semenovskiy, and V. A. Smit (Moscow) discussed the used of gas-liquid chromatography in natural compound chemistry. O. Motl (Prague) discussed present-day analysis methods for essential oils and the formation of gynesol. I. Krzhepinskiy (Prague) discussed valeronone formation; V. I. Shvets and E. I. Filipovich (Moscow) discussed work on phospholipid compounds and a series of mesodisplaced dipyrrylmethines. G. V. Pigulevskiy and D. V. Motskus (Leningrad) talked about the formation of essential oil of the wild carrot. Kishinev chemists G. V. Lazur'evskiy, D. P. Popa, I. V. Terent'eva, Yu. M. Revenko, P. F. Vlad et al. reported on the chemistry of sclareol, on the composition of lavender-processing by-products, about future use of ursolic acid for making compounds with practical applications, about new alkaloids from reed grasses native to Moldavia, etc.

"At the section on high-molecular compounds A. M. Shur discussed ways of making new polymers. A. M. Shur and V. I. Spektor presented experimental facts about making vinyl directly from several acids by using acetylene. S. A. Potievskaya (Kiev) reported on methods of making resins from condensation products of furfural and urea. E. V. Zobov discussed the possibility of using epoxy resins as high-quality, harmless and long-lasting protective coverings. Ya. S. Fel'dman, Kh. Sh. Khariton, and A. M. Shur reported on high-density gypsum polymers. Ya. S. Fel'dman described woodchip tiles useful in the construction of beehives. L. L. Matsyuk and Kh. Sh. Khariton suggested the possible use in certain situations of furfural alcohol, and resin derived from it, as a modifier of epoxy resins. Kh. Sh. Khariton indicated the possibility of using ordinary clay as a rubber filler.

"In the chemical technology section, N. I. Lobanov reported on making precipitated chalk from Moldavian limestone. L. B. Kotlyarskiy and V. V. Koval' discussed making consumer goods from porolon, sonic and ultrasonic methods for the continuous dispersion and emulsification of oil and enamel dyes by using magnetostrictional and sonic hydrodynamic dispersers. Reports were also heard on the recovery of mineral oils from Moldavian clay.

"In the section on history of chemistry, M. G. Feyershteyn presented new facts on the 150th anniversary of Avogadro's Law, and S. N. Kuz'menko discussed several little-known facts about the history of thermochemistry in Russia. I. L. Znachko-Yaborskiy (Leningrad) discussed thickeners, solutions and structural concrete on the territory of USSR from the sixth century B. C. to the middle of the 19th century. A. G. Kochorya suggested a plan for Moldavian chemistry courses which include teaching about important food productions that have been speeded up by technology.

"The reports provoked lively discussion.

"The conference resolved that the most important tasks facing Moldavian chemists are:

"Developing the production of artificial and synthetic building materials, mineral fertilizers, microfertilizers, growth stimulators for plants and animals, chemical means for controlling plant pests and diseases, preventatives for the food industry, etc;

"Studying more intensively the mineral and vegetable raw materials;

"Putting modern physicochemical methods of production control into practice and automating technological processes;

"Strengthening theoretical work in chemistry of complex compounds, biochemistry, polarographic analysis, and organic synthesis."

47. Seminar on Industrial Crystallization in Czechoslovakia

"II Seminar on Crystallization"; Prague, Chemicky Prumysl,  
Oct 62, p 557

The physical chemistry laboratory of the Research Institute for Inorganic Chemistry in Usti nad Labem (Czechoslovakia) has organized a seminar on crystallization to be held on 22 March 1963. Reports in the field of industrial crystallization will be presented at the seminar.

48. Electrochemistry Conference Emphasizes Anode Processes During Electrolysis of Organic Compounds

"All-Union Conference on the Electrochemistry of Organic Compounds,"  
by M. Ya. Fioshin, Candidate of Technical Sciences, and L. G. Feoktistov; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva,  
Vol. 7, No 5, 1962, pp 568-570

At the end of March, 1962, the fourth conference on electrochemical compounds, called by the division of electrochemistry of the All-Union Chemical Society imeni Mendeleev and the Institute of Electrochemistry of the Academy of Sciences, USSR, took place in Moscow,

The conference was opened by Academician A. N. Frumkin, chairman of the Orgkomitet of the conference. He stressed the significance of work on the electrochemistry of organic compounds and pointed out basic problems of this prospective field, and also the need to lessen the gap between research on the mechanism of processes and development of preparative methods of electrosynthesis.

The reports fall into two groups. The first deals with research of mechanisms and kinetics and also of electrochemical syntheses of organic compounds, carried out on solid electrodes. The second concerns polarography of organic compounds on a mercury cathode.

The distinguishing feature of the fourth conference is the great quantity of reports on anode processes during electrolysis of organic compounds.

V. I. Bystrov, N. E. Khomutov, and S. F. Chernyshev discussed work on the kinetics of anode processes during electrolysis of aqueous solutions of phenol with anodes of platinum, nickel and lead dioxide. After an analysis of polarization curves, it was concluded that there is a type of phenolate ions in an alkaline solution which is inhibited either by adsorbed molecular phenol or by a film of a polymer. On lead dioxide anodes, in

sulfuric acid solutions of phenol, a quinone was obtained with a yield of 30% and higher based on the current.

Yu. V. Vodzinskiy and G. S. Kalinina studied the electrochemical oxidation of phenols. Regardless of the number of hydroxyl groups, only one group is oxidized on the graphite anode with the participation of two electrons.

M. I. Smirnov and Yu. I. Rozin reported on anode displacement. Anhydrous methyl, isopropyl and allyl alcohol saturated with hydrogen chloride were oxidized on a graphite anode. During the electrolysis of methyl alcohol no chlorine derivatives were found among the reaction products. In the case of isopropyl alcohol, acetone and traces of monochloroacetone, of allyl alcohol and dichloropropanol were formed. When a lightly chlorinated substance (ethylene, vinyl chloride, butadiene, and red phosphorus) was present in the methanol solution, methoxydichloroethane and trimethylphosphate were formed. This method could be used for the methoxylation of unsaturated compounds of the aliphatic series, and for making esters of phosphoric acid.

V. S. Bagotskiy and Yu. B. Vasil'ev reported on the influence of the change in composition of the electrode surface on the kinetics of the anode oxidation of organic compounds. During the electrochemical oxidation of aliphatic carboxylic acids, alcohols and aldehydes on platinum and gold electrodes, the authors detected on the polarization curve several maxima and minima in the current, indicating a kinetic nature. The potentials at which these minima are observed depend only on the pH of the solution and on how near the corresponding degrees of oxidation of the platinum are to equilibrium potentials.

M. Ya. Fioshin and Yu. B. Vasil'ev reported on the influence of the structure of anions of carboxylic acid on anode processes during a Colby electrosynthesis. As in the case of acetate, the discharge of anions of homologous and halogenated acetic acids gives a more positive potential than that for oxygen liberation. However, during the electrolysis of salts of halogenated acetic acids, dimeric products are not formed.

A series of reports dealt with the electrochemical hydrogenation of organic compounds and with problems of the adsorbent and catalytic properties of catalysts.

In two reports, I. I. Kulakova and A. V. Shashkina discussed the electrohydrogenation of vinyl acetate methyl acrylate and acrylic acid on a palladium electrode. They also discussed the connection of the quantity of adsorbed hydrogen resulting from increased and lowered combination energies to the mechanism of electrohydrogenation of these compounds.

The report of M. E. Manzheley presented information about the mechanisms of electroreduction of allyl alcohol. It was established that at potentials more positive than the reversible hydrogen potential, in an acid medium, propane, propylene, ethylene, ethane and methane are evolved on platinum, but not hydrogen as it was earlier erroneously thought. Hydrogen appears only in the area of overvoltage. In alkaline media, hydrogen is the only gaseous product and only in the overvoltage area.

D. V. Sokol'skiy discussed a series of interesting facts about the correlation of adsorption and kinetic phases during hydrogenation in solutions; a connection was also made between the potential of the catalyst and the character of the hydrogenation process on its surface.

G. D. Zakumbayeva reported on the influence of the formation of a second layer on the adsorption and catalytic properties of platinum.

I. V. Chvankin and V. G. Khomyakov examined the results of research on the hydrogenation and electrohydrogenation of adipic acid dinitrile and  $\epsilon$ -aminocapronitrile on the platinum and palladium plating of platinum electrodes in water solutions of sulfuric acid. The greatest rate of electrolysis was observed on the palladium electrode, while the  $\epsilon$ -aminocapronitrile is hydrogenated at the lowest rate.

B. I. Tomilov and M. A. Loshkarev, in a report on the classic electrochemical system -- quinone-hydroquinone -- discussed the kinetic characteristic of the electrochemical law and the influence of temperature, pH and surfactants on it.

In his report, N. E. Khomutov examined several unsolved problems on the electrosynthesis of organic compounds.

S. V. Gorbachev touched on kinetic prerequisites for the substantial acceleration of the electrosynthesis of organic compounds. He considers that during reactions in which activation energy is very important an increase in temperature is very effective. When activation energy is not very significant the rate of the electrode reaction is determined by the rate of diffusion which can be increased by forced convection.

A series of reports was devoted to problems of the synthesis of organic compounds.

N. G. Bakhchisarayts'yan, M. Ya. Fioshin, E. A. Dzhafarov, M. A. Khizolitova and G. A. Kokarev discussed the electrooxidation of aliphatic alcohols on an anode of electroplated lead dioxide. The influence of the composition of the solution and of the condition of the electrolysis on the yield of isobutyric acid were studied using the example of electrooxidation of isobutyl alcohol.

L. A. Mirkink, M. Ya. Fioshin, A. I. Kamneva, L. A. Salmin', and A. G. Kornienko discussed their research on the synthesis of higher unsaturated dicarboxylic acids by the electrolysis of monoesters of lower acids in the presence of 1,3-butadiene. They discussed the optimum conditions of electrosynthesis on an anode of dimethyl esters of 6-dodecene-1,12-dicarboxylic acid and 6,10-hexadecadiene-1,6-dicarboxylic acid.

Yu. M. Tyurin, E. P. Kovsman, M. E. Veselova, E. A. Karavayeva, and A. E. Belous discussed the results of their research on the electrosynthesis of dimethyl ester of sebacic acid. They presented facts about the influence of the anode material, of the solvent, of the intensity of current and of a series of other factors about the current yield of dimethylsebacinate.

M. Ya. Fioshin expressed several considerations about the role of the anode in the electrosynthesis of organic compounds at high positive potentials. In particular, he discussed the change in the platinum anode during the electrosynthesis of dimethylsebacinate, when this anode undergoes strong corrosion. He also talked about electrosynthesis on bimetallic anodes and on anodes of compressed graphite.

G. M. Veyshteyn talked about the electrochemical transformation of nitrocyclohexane into cyclohexanone oxime, an important intermediate product in the making of caprolactam. The process occurs in an electrolyzer without a membrane and probably ends in the electrochemical reduction of nitrocyclohexane to cyclohexylamine in an alkaline solution and the simultaneous oxidation on the anode of the newly formed cyclohexylamine to cyclohexanone oxime.

L. V. Kaabak, A. P. Tomilov, and S. L. Varshavskiy discussed the electroreduction of nitryl vinylacrylic acid.

The report of V. P. Pakmove, N. E. Komytov, and T. N. Skornyakova dealt with the electrochemical method of obtaining metanilic acid by the electroreduction of m-nitrobenzene sulfonic acid -- an intermediate product in the formation of the antituberculine preparation PASK.

V. V. Skornyakov, N. E. Khomutov, and T. P. Fadeyev discussed the electrochemical method for making dihydrostreptomycin by hydrogenation of streptomycin.

A. P. Tomilov and L. B. Kaabak described electrochemical methods of making stannous organic compounds by reduction on a tin cathode of several  $\alpha,\beta$ -unsaturated nitriles.

The second group of reports was devoted to a study of the mechanism of reducing organic compounds on a mercury electrode. Characteristic of this group was its wide use of the theoretical ideas of the school of Academician A. N. Frumkin.

In a summary report S. G. Mayranovskiy classified material accumulated over the past years on the influence of the building of a double electric layer and of adsorption of the components of electrode reactions on the polarographic behavior of organic substances. In general this influence is determined by three factors; (1) a change in the effective potential jump between the electrode and the discharging particle; (2) a change in the concentration of ions around the surface of the electrode in comparison with the volume of solution and (3) a change in the adsorptive capability of the substances.

The influence of a change in effective potential jump on the potentials of half-waves is especially clear during halogen displacement reduction. As L. G. Feoktistov showed in his report, the change in concentration of the inert electrolyte within the broad limits of 0.01-3N KCl causes a decrease in the potential jump in the diffusing portion of the double electric layer, in fine agreement with theory. In a mixture of 1,1-valence electrolytes of varying composition this effect is strengthened by a preferential adsorption of ions with large crystallographic radii.

Because of this last circumstance, it sometimes happens that a wave which is hidden in the presence of sodium ions for example, behind the discharge current of the background, can easily be observed on a background of cesium salts, through the rise in the background current occurs at practically the same potentials. G. A. Tedoradze, A. B. Ershler, and S. G. Mayranovskiy illustrated this using benzyl chloride.

The influence of the potential jump in the diffusion part of the double layer when oxidation the surface of the electrode is in the electrochemical stage and it is necessary to calculate the changes in adsorption of the organic substance and of the shift in acid-base equilibrium, was shown by M. K. Polievktov and S. G. Mayranovskiy by the example of catalytic separation of hydrogen in the presence of puridine in nonbuffer solutions.

The influence of the adsorption of organic depolarizers on the kinetics of its electroreduction is shown not only through its surface concentration, depending on the potential, but also as a result of the change in the rate constant of the electrode reaction because of the change in activation energy and the steric factor; the last effect may be especially significant as a result of a certain orientation of the adsorbed molecules. By taking these factors into account, A. B. Ershler, G. A. Tedoradze, and S. G. Mayranovskiy were able to explain the phenomena observed during the reduction benzyl chloride. Yu. P. Kitayev, G. K. Budnikow, and T. V. Troyepol'skaya tried to explain the polarographic behavior of several azomethin compounds from the viewpoint of the variation of adsorption with the potential.

During the reduction of carbonyl compounds of the naphthaline and tetraline series, V. D. Bezuglyy, L. A. Mel'nik, V. N. Kmitrieva, and I. A. Shkodina observed that the strong influence of the radius of the background cations on the magnitude of the threshold current in water solutions diminishes in alcohol solutions. The current was observed to have the greatest influence in the presence of cations with large crystallographic radii. V. D. Bezullyy, V. F. Iavrushim, and G. G. Belous reported on the polarographic behavior of unsaturated ketones of the aromatic series.

A. P. Tomilov and I. G. Sevast'yanova showed that while being shifted from a water solution to one of dimethyl formamide, a double-electron wave of vinylacrylic acid nitrile breaks down to two single-electron waves.

The report of Yu. A. Vakhrushev and Ya. I. Tur'yan was devoted to the polarographic study of the kinetics of recombination of anions of nitrophthalic and trimethyl acids with hydrogen ions. D. I. Dzhaparidze, A. B. Ershler, and G. A. Tedoradze discussed their discovery of polarographic maxima by the method of current curves -- the time in the static and in the rising drop.

The nature of the products formed during the reduction of organic compounds on a mercury drop cathode was explained in the report of S. I. Zhdanov and L. G. Feoktistov, who used the phenomenon of hidden threshold currents of the hydrogen ion. This method, due to its simplicity and reliability may be useful in other cases.

#### 49. Recent Soviet Conferences in Chemistry and Metallurgy

The conferences listed below were reported or announced in recent issues of Soviet periodicals. Included in the listing are the date and location of the conference, sponsoring organizations, and source. Unless otherwise noted, it is assumed that there was no non-Soviet participation in the conferences.

a. Fourth All-Union Conference on the Electrochemistry of Organic Compounds; end of March 1962, Moscow; sponsored by the Electrochemistry Section of the All-Union Chemical Society imeni D. I. Mendeleev and the Institute of Electrochemistry of the Academy of Sciences USSR. (Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleeva, Vol 7, No 5, 1962, p 568)

b. Conference on Activation Methods of Analysis; "recently," Tashkent; sponsored by the Academy of Sciences USSR and the Academy of Sciences Uzbek SSR. (Pravda Vostoka, 13 Nov 62, p 4)

c. All-Union Conference on Automation of Petroleum Refining Processes and Petrochemistry; 16-21 April 1962, Sumgait. (Khimiya i Tekhnologiya Topliv i Masel, No 10, Oct 62, p 70)

d. Symposium on Results of Investigations of the Hydrogen Bond and Most Important Problems of its Further Study; 4-7 July 1962, Leningrad; sponsored by the Physics Faculty of Leningrad University, the Scientific Council on the Theory of Chemical Structure, Kinetics, Reactivity, and Catalysis, and the Commission on Spectroscopy of the Academy of Sciences USSR. (Vestnik Akademii Nauk SSSR, No 10, Oct 62, p 110)

e. Third Conference on High Speed Photography and Cinematography (14th Conference on Scientific Photography); 4-7 July 1962, Leningrad; sponsored by the Commission on Scientific Photography and Cinematography of the Department of Chemical Sciences of the Academy of Sciences USSR, the Leningrad Institute of Motion Picture Engineers, and the State Optics Institute imeni S. I. Vavilov; Forth conference to be held in Novosibirsk. (Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii, Vol 7, No 6, Nov/Dec 62, p 474)

f. Eighth All-Union Conference on the Theory of Foundry Processes; 24-27 January 1962, Moscow; sponsored by the Commission on Machine Building of the State Committee of the Council of Ministers USSR on Automation and Machine Building. (Izvestiya Vysshikh Uchebnykh Zavedeniy -- Chernaya Metallurgiya, No 10, 1962, p 203)

g. All-Union Conference on Electroslag Remelting; 14-16 June 1962, Kiev; sponsored by the Institute of Electric Welding imeni Ye. O. Paton of the Academy of Sciences Ukrainian SSR. (Avtomaticheskaya Svarka, No 9, Sep 62, p 92)

h. Second Scientific-Technical Conference on Diffusion Welding of Metals, Alloys, and Nonmetallic Materials in a Vacuum; 24-26 May 1962, Moscow; possibly sponsored by the Moscow Oblast Sovnarkhoz. (Avtomaticheskaya Svarka, No 9, Sep 62, p 93)

i. Second Conference on the Problem of hot Cracks in Welded Joints, Castings, and ingots; 22-23 May 1962, Moscow; sponsored by the Section on Metallurgy, Metal Science, Mining, and Enrichment of the Department of technical Sciences of the Academy of Sciences USSR, the National Committee of the USSR on Welding of the Academy of Sciences USSR, and the Institute of Metallurgy imeni A. A. Baykov. (Svarochnoye Proizvodstvo, No 11, Nov 62, p 41)

j. All-Union Conference of Chief Welders of Sovnarkhozes, Ministries, and Departments; 5-6 June 1962, Kiev. (Avtomaticheskaya Svarka, No 9, Sep 62, p 91)

k. Conference on Problems of the Physics of Welding Arcs; 29-30 May 1962, Moscow; sponsored by the Institute of Metallurgy imeni A. A. Baykov and the National Committee on Welding under the Academy of Sciences USSR; next conference to be held in 1964. (Svarochnoye Proizvodstvo, No 11, Nov 62, p 43)

l. Scientific-Technical Conference on Experience in the Design and Operation of Automatic Foundry Lines; May 1962, Moscow; sponsored by the Committee on Mechanization and Automation of the Moscow City Board of the Scientific-Technical Society of the Machine Building Industry. (Liteynoye Proizvodstvo, No 10, Oct 62, p 43)

m. Third Siberian Scientific-Technical Conference on Welding; 18-22 June 1962, Krasnoyarsk; sponsored by the Coordination Council on Welding under the Institute of Electric Welding imeni Paton, the Krasnoyarsk and Altay Sovmarkhozes, and the Krasnoyarsk Kray Council of the Scientific-Technical Society of the Machine Building Industry; fourth conference to be held in Irkutsk in 1963. (Svarochnoye Proizvodstvo, No 10, Oct 62, p 45)

n. Moldavian Republic Scientific-Technical Conference on Welding; 24 May 1962, Tiraspol. (Avtomaticheskaya Svarka, No 9, Sep 62, p 95)

o. Seminar of Engineering and Technical Workers and Welding Innovators Working on the Installation of Equipment for Thermal Electric Power Stations; 7-11 July 1962, Moscow; sponsored by the Exhibition of the Achievements of the National Economy. (Svarochnoye Proizvodstvo, No 11, Nov 62, p 45)

p. Ukrainian Republic Seminar of Welders-Builders; May 1962, Kiev; possibly sponsored by the Ministry of Construction of the Ukrainian SSR. (Avtomaticheskaya Svarka, No 9, Sep 62, p 94)

## II. METALLURGY

Crystallography50. Distribution of Slip Traces

"The Density of Slip Traces on the Surface and Within a Specimen," by O. M. Kugayenko, V. M. Rozenburg, and A. V. Shalimova; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 5, Sep Oct 62, pp 126-127

Data are given on the distribution of slip traces in specimens of high-silicon steel (3.4% Si). It was established that the number of slip traces remains constant with depth but the distribution is more uniform within a sample than at the surface. It is claimed that this fact concerning the equal quantities of slip traces within and at the surface of a polycrystalline specimen indicates that the effect of the free surface of internal grains of the formation of slip traces is secondary.

51. Relationship Between Slip Lines and Etch Figures

"On the Connection Between the Location of Etch Figures and Slip Lines in Polycrystalline Aluminum," by A. A. Bochvar, N. I. Glagoleva, and I. I. Novikov; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 5, Sep Oct 62, pp 15-16

Results are given of various special investigations of slip lines and etch figures in specimens of 99.994%-pure aluminum. It is established that the absence of any clearly defined connection between slip lines and etch figures shows that it is not possible to judge the dislocation structure of metallic crystals in accordance with the etch figures in all cases, even if the etchant employed is considered as being the best for revealing dislocations. Microphotographs are presented of various etch figures.

Electrolysis52. Electrolytic Separation of Molybdenum and Nickel

"Electrolytic Separation of Molybdenum and Nickel," by G. P. Protsenko and P. N. Kovalenko, Rostov State University; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 28, No 4, 1962, pp 522-525

Goal of the present work was to study conditions for electrolytic separation of molybdenum from nickel in solution without the formation of Mo-Ni alloys.

Measurements of pH and color changes of the molybdenum being deposited on a platinum cathode at constant voltage were recorded. Analyses showed that the molybdenum is deposited in the form of a hydrate of MoO<sub>2</sub> and is dependent on the pH with maximum deposition occurring in the 3.22-2.40 pH range. Subsequent roasting in a vacuum was conducted to remove the oxide.

Weighed specimens of N-79 alloy containing 79.76% Mo were used for the experiment and the results tabulated to compare the amounts of molybdenum and nickel obtained to the original amount in the alloy.

53. Theory of Alloy Electrodeposition

"Certain Aspects of the Alloy Electrodeposition Theory. VIII Investigation of the Dependence of the Copper Alloy Phase Structure on Conditions of Alloy Preparation," by Yu. M. Polukarov, K. M. Gorbunova, and V. V. Bondar, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 36, No 9, Sep 62, pp 1870-1876

Data are presented on the phase structure of electrodeposited alloys of Cu-Pb, Cu-Tl, Cu-Sn, and Cu-Cd prepared at various cathode potentials from simple electrolytes without addition agents. It was shown that under such conditions, supersaturated solid solutions of lead, thallium, tin and cadmium in copper are formed. A high temperature delta phase was observed to form in the case of the Cu-Sn alloy. The degree of supersaturation has been found to be determined by the cathode potential. It was suggested that in the formation of supersaturated solid solutions, the shift in potential of the electro-negative metal is towards the positive rather than toward an equilibrium value. Reasons for this phenomena are not clear.

Forming and Machining54. Deep Drawing Austenitic Stainless Steels

"Increasing the Technological Ductility of Austenitic Stainless Steels," by V. P. Martynov, Candidate of Technical Science, Khar'kov Aviation Institute; Moscow, Metallovedeniye i Termicheskaya Obrabotka Metallov, No 8, Aug 62, pp 30 and 35

An academic approach to problems involved in deep drawing austenitic stainless steels without intermediate heat treatment is presented.

Two major factors, proper plastic flow and minimum austenite → martensite transformation, must be taken into account to attain a high drawing coefficient. Also, it must be remembered that hardened austenitic stainless steels possess good ductility at negative temperatures.

Using Kh18N9T steel as an example, an optimum drawing process would consist of three passes: (1) preheat stainless steel blank to a temperature (150°C) above the  $M_d$  (martensite formed by cold working) curve, (2) preheat blank to 130°C but cool the critical zone (area which touches bottom of the plunger) to a temperature (-196°C) below the  $M_s$  (martensite transformation upon heating) curve, (3) cool semi-finished blank to -196°C for last pass.

For comparison, K (drawing coefficient) for Kh18N9T steel in preceding paragraph was 7.2 while for the same steel, deep drawn at 20°C, K = 4.15.

55. Face Milling of Titanium Alloys

"Face Milling of Titanium Alloys," by K.F. Mitryayev, Candidate of Technical Science and Engr V. I. Komissarov; Moscow Vestnik Mashinostroyeniye, No 9, Sep 62, pp 68-70

Results of experiments on the machinability of titanium alloys VT6 and OT4 are described. The work was conducted at the Kuybyshev Aviation Institute by the authors under the direction of Doctor of Technical Sciences, Prof. N. I. Reznikova.

Cutting tools of alloys TT7K12, VK8V, VK8, VK4, VK6, and VK6M, and high-speed steels R9K5 and R9K10 were tested and VK6M was found to be best suited for milling alloys VT6 and OT4. Optimum cutting angles and other parameters for face milling with the VK6M tool are given.

56. Precision Machining by Chemical and Abrasive Action

"Practicability of the Anode Jet Method for machining Metal Surfaces," by S. A. Dovnar, Institute of Machine Building and Automation, Academy of Sciences Belorussian SSR; Minsk, Doklady Akademii Nauk Belorusskoy SSR, Vol 6, No 8, Aug 62, pp 494-496

A method of combining mechanical abrasion and chemical action is described as a means of controlled, high-precision machining of metal parts.

The process involves coating the part with celluloid and placing it in the electrolyte and connecting to the system as the cathode. The part was then blasted with powdered corundum emanating from the anode. Several different electrolytes and powder sizes were tested with varying currents and voltages. Current density and powder size were found to be the contributing factors for removing metal from a specified area to a specified depth.

57. Thin-Wall Castings of Heat-Resistant Alloys

"Problems on the Forming Properties of Thin-Walled Castings of Heat-Resistant Alloys," by M. T. Bogdanov; Moscow, Liteynoye Proizvodstvo, No 7, Jul 62, pp 29-33

Descriptions are given of tests of the influence of structure, density, hydrogen content, gas blisters, mold preheating, pouring temperatures, cooling rates, etc., on the mechanical properties of thin-walled castings of the heat-resistant, austenitic, chrome-nickel steel Kh1 of the EI-572 type and nickel alloy ZhS6 as materials for gas turbine blades. Graphic data are given for the parameters involved.

## Special Metals

58. EI765 in Turbine Fastener

"Use of Heat-Resistant Alloy EI765 for Fasteners," by Ya. L. Voynich, and N. A. Kravchenko; Leningrad, Energomashinostroyeniye, No 10, Oct 62, p 37

The Khar'kov Turbine Plant is using bolts, nuts, and pins made of alloy EI765 to fasten housings of turbines which operate at temperatures from 580° to 750° C. This alloy, developed by TsNIIIMash [Central Scientific Research Institute of Technology and Machine Building], is

a heat-resistant, chromium-nickel material which possesses a high resistance to relaxation up to 750° C. This alloy is also used at the plant as a material for forged plate used in powerful gas turbines. Chemical data are given on composition and mechanical properties of EI765 at 20° and 700° C.

59. Stainless Steel Kh18G14AN4 As a Substitute for Kh18N9T

"Die Stamping Parts for Medical Equipment from Stainless Steel Kh18G15AN4," by S. Z. Gol'berg and Ye. L. Vayner; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 10, Oct 62, pp 27-30

The All-Union Scientific Research Institute of Medicinal Instruments and Equipment was confronted with the task of finding a stainless steel with lower nickel content to replace steel Kh18N9T. Seven steels tested and compared with Kh18N9T were: Kh17, Kh17N2, Kh13N5G9(EI100), Kh14G14N3T (EI711), Kh18G14AN4 (EP197), Kh18N2G5N (EP26), and Kh28N2N (EI657) [The second "N" in the last two steels represents nitrogen]. Among these steels, Kh18G14AN4 was found to exhibit the properties best suited for medical equipment and equivalent to Kh18N9T. Chemical data on the composition and mechanical properties of the steels tested are given.

Welding

60. Factors Affecting Weldability of Aluminum-Base D-20-Type Alloys

"Effect of Comparison on the Properties and Weldability of D-20-Type Alloys," by V. A. Kozlovskaya, O. V. Meshkova, and A. G. Yelkina; Kiev, Avtomaticheskaya Svarka, No 9, Sep 62, pp 57-62

The effects of adding copper manganese, magnesium, beryllium, zirconium or other elements on the mechanical properties of welded seams of aluminum-based D-20-type alloys (4-7% Cu, 0.2-1.0% Mn, 0.2% Ti) are studied.

Short- and long-time tensile strength, impact strength, ductility and hot-cracking tendencies were studied for both the base metal and weld seam. In most cases the addition of one or more of the above listed metals will give improved properties if certain composition limits are maintained. The most significant item mentioned was the impact strength of a weld in which the alloy contained 7% Cu. The base metal in this case was little affected by the addition of the copper, while the impact strength of the weld was almost doubled.

61. Neutron Welding

Moscow, Mashinostroitel', No 9, Sep 62, p 29

"Synthetic materials or metals, which until recently could not be bonded or soldered, can now be firmly joined by means of exposure to slow neutrons.

Small quantities of lithium or boron compounds are placed on the weldable surface. During exposure to the neutrons, nuclear reactions occur in these chemical elements. The edges of the materials being welded are heated up to several hundred and even thousands of degrees in a billionth part of a second.

In modern engineering it sometimes becomes necessary to join glass with plastic, to join two different types of synthetic plastics, or to join rubber and synthetic fiber. In these cases a special fine coating of polystyrene with added boron is recommended."

62. Spot Welding With Ultrasonics

"Spot Welding of Metals With Ultrasonics," by B. B. Zolotarev, Candidate of Technical Science, Engrs Yu. D. Volkov and V. I. Domaskin; Moscow, Svarochnoye Proizvodstvo, No 9, Sep 62, pp 37-41

Results of research is presented on a technology of spot welding various metals and alloys by ultrasound. The effect of various fundamental factors of the welding process on the strength of the weld is discussed. Also discussed are the equipment, methods of pulse amplitude control, and results of metallographic studies. Welding process data and tensile strengths of the welds are given for the alloys studied which are comprised of aluminum, copper, titanium, molybdenum, niobium alloys and combinations of two alloys, and 1Kh18N9T stainless steel.

Miscellaneous63. Additional Information on East German Meeting of Metallurgists

Berlin, Die Technik, No 11, Nov 62, p 796

The Eighth Annual General Meeting of the Society of German Miners and Metallurgists will be held in Leipzig during 6-8 December 1962 [previously scheduled for 8-10 November]. Prof Dr G. Mayer, rector of the Karl-Marx University in Leipzig, will deliver the key address.

Lectures will be delivered on "Metallurgy and Applied Physics" by Prof M. von Ardenne, Dresden; and "The Chemical, Physical, Technological, and Economic Prerequisites for the Use of Plastics in Mining and Metallurgy" by Dr Thinius, Dresden.

Well-known scientists from Czechoslovakia, Austria, Poland, the USSR, Hungary, and other countries will deal with the following subjects during events which will be held simultaneously in the various specialized fields:

"Prospects of Success in Petroleum and Natural Gas Drilling in the GDR," Diploma Geologist R. Wienhold; "Electrical Processing," Prof Dr Engr H. Kirchberg, Freiberg; "Development of New Flotation Reagents," Diploma Engineer Oktawiec, Katowice; "New Methods and Information Concerning the Development of Steel," Prof Dr Engr W. Kuentscher, Hennigsdorf; "Processing and Application of Aluminum in Hungary," Dr Engr A. Domany, Budapest; "Cold-Formed Shapes for Light Construction," Engr R. Beck, Zwickau; "Production and Use of Magnesium," Prof Dr G. Wehner, Bitterfeld; "Effective Use of Materials in the Shipbuilding Industry," Diploma Metallurgist H. Klaas, Rostock; "Production and Technical Application of High Temperature Plasmas," Dr K. Rademacher, Berlin; and "Use of Mathematical-Statistical Methods for the Analysis, Control, and Regulation of Metallurgical Processes," Diploma Engineer M. Knotek, Prague.

Fees for attending the conference are DM 30.00 for nonmembers; DM 20.00 for regular members; and DM 5.00 for special members and students.

#### 64. Approximately Melting Points of Multicomponent Systems

"Approximating the Melting Point of Alloys in the Ni-Ti-Cr-Mo-W-Nb System," by F. M. Perel'man; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 62, pp 844-849

Approximation of melting points of alloys in a six-component system was attempted by utilizing all the known information of the metals involved and the properties of their respective binary and ternary systems. Four alloys, two rich in nickel and two in titanium, of the Ni-Ti-Cr-Mo-W-Nb system were analyzed and from the knowledge of the existing solid solutions formed in the various binary and ternary systems, melting points of the two, three, and four component systems, and the composition of the alloys, the approximated melting points were calculated. The two nickel-rich alloys were experimentally tested and found to have melting points of 1,356° and 1,350°C.

65. Control of Ferromagnetism in Plated Nickel

"Influence of Bath Composition and Its Temperature on the Magnetic Properties of Nickel Coatings," by N. V. Kotel'nikov, N. A. Korenev, and T. D. Yermolina, Perm State University; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 6, 1962, pp 105-107

Experimental work disclosed that in electrolytic plating of nickel, the magnetic properties of nickel can be controlled. Two main factors influencing ferromagnetism of nickel are the bath composition and its temperature. Hysteresis studies of a number of test specimens plated in electrolytic baths of varying  $\text{NiSO}_4$  concentration and temperatures ranging from 70-90° C showed that the highest degree of ferromagnetism in all cases was obtained by those specimens plated at 80° C, while the greatest magnitude of magnetization occurred in those specimens plated in a low  $\text{NiSO}_4$ -concentration bath.

66. Czechoslovak Will Obtain Germanium From Coal Smoke

"Germanium From Coal Dust"; Tudomány es Technika, Bratislava, No 21, 23 Oct 62, p 735

According to examinations of Czechoslovakian black and brown coals, they contain 20-25 grams of germanium per ton. Now, after several years of research, Czechoslovak researchers have developed a method with which the germanium content of power plant gases containing dust can be extracted through cyclone dust washing. The operation is continuous and automatically controlled, and, after zone melting, it gives germanium of 99.9 percent purity. According to plans, a number of Czechoslovak power plants will be equipped with germanium extracting equipment in the near future.

67. Determining the Tensile Strength of Copper Whiskers

"Determining Size and Shape of Cross Sections of Thread-like Crystals," by S. Z. Boksteyn and I. L. Svetlov; Moscow Zavodskaya Laboratoriya, Vol 28, No 5, 1962, pp 595-596

A method of mounting metal whiskers in a 712-9M-Kh0 polymerized plastic is described. This method makes it possible to determine the size and shape of metal-whisker tensile specimens at the point of fracture in order to accurately determine the tensile strength of whiskers. More than fifty copper whiskers were mounted by this method. Cross sectional area of these whiskers ranged from  $3.7 \times 10^{-8}$  to  $100 \times 10^{-8}$   $\text{cm}^2$ . Greatest tensile strengths ( $200 \text{ kg/mm}^2$ ) were

found in those whiskers with a diameter of 2-3 microns. Those with a diameter of 10-15 microns had tensile strengths equal to that of their standard size specimens. No relationship was found to exist between the tensile strength and crystal orientation.

#### 68. Electroslag Remelting of Austenitic Steel G13

"Electroslag Remelting of Austenitic Steel G13," by B. I. Medovar and G. V. Ksendzyk, Institute of Electric Welding Imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR; Kiev, Avtomaticheskaya Svarka, No 9, Sep 62, pp 18-21

Attempts were made to increase the ductility and improve the forgeability of austenitic steel G13 by electroslag remelting using several different oxidizing fluxes. In order to achieve the improved properties, the silicon and phosphorus content of G13 steel was limited to a maximum of 0.50% and 0.03% respectively.

Tests melts were made using standard fluxes ANF-17 ( $\text{CaF}_2\text{-Mn}_2\text{O}_3$ ), ANF-20 ( $\text{CaF}_2\text{-BaO}$ ), and ANF-6 ( $\text{CaF}_2\text{-Al}_2\text{O}_3$ ). Less than the allowable silicon content was achieved with all the fluxes but the phosphorus content exceeded the specified limits.

An experimental flux ( $\text{CaF}_2\text{-BaO-MnO}$ ) was tested which proved satisfactory as a rapid oxidizer but still did not reduce the phosphorus content to the required limit.

#### 69. Heat Resistance of Zr-Nb Alloys

"Heat Resistance of Zirconium-Niobium Alloys," by V. B. Kishenevskiy and V. K. Grigorovich; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 5, Sep/Oct 62, pp 135-138

The hot hardness, short-time strength and creep of alloys of the Zr-Nb system (5, 10, 17.5, 20 and 35% Nb by atomic weight) are investigated at temperatures up to 850°C. Data on these properties are correlated with phase structures.

#### 70. Niobium Silicide Stability

"Concentration Regions of Stability of Niobium Silicides at 1,250°C," by S. I. Alyamovskiy, P. V. Gel'd, and I. I. Matveyenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 62, pp 836-843

The Nb-Si binary system was investigated at temperatures up to 1,500° C. Only two stable silicides, alpha-Nb<sub>5</sub>Si<sub>3</sub> and NbSi<sub>2</sub> were found to exist. Alpha-Nb<sub>5</sub>Si<sub>3</sub> was found to be a phase of changing composition formed by atom substitution which is stable at 1,250° C. Its composition ranges from NbSi<sub>0.58</sub> to NbSi<sub>0.66</sub>. Niobium disilicide which occurs in the range from NbSi<sub>1.85</sub> to NbSi<sub>2.20</sub> is a single phase which is formed also by atom substitution. Due to the similarities in structure, these two solid solutions are difficult to identify since their crystal lattices are practically independent of composition.

\* \* \*



Washington, D.C. 20505

7 September 2004

Ms. Roberta Schoen  
Deputy Director for Operations  
Defense Technical Information Center  
7725 John J. Kingman Road  
Suite 0944  
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

A handwritten signature in cursive script that reads "Sergio N. Alcivar".

Sergio N. Alcivar  
Chief, CIA Declassification Center,  
Declassification Review and Referral  
Branch

Enclosures:

1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)



## Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	Fldr	Doc	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date
AD0463342	78-03109A	55	1	2	88	Consolidated Translation Survey For April 1965	4/1/1965	190	Approved For Release	3/25/2004
AD0465168	78-03109A	55	1	3	89	Consolidated Translation Survey For May 1965	5/1/1965	245	Approved For Release	3/25/2004
AD0467068	78-03109A	55	1	4	90	Consolidated Translation Survey For June 1965	6/1/1965	221	Approved For Release	3/25/2004
AD0468849	78-03109A	55	1	5	91	Consolidated Translation Survey For July 1965	7/1/1965	218	Approved For Release	3/25/2004
AD0471155	78-03109A	55	1	6	92	Consolidated Translation Survey For August 1965	8/1/1965	236	Approved For Release	3/25/2004
AD0473500	78-03109A	55	1	7	93	Consolidated Translation Survey For September 1965	9/1/1965	221	Approved For Release	3/25/2004
AD0474384	78-03109A	55	1	8	94	Consolidated Translation Survey For October 1965	10/1/1965	181	Approved For Release	3/25/2004
AD0475860	78-03109A	55	1	9	95	Consolidated Translation Survey For November 1965	11/1/1965	305	Approved For Release	3/25/2004
AD0477388	78-03109A	56	1	1	96	Consolidated Translation Survey For December 1965	12/1/1965	181	Approved For Release	3/25/2004
AD0478471	78-03109A	56	1	2	97	Consolidated Translation Survey For January 1966	1/1/1966	198	Approved For Release	3/25/2004
AD0479675	78-03109A	56	1	3	98	Consolidated Translation Survey For February 1966	2/1/1966	354	Approved For Release	3/25/2004
AD0481681	78-03109A	56	1	4	99	Consolidated Translation Survey For March 1966	3/1/1966	237	Approved For Release	3/25/2004
AD0334379	78-03117A	191	1	37	4255	Status And Activities Of Prominent Scientists In Communist China In 1962	1/29/1963	53	Approved For Release	3/29/2004
AD0333974	78-03117A	190	1	35	4212	Scientific Information Report Outer Mongolia (1)	1/17/1963	27	Approved For Release	3/29/2004
AD0335202	78-03117A	195	1	13	4394	Scientific Information Report Outer Mongolia (2)	3/13/1963	27	Approved For Release	3/25/2004
AD0332657	78-03117A	183	1	13	3924	Scientific Information Report Biology And Medicine (22)	10/12/1962	76	Approved For Release	3/29/2004
AD0333147	78-03117A	185	1	30	4020	Scientific Information Report Biology And Medicine (23)	11/16/1962	90	Approved For Release	3/29/2004
AD0333427	78-03117A	188	1	13	4112	Scientific Information Report Biology And Medicine (24)	12/13/1962	84	Approved For Release	3/29/2004
AD0334160	78-03117A	190	1	10	4187	Scientific Information Report Biology And Medicine (25)	1/10/1963	69	Approved For Release	3/29/2004
AD0334612	78-03117A	193	1	10	4310	Scientific Information Report Biology And Medicine (26)	2/20/1963	112	Approved For Release	3/29/2004
AD0335309	78-03117A	195	1	32	4413	Scientific Information Report Biology And Medicine (27)	3/20/1963	110	Approved For Release	3/29/2004
AD0336242	78-03117A	198	1	16	4509	Scientific Information Report Biology And Medicine (28)	4/12/1963	81	Approved For Release	3/29/2004
AD0332575	78-03117A	184	1	6	3957	Scientific Information Report Chemistry And Metallurgy (22)	10/23/1962	47	Approved For Release	3/29/2004
AD0333164	78-03117A	187	1	2	4061	Scientific Information Report Chemistry And Metallurgy (23)	11/28/1962	65	Approved For Release	3/25/2004
AD0333857	78-03117A	189	1	22	4160	Scientific Information Report Chemistry And Metallurgy (24)	1/2/1963	57	Approved For Release	3/29/2004
AD0334310	78-03117A	191	1	20	4238	Scientific Information Report Chemistry And Metallurgy (25)	1/28/1963	52	Approved For Release	3/29/2004