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USSR REPORT

CHEMISTRY

No. 105

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ALKALOIDS

UDC 633.511:631.52:631.531(575.1)

EFFECTS OF NOVEL LOW-TOXICITY DEFOLIANTS ON PHYSICOCHEMICAL CHARACTERISTICS OF COTTONSEED OIL

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 83
(manuscript received 18 Jan 82) pp 60-63

MAKHMUDOV, T. M. and MAKSUDOV, S., Tashkent Auto Traffic Institute

[Abstract] New low-toxicity defoliants alpha-3 and alpha-4 (mean lethal dose 6700-6900 mg/kg for mammals) were tested for their effects on cottonseed oil and gossypol concentration in cotton varieties 108-F, Tashkent-1, and Kizil-Ravat sprayed with these defoliants 12 days prior to testing. Chemical analysis of the composition of the oils showed insignificant deviations from control samples and, consequently, the physicochemical (iodine number, refraction index, saponification number, etc.) characteristics and taste were not affected. Gossypol concentrations, however, were 0.13 to 0.25% lower than in comparable control samples. Figures 1; references 11 (Russian). [266-12172]

UDC 543.51:543.3

THIN LAYER METHOD IN SPARK MASS SPECTROMETRY; ANALYSIS OF HIGHLY PURE WATER

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 4, Apr 83
(manuscript received 22 Jun 81) pp 581-585

SHELPAKOVA, I. R., SAPRYKIN, A. K., CHANYSHEVA, T. A. and YUDELEVICH, I. G.,
Institute of Inorganic Chemistry, Siberian Branch, USSR Academy of Sciences,
Novosibirsk

[Abstract] Spark time spectrometry is one of the most highly sensitive multiple-element water analysis methods available. The absolute limits of detection of some 60 impurities by this method amount to 10^{-10} to 10^{-12} g, the relative limits are 10^{-5} to $10^{-7}\%$. Evaporation of specimens to small volume and analysis of a frozen drop of the resulting concentrate allows determination of about 50 impurities with detection limits of 10^{-7} to $10^{-9}\%$. This work studies the possibility of combining spark mass spectrometry with concentration of impurities by evaporation of a water specimen to dry residue. A drop of about 0.05 ml remaining from evaporation of a larger specimen was placed on a special highly pure substrate of semiconducting silicon and evaporated until dry. The surface layer of the substrate containing the dry residue was then analyzed layer by layer. The levels of detection of 60 impurities were found to be 10^{-9} - 10^{-12} mass%, the relative standard deviation 0.17-0.36. References 13: 11 Russian, 2 Western.
[269-6508]

UDC 535.8:543.420.62

DETERMINATION OF ELEMENT TRACES BY INTRARESONATOR LASER SPECTROSCOPY:
SPECTROPHOTOMETRIC MULTILAYER DETERMINATION OF PHOSPHORUS IN SILICON

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 4, Apr 83
(manuscript received 29 Mar 82) pp 586-591

GRISHKO, V. I., YUDELEVICH, I. G., KRAVCHENKO, L. Kh. and NIKITINA, V. P.,
Institute of Inorganic Chemistry, Siberian Branch, USSR Academy of Sciences,
Novosibirsk

[Abstract] An attempt was made to create a simple intraresonator laser spectrophotometer for quantitative measurement based on a helium-neon laser

with secondary resonator. The laser was selected as being the simplest, cheapest and most reliable in operation, allowing the lowest levels of detection and expanding the operating range of concentrations. The instrument was used for multilayer determination of very small traces of phosphorus in films and silicon structures. Calibration graphs are presented for the determination of phosphorus in aqueous solutions and in isobutanol extracts. Extraction allows determination of lower phosphorus contents. The minimum phosphorus concentration which can be determined is 10 pg/ml, absolute quantity 0.3 pg. Figures 4; references 16: 6 Russian, 10 Western.
[269-6508]

CATALYSIS

UDC 541.124/128.3+542.943.7:546.221.1

CATALYTIC ACTIVITY OF IRON-IONITE ANKB-50 COMPLEXES IN LIQUID-PHASE OXIDATION OF HYDROGEN SULFIDE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 28, No 5, May 83
(manuscript received 15 Mar 82) pp 1219-1223

ASTANINA, A. N., FUNG TI SHI, RUDEKNO, A. P., KOPYLOVA, V. D. and
FRUMKINA, Ye. L., Moscow State University imeni M. V. Lomonosov

[Abstract] Studies were conducted on the catalytic activity of iron-ionite ANKB-50 complexes in the oxidation of hydrogen sulfide by molecular oxygen in aqueous solutions. Ionite ANKB-50 contains iminoacetic groups and forms firm coordinates with Fe(II, III). Formation of the complexes was confirmed by IR spectroscopy, while IR and ESR spectral analyses demonstrated that the most probable oxidation mechanism consisted of a two-step process, involving initial oxidation of surface iron sulfides by molecular oxygen ($4\text{FeS} + 3\text{O}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{FeOOH} + 4\text{S}$) and subsequent reduction of the surface iron hydroxides by hydrogen sulfide ($2\text{FeOOH} + 3\text{H}_2\text{S} \rightarrow 2\text{FeS} + 4\text{H}_2\text{O} + \text{S}$), for an overall process described by the following equation: $2\text{H}_2\text{S} + \text{O}_2 \rightarrow 2\text{S} + 2\text{H}_2\text{O}$. The Fe serves to transfer electrons from H_2S to oxygen through variations in its valence between Fe^{++} and Fe^{+++} . Figures 4; references: 5 Russian.
[271-12172]

UDC 547.281:542.943.7

CATALYTIC OXIDATION OF n-BUTYRIC ALDEHYDE BY MOLECULAR OXYGEN IN LIQUID PHASE

Moscow NEFTEKHIMIYA in Russian Vol 23, No 2, Mar-Apr 83 (manuscript received 25 Feb 82) pp 243-249

CHERNYUK, G. P., STAN'KO, V. N. and BEL'FERMAN, A. L.

[Abstract] Results are presented from a study of the reaction of liquid phase oxidation of BuH (butyric aldehyde), by molecular O_2 in the presence of a mixed Cu-Co-acetate catalyst. The study was performed in a laboratory installations with a continuous flow using a tubular stainless steel reactor with an inside diameter of 12 mm, total height of reaction zone 75 cm, with

5 taps through the height of the column to take off specimens. It was found that Bu_2O was formed beginning at the very start of the reaction, not requiring a certain quantity of $3\text{Bu}_2\text{O}$ to be present in the reaction mixture. The degree of conversion of BuH increases with increasing total concentration of catalyst in the initial mixture. Co^{2+} is more active in oxidation than Cu^{2+} and there is no synergism in the catalytic action of the mixed catalyst. The optimum conditions for production of n-butyric acid and its anhydride are temperatures 60°C , copper (II) and cobalt (II) ion concentration $5-6 \cdot 10^{-4}$ and $2-3 \cdot 10^{-4}$ g-ion/g-mol aldehyde, molar ratio of n-butyric aldehyde: O_2 1:0.5, concentration of aldehyde in initial mixture 80-85 vol.%, reagent contact time 25 minutes. Figure 1; references 10 Russian.
[259-6508]

UDC 541.128

POTENTIOMETRIC METHOD OF STUDYING POWDERED CATALYST UNDER HYDROGEN PRESSURE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 269, No 6, Apr 83
(manuscript received 25 Oct 82) pp 1381-1383

BIZHANOV, F. B., SOKOL'SKIY, D. V., academician, Kazakh Academy of Sciences, DINASYLOVA, Sh. D. and SERTAZINA, S. Sh., Institute of Organic Catalysis and Electrochemistry, Kazakh Academy of Sciences, Alma-Ata

[Abstract] Results are presented from studies intended to refine the boundaries of applicability of the potentiometric method under hydrogen pressure for the study of powdered catalysts. Five percent Pd and Pt/C catalysts were studied in the 0.1-9.8 MPa pressure interval at 298-348K in 0.1 N aqueous solutions of H_2SO_4 , NaOH, double distilled water and ethanol. The experimental results fall with ± 5 mV of the results theoretically calculated using the Nernst equation. The results are explained by assuming that as the specific conductivity of alcohol decreases in comparison to aqueous solutions the diffusion potential at the ethanol-aqueous KCl solution boundary increases. A significant increase in potential with increasing pressure is assumed to relate to the charging of the surface of the catalyst not only due to ionized hydrogen, but also with the formation of cation radicals of alcohol. The studies show that in aqueous solvents there is complete attachment of the catalyst potential to the measurement electrode. The Nernst equation completely describes the change in potential with pressure, temperature and pH. The potentiometric method suggested can therefore be used to study oxidation-reduction reactions under hydrogen pressure in water and aqueous solutions of acids and alkalis. Figures 3; references 5 Russian.
[282-6508]

HETEROGENEOUS METAL-COMPLEX ORGANIC SYNTHESIS CATALYSTS BASED ON CARBON MONOXIDE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 293-298

LISICHKIN, G. V. and YUFFA, A. Ya.

[Abstract] Reactions with carbon monoxide are exothermic. Energy consumption in the maintenance of the necessary reaction rate makes a significant contribution to the cost of products in such reactions. The development of catalytic chemistry indicates the promise of using metal-complex catalysts for this purpose. However, homogeneous metal-complex catalysts are difficult to produce and require additional stages of separation of catalysts from products and unreacted raw materials. The solution is attachment of catalytically active transition metal complexes to the surfaces of solid carriers. The method of bonding of transition metal catalysts to carriers includes 5 methods of attachment which are described in this article: adsorption of catalytically-active complexes in carrier pores, ion exchange heterogenization of transition metal complexes; coordination heterogenization; covalent heterogenization; and inclusion of catalytically active complexes in the grid of polymer gels. Heterogenized transition metal-complex catalysts will be particularly useful as coal is increasingly used as the raw material for organic synthesis, replacing increasingly scarce petroleum. References 48: 13 Russian, 35 Western.
[286-6508]

CHEMICAL INDUSTRY

INDUSTRIAL CHEMISTRY IN UZBEKISTAN

Tashkent EKONOMIKA I ZHIZN' in Russian No 1, Jan 83 pp 32-34

[Article by U. Dalabayev, head of the Uzbek State Planning Commission Department of Chemistry, Geology, Metallurgy, and Raw Minerals: "Great Chemistry in the Service of Man"]

[Text] The faithful Shorsu Mine, put into operation in the 1920s, can be considered the first chemical enterprise in the republic. But before the victory of October there could be no thought of creating a branch of industry such as chemistry in a backward, colonial region of the tsar's empire. Only the Soviet rule, adhering to the Leninist course for the comprehensive economic and cultural uplifting of all peoples forming our indissoluble union, provided for the creation and steady growth of the chemical industry in Uzbekistan.

The first things necessary for rapidly developing agriculture, in particular cotton-growing, were mineral fertilizers and agents to protect plants. So the Kokand Superphosphate Plant and Chirchik Electrochemical Combine were constructed, and the, successively, the Samarkand Superphosphate Plant and Fergana Nitrogen Fertilizer Plant, the Almalyk Chemical Plant, and the Navoi Chemical Combine and Electrochemical Plant. Now these enterprises fully satisfy the needs of agriculture not only in Uzbekistan but also in other Central Asian republics.

Today the chemical industry of Uzbekistan is one of the most important sectors of the national economy. Its output is no longer reserved for agriculture alone but has wide use in industrial production and everyday life. For example, synthetic fibers, resins, and plastics that make it possible to create an abundance of the goods people want.

Providing itself with everything necessary, Uzbekistan supplies other republics with varnishes in condensation resins, furan resins, ethers, polymer tubing, polyethylene films, cultural and consumer goods, processed cellulose acetate products, polinaka [unidentified], and so forth. In other words, our republic has become one of the country's foremost suppliers of a multitude of products from the chemical, petrochemical, and microbiological industries.

Their rapid growth occurred in the last three five-year periods, aided by the discovery of new natural gas and gas condensate deposits in Bukhara Oblast. For 1966-1970, double the funds of the preceding period were set aside for the

development of the chemical industry in Uzbekistan. As a result, the facilities of the Chirchik Electrochemical Combine were expanded. Two chemical fiber facilities were put into operation at the Fergana plant. At the Navoi Chemical Combine, the construction of a production complex for organically synthesizing nitrylacrylic acid and acetic acid, nitron fibers, and so forth went on at an accelerated pace. In Almalyk, a consumer chemical plant was built to produce a variety of consumer goods.

In the 10th Five-Year Plan, reconstruction and technical re-requirement began at the Tashkent Paint and Varnish Plant. It was practically reborn. In 1983, yet another facility will be put into operation here to produce 55,000 tons of condensation resins, as a result of which the volume of goods produced by the enterprise will increase by a factor of 2.3 with practically no increase in manpower. The Elektrokhimprom Production Association in Chirchik recently put into operation the country's most powerful (80,000 tons per year) complex for caprolactam production, and intensive work is now going on there to assimilate the capacity.

At the Azot Production Association in Fergana, a complex for producing modern fiber-type polymers--di- and triacetates of cellulose--has begun production. The first portion of its output is being processed in the Fergana Chemical Fiber Plant operating nearby; the second part is being exported to other republics. In 1982, the Namangan Chemical Plant, which is exclusively for the production of carboxymethyl cellulose (CMC), put into operation two production lines with a capacity of 7,500 tons each. This plant is the only one in the country to produce refined CMC using glycerine as the substitute.

Last year the Navoiazot Production Association expanded its output of the synthetic polymer methacrylic acid for further processing into 23,000 tons of nitron fibers. This means the enterprise is becoming the country's largest producer of this fiber.

Finally, in the current five-year period, the construction of the Dzhizak Plastic Plant will be completed. This plant manufactures tubes made from polyethylene and polyvinylchloride, polyethylene film, and consumer-cultural goods.

Uzbekistan devotes special attention to the production of polymer films. They are widely used in vegetable growing, orchards, grape growing, and other agricultural sectors. They protect the soil from water and wind erosion; they are used to manufacture packaging for transporting and storing agricultural products, mineral fertilizers, herbicides, defoliants, and so forth.

It is essential to mention the use of polymer films in constructing hotbeds and greenhouses. In combination with traditional materials, they make it possible to reduce outlays for these things by up to 20-40 percent. When sprouts are grown under a film, the yield of early cabbages can be increased by 35 percent, and the maturation period of early cucumbers can be reduced by 20-40 days, also with significantly greater yields. Tomato production under these conditions reaches 300-350 quintals per hectare.

Of course, agriculture's demand for polymer film is very high. So the Dzhizak Plastics Plant plans a further increase in its production. More film will also be manufactured in the experimental Uzbytkhimplast Production Association in order to provide it to all the Central Asian republics. This will be another contribution of Uzbekistan's great chemistry toward fulfilling the Food Program approved by the May 1982 CPSU Central Committee Plenum.

Volumes of cultural-consumer goods made from polymer materials are increasing, and the products list is being systematically expanded. Last year individual sections of the Dzhizak Plastics Plant alone manufactured hundreds of different products worth more than five million rubles.

In order to sharply increase the output of consumer goods, the Uzbytkhimplast Production Association began a specialized experimental facility equipped according to the latest word in technology. It is becoming a fine facility for trying out the technology of new types of plastics intended for cultural-consumer use and polymer compositions, polyvinylchloride processing, polystyrene, polystyrene foam, polyurethane foam, and so forth. The association has already developed and produced 30 types of products made from polystyrene foam, worth several million rubles. At the same time, the economizing on material-technical and labor resources totalled 700,000 rubles.

Polymer films, tubes, sheets, and various assembled items are widely used in agriculture, residential construction, and many sectors of Uzbek industry. That is why the scientific-research department of Uzbytkhimplast has been conducting research for many years on the aging processes of plastics. After long testing, a method was developed for quickly determining their resistance to the elements, which is very important for rational and economic use of polymer materials in the national economy.

The growing demand for foam plastics and the availability of a raw materials base is stimulating the adoption of more modern technological methods of producing and processing them. The scientific-research department has developed a technique of injection-mold processing of suspended foaming polystyrene in order to obtain products which imitate wood. Compounds for surface painting of molded polystyrene products simulating metal and ivory have been developed and adopted. The technology of preparing the compositions is simple, it does not require special equipment, and the use of scarce polymer binders is unnecessary.

An important part in finishing off plastic products is galvanic plating in decorative colors, also preventing the accumulation of static electricity in them. Today, instead of a multi-operational process of coating plastics with a current-conducting layer by chemical means, the method of air-spraying is being adopted.

The 26th CPSU Congress set the task of steadily increasing the effectiveness of all social production, for example, in capital construction, to reduce the time needed to build projects and lower their cost. Our republic's builders will be aided in this task by light-weight components, such as air-supported pneumatic structures and pneumatic shells [opalubki] which we manufacture from a multitude of polymer materials.

A high-strength, rubberized air-supported shell made of synthetic fibers covers a surface of 864 square meters. Such "tents" are used as temporary shelters in BAM construction in Tyumen Oblast, Yakutsk, regions of the non-chernozem zone, Central Asia, and Kazakhstan. During the cold weather, they serve as a shelter for people, equipment, agricultural products, machinery, and materials. They can accommodate vehicle parking and pneumatic warehouses for storing mineral fertilizers.

Specialists calculate that the economic effect of using just one air-supported pneumatic structure as a storehouse for fertilizers is 258,000 rubles. Pneumatic shells are used with great economic effect in concreting domes and arched structures with a span of 12 to 18 meters.

Systematic industrial adoption of polymer chemistry has enormous significance. Replacing metals with plastics in many machine parts and units makes it possible to lower the labor cost and prime cost of manufacturing them, raise the quality, and often the longevity as well. Thus, with a yearly economic effect of 130,000 rubles and a savings of 240 tons of scarce stainless steel, the Uzbeksel'mash Plant is producing plastic tanks for machinery applying herbicides to the soil. The Tashkhimsel'mash Plant, just in manufacturing the pulley for the OVKh-14 sprayer, is obtaining an economic effect of 21,300 rubles, saving 76 tons of cast iron per year, and lowering the labor cost of production by a factor of five.

Parts, units, and materials made from plastic find broad application in the cotton ginning, textile, food, electrical engineering, and cable industries, and in many other sectors of industry. Scientific research is going on continuously to further expand this sphere.

Thus, great chemistry has come into production to stay, and into the lives of the Soviet people. The sector of industry which took its first timid steps in Uzbekistan during the establishment of Soviet rule has now become an integral part of its immeasurably expanded economy.

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12255

CSO: 1841/262

MINISTRY RELUCTANT IN AIDING EFFORT TO UTILIZE PETROCHEMICAL WASTES

Moscow IZVESTIYA in Russian 26 Apr 83 p 3

[Article by correspondent E. Kondratov: "Why Lose a Million?: Planners Show Little Concern for Utilizing Petrochemical Wastes" (Novokuybyshevsk)]

[Text] The problems of creating rosin substitutes were discussed in IZVESTIYA earlier (No 280, 1977). Let us recall that rosin is an extremely valuable substance used in over 70 production operations. It is obtained from galipot, an amber resin that bleeds from cuts made in conifers. The demand for it is enormous, and although our forests are vast, unfortunately they are not boundless. This is why the newspaper carried an article on the urgent need for synthesizing substitutes for this "gold resin" and why it proposed placing this problem on the agenda of the ministries of chemical and petroleum refining and petrochemical industry.

At that time, frankly speaking, the ministries reacted to the article listlessly. But fortunately the resourceful people of our enterprises did not give up. Entering into creative ties with scientists of the All-Union Scientific Research Institute of Cable Industry, process engineers of the Novokuybyshevsk Synthetic Alcohol Plant managed to "gnaw" through this "nut." They adapted a "wax," as it is called, obtained from granulating low molecular polyethylene, as a substitute for rosin for impregnation of cables. Each ton saves 4 or 5 tons of "gold resin," acquisition of which would have required tapping five to seven thousand pine trees. The cable-makers are pleased: Instead of scarce rosin, they are now receiving plenty of "wax" that is, moreover, five times cheaper. The economic impact of using a ton is 11,000 rubles. But what about the petrochemists, are they not losing out? This is the "best" that I was saving for last: To them, this "wax" had formerly been a waste to be discarded. Each year they dumped and incinerated half a thousand tons of the whitish mass, similar in texture to a melted candle. But now they are selling this "wax" for 720 rubles a ton. What is particularly interesting is that their principal product--polyethylene--is 110 rubles cheaper than their "waste."

It is not by accident that I placed the word "waste" in quotation marks. If a waste brings in an income, I get the urge to call it something else, something more respectful perhaps.

It may be asserted today without any reservations that the collectives of the "Kuybyshevnefteorgsintez" Association, which includes, besides three

petroleum refineries, the synthetic alcohol plant, found a common and, most importantly, effective language with scientists. The activities of a special "commission for wastes," which came into being several years ago under the oblast council of the All-Union Chemical Society imeni Mendeleev, was the inducement to joint creativity. A register of wastes was compiled, and plans for joint research began to be drawn up. Slowly the picture became clear: The oblast's "waste bank" was discovered to contain unexpected valuables that no one wanted to even look at before.

"Science, help us!"--this is what petrochemists declared at that time, perhaps louder than anyone else, on discerning, though perhaps not right away, several enticing, advantageous projects.

Here is one as an example: using one of the wastes of petroleum refining--sludge--for oil well injection. Possessing surfactant properties, it increases the "payoff" of aging wells. The scientific partner of the petrochemists--Giprovostokneft' [State Institute for Planning and Research in Petroleum Production Industry]--is vitally interested in this problem.

The Kuybyshev Construction Engineering Institute got together with the association's process engineers to seriously study the problem of utilizing solid petrochemical wastes--aluminum and silicon oxides--as effective concrete binders. If we consider that 40,000 tons of these wastes are produced each year by just a single association, we could imagine the scale of the support that petrochemists could provide to construction materials industry.

Another construction institute--one in Voronezh--is working with Novokuybyshevsk engineers on the use of phenol and acetone production wastes in the manufacture of colored asphalts. Working in contact with Tashkent scientists, Volga engineers have developed the procedures for producing, and have actually produced, an outstanding insulation material needed by builders. Scientists of the Leningrad Scientific Research Institute of Chemical Machine Building were their partners in finding a way for extracting phenol from phenol water--a very unpleasant waste that has always been very troublesome.

Need I go on? Perhaps not. Perhaps it is already clear that engineers of "Kuybyshevnefteorgsintez" are striving to transform useless and often toxic production wastes into valuable products. This is precisely why they are seeking scientific partners. And as you can see, they are finding them. But they are finding them "on the side" so to speak--in institutes belonging to the most diverse ministries. In all but their own. The association has no creative ties with the main institutes of the Ministry of Petroleum Refining and Petrochemical Industry. They are not working on a single joint project that could be associated with the problems of making sensible use of production wastes.

I must admit that I was delighted in writing down everything Novokuybyshevsk engineers told me about their discoveries. In former times, acid bottoms were simply burned--now they are used to enrich sulfur ore. Outstanding! Before, spent catalysts were sent to the dump--now valuable metals are extracted from them. Good work! Before, phenol resin had also been burned, and soon the association will be obtaining benzene and toluene from it. Superior!

They tell me all of this, and I write it down.... And suddenly, I hear the ironic sentiments of V. Popov, the association's general director: "As it turns out, we ourselves don't know how rich we are. Here a ruble is earned, there half a ruble goes unnoticed...."

Sobering sentiments. We could of course be happy that ways of making sensible use of discarded products keep cropping up. But why are there so many of these unaccounted-for rubles and half-rubles? Could this be because the sector's scientific research and planning institutes do not want to bother with production wastes when they develop new production procedures? Their recommendations are so simple: Use it as fuel, burn it away--why bother ourselves with such trifles?

But Novokuybyshevsk engineers seem to want the "bother." Several years ago the synthetic alcohol plant began producing commercial alpha-methylstyrene, which is used in the acquisition of synthetic rubber. Wastes from phenol production--one of the side fractions that had formerly been used as fuel--began to be used as the raw material. The volume of this waste material is not all that large--50 or 70 tons a year. But this is only at a single plant. What if there are many such plants? In short, the workers of Novokuybyshevsk began collecting the "unneeded" fraction not only from themselves but also from Saratov and Kazan. The result: This "correction" to the plan has already earned the association an additional 9 million rubles. The association has also saved 20,000 tons of scarce benzene and 11,000 tons of propylene. And the synthetic rubber plants received 24,000 tons of a most valuable raw material. Resourceful people these Novokuybyshevsk workers are, isn't that true? But they are even more--they are thrifty businessmen. It makes them sad to throw the people's money to the winds, poisoning the air at that. That is precisely what is happening today with petroleum residues. Tens of thousands of tons are being dumped from one year to the next. Residues occupy many hectares of land and release hydrocarbons into the atmosphere. But there are grounds for hoping that these residues could be utilized. "Science, help us!"--producers are looking hopefully to their ministry's main scientific research and planning institutes.

But sector science of the Ministry of Petroleum Refining and Petrochemical Industry is remaining true to itself: A furnace has been planned for the Novokuybyshevsk Petroleum Refinery for, of all things, burning residues. Moreover there are not even any plans for utilizing the heat. The furnace will cost a million rubles, plus the fuel for the furnace, transportation and other expenses. Novokuybyshevsk engineers find this insulting: Once again they are asked to burn the people's money! Does this really mean that they will have to once again seek scientists "on the side" who might share their concern for thrift and economy?

As everyone knows so well, petroleum is a scarce raw material. And rational utilization of the wastes obtained from its processing is one of the most important directions of economizing on raw material resources. It is a good thing, of course, that the collective of "Kuybyshevnefteorgsintez" is persistently seeking ways to transform wastes into useful products. But initiative from the bottom, taken alone, is not enough in this important effort.

Shaping a resource-conserving technical policy is an obligation of the sector's staff--of the Ministry of Petroleum Refining and Petrochemical Industry and its institutes, which are called upon to create wasteless procedures for all of their enterprises. As we can see, however, the sector's planners are in no hurry to utilize the experience of the best enterprises, proposing instead solutions that occasionally mean multimillion losses for the national economy. One would think that the board of directors of the Ministry of Petroleum Refining and Petrochemical Industry and the USSR State Committee for Science and Technology would attentively study the state of affairs in the planning organizations responsible for creating petroleum processing procedures, and that they would take steps to make sure that a maximum of products useful to the country would be extracted from every ton of valuable raw material.

11004

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VENTSPILS PLANT IMPROVES LIQUID COMPLEX FERTILIZER PRODUCTION

Riga SOVETSKAYA LATVIYA in Russian 14 May 83 p 2

[Article: "New Form of Fertilizers"]

[Text] Liquid complex fertilizers produced by the Ventspils Portside Plant are widely used in our country. According to calculations made by specialists, they increase yields by 40 percent. They have been awarded the State Seal of Quality.

But specialists are continuing to improve this fertilizer. A new universal facility preparing compound-mixed and suspended liquid complex fertilizers containing a broader assortment of nutrients and microelements is now operational.

These liquid complex fertilizers will be used as the basis for producing three forms of fertilizers that may be used depending on soil conditions. The new liquid complex fertilizers, which have a greater nutrient content, will make it possible to raise the yields from the fields and to fulfill the Food Program more successfully.

11004

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BRITISH BLAMED FOR CHILLING OF ANGLO-SOVIET TRADE RELATIONS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 May 83 p 3

[Article by V. M. Ivanov, USSR trade representative in Great Britain: "Trends in Trade"]

[Text] Throughout the entire history of its trade relations with Great Britain, the Soviet Union has invariably guided itself by Lenin's principles of peaceful coexistence between states with different social structures, and it has consistently supported mutually advantageous and equal cooperation.

Unfortunately, this cannot be said of the ruling circles of Great Britain. Two opposing trends can be discerned rather distinctly in their approach. One of them, a realistic one, is to establish stable mutually advantageous ties and to create a trade and political climate favoring this. The other is to retard business cooperation on the basis of various fabricated excuses.

Looking at the last decade, the former of these trends manifested itself especially clearly in the mid-1970s. In February 1975 a long-range program for development of economic and industrial cooperation between the USSR and Great Britain and a Soviet-British credit agreement were signed.

Implementation of the agreement reached in Moscow in 1975 provided new impetus to expansion of mutual trade, the turnover of which attained record levels by 1979. It is no accident that it was precisely in the second half of the 1970s that Soviet-British economic cooperation began to acquire a longer-range and larger-scale nature. New, promising forms of cooperation, including on a compensatory basis, and cooperative production between organizations and companies of both countries enjoyed development.

The largest Soviet-British trade contracts were signed during this period within the framework of the long-range program. They included ones with Simon Karvz [transliteration] for delivery of equipment for the Nizhnekamsk, Belotserkovsk and Voronezh tire plants, Kobberou [transliteration] for delivery of gas pumping units for the Surgut-Chelyabinsk Gas Pipeline, Vudl Dakkhem [transliteration] for delivery of equipment to the USSR for producing fiber glass, and Deyvi Corporation [transliteration] and ACI for delivery of equipment outfits to two of the world's largest methanol plants in Tomsk and Gubakha.

Deliveries of Soviet goods to the British market also increased noticeably in these years. On the whole the mutual trade turnover almost doubled in the second half of the 1970s in comparison with the preceding five-year plan.

However, as early as in the very beginning of the 1980s a serious worsening in the overall climate of our bilateral relations occurred at no fault of the Soviet side. Unfortunately the Conservative government, following in the mainstream of Washington's anti-Soviet strategy, began making more frequent attempts at using trade as a tool of political pressure upon the Soviet Union, and establishing new prohibitions and constraints for this purpose.

An extremely unfavorable and, in relation to a number of goods, an openly discriminatory policy of imports into the British market has now been established for the USSR. Imports of a large number of goods require special permits, and since March of last year the range of Soviet finished articles and industrial materials that may be imported into Great Britain in strictly limited quantities was significantly expanded. Exports of many forms of modern equipment to our country have been prohibited on the excuse that these are supposedly strategic goods.

Stiff constraints on the number of Soviet specialists working in Great Britain and other unfriendly actions are not promoting further development of business-like cooperation.

Such a short-sighted policy was not long in having an effect on the indicators of mutual trade: In just 2 years (1980-1981) its volume decreased by more than 20 percent. Last year the commodity turnover hardly increased in comparison with 1981.

Despite a number of negative phenomena in Great Britain's foreign trade policy in relation to our country, a significant proportion of the British business world continues to display an active interest in developing trade with the Soviet Union.

Just in 1982 alone about 2,000 British businessmen visited the Soviet Union. Many of them visited our country as members of delegations representing various chambers of commerce and other organizations of British industrialists. Last year 169 British companies took part in international exhibitions held in the USSR. Moreover seven specialized exhibitions of British products were organized--the "Britnauchpribor-82" exhibition in particular.

The British-Soviet Chamber of Commerce, which represents more than 500 Soviet and British organizations and firms, is making a great contribution to strengthening business ties between the two countries. The chamber provides assistance to businessmen in establishing contacts with Soviet organizations, and it publishes information on mutual trade issues. For the first time in the history of the chamber, on 16 March 1983 its annual meeting was held in Moscow with the attending delegation containing a record number of participants (more than 200 persons).

In connection with this interest displayed by business circles, in a number of cases the British government departs from its policy of restraining trade with the Soviet Union. As an example in summer of last year it provided support to the John Brown Company, which is fulfilling its contracted obligations to deliver gas pumping equipment for the gas pipeline between West Siberia and the western border of the USSR, despite the U.S. administration's embargo. The 10th Session of the Permanent Intergovernmental Anglo-Soviet Commission for Scientific-Technical, Trade and Economic Cooperation, held in September 1982 in Kishinev, also promoted an improvement in the overall climate of bilateral business relations.

We expect the forthcoming 11th Session of the permanent intergovernmental commission to make further steps toward securing the positive advances made in the last years in regard to expanding the base of mutually advantageous cooperation between the USSR and Great Britain.

11004
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A. JOHNSON FEATURED AS MODEL OF BRITISH-SOVIET BUSINESS TIES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 May 83 p 3

[Article by special correspondent M. Bogdanov: "'Solnyshko' From Reeding"]

[Text] Your correspondent recently visited the English affiliate of Sweden's A. Johnson, which has a long history of cooperation with the USSR.

The company is small--only 65 persons working in an industrial complex on the outskirts of the city of Redding. However, its modest dimensions do not keep it from satisfying a sizable share of the demand of all British industry for production equipment used in the processing of many foodstuffs, pharmaceuticals and chemicals, including margarine and gelatin. Moreover about 80 percent of the complex machine units manufactured by the company are exported.

Interviewing a Soviet citizen is a totally commonplace event for the person who received me--the company's assistant director, Mr De Solls. He has been to the USSR over 30 times, and it is with warmth and pride that he talks about the stable, friendly contacts with the "Tekhnopromimport" All-Union Association. And this is no surprise if we consider that in the last 10 years about a fourth of all of A. Johnson's products were manufactured in response to orders from the Soviet Union.

"Our cooperation began in 1961," Mr De Solls explained. "Since that time we supplied the USSR with equipment for 60 margarine production lines and for a plant to manufacture plastic packaging for it. Just since 1977 the volume of its deals exceeded 25 million pounds sterling. You would have to agree that for such a small company as ours, such figures are impressive. But even this is not the limit. Besides expanding cooperation in margarine production, we intend to activate contacts in production of gelatin for the needs of the USSR's photochemical industry."

In principle, 10 minutes would have been enough to inspect the handful of A. Johnson's work buildings. But the tour took me a great deal longer. Every colleague of the company--from the common workman to the engineer--wanted to talk with a representative from the country that was placing the orders he was working on. Many of them had been in the Soviet Union, they had communicated with Soviet workmen, and therefore they relate to our country without any sort of prejudices.

In the technical library I was shown dozens of fat tomes in English and Russian intended to support the projects for 1983-1985. Next door, files had already been prepared for the next generation of equipment to be delivered on the basis of a large contract signed by the company with the Soviet Union in December of last year.

In the assembly shop, one of several machine units ordered by the USSR--a "Votator" heat exchanger, rightfully the pride of the company--was being assembled at full steam. The "Votator" was designed to process foodstuffs and chemicals with a higher viscosity--for example margarine, gelatin or licorice.

On returning to the assistant director's office I posed the following question to Mr De Solls: Have the occasional ups and downs in British-Soviet political relations had any effect on his company's business ties with the USSR?

"No, they have not affected us, and I am hopeful that they will never affect us from here on in," my fellow communicant replied with certainty. "You know, when you've got decades of stable, mutually advantageous relations behind your back, and you're certain of the evenness and reliability of your partner, you look at the future optimistically. But at the same time I know quite well that many businessmen planning to establish their first business relations with the Soviet Union may be frightened away by some anti-Soviet campaign such as those periodically taking shape in the West, and sometimes, alas, with the active participation of our government."

But Mr De Solls was clearly not in the mood for ending the meeting on a pessimistic note. He eagerly described his trip to Moscow in March of this year for a meeting of the British-Soviet Chamber of Commerce, he shared his plans for the future, and in conclusion he showed me a sample of plastic packaging developed by the company for a Soviet brand of margarine with the affectionate name "Solnyshko" [Little Sun].

On my way to London I pondered how typical the things I saw in Redding were of British-Soviet business relations. On one hand A. Johnson is atypical, since the bulk of British business is still oriented on trade with nonsocialist countries, which can be explained by a large number of historic and political factors. On the other hand the small company in Redding is a clear representative of that faction of British business circles which, having assumed the course of trade with the Soviet Union a while back, gradually came to recognize, and place a high value upon, the benefits of cooperating on a long-range basis.

11004

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RECENT STRUCTURE OF CEMA FOREIGN TRADE IN CHEMICALS ANALYZED

Moscow EKONOMICHESSKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 2, Feb 83 pp 17-22

[Article by Nikolay Titov, CEMA Secretariat: "Chemical Goods in Foreign Trade of CEMA Countries"]

[Text] In 1971-1980 CEMA chemistry developed at a rate that exceeded the growth rate of all CEMA industrial production by a factor of 1.3. Preferential development of this sector is being promoted in many ways primarily by chemical science and technology. An important role is also being played by the achievements of sectors such as metallurgy, machine building, instrument making and others which provide apparatus and equipment operating in caustic media at high and low pressures and temperatures, and instruments to control production processes. Correspondingly with growth in chemical production volume, the possibilities that CEMA countries have for participating in international division of labor and in development of foreign trade are rising.

In 1980, foreign trade turnover of the CEMA countries in the chemical goods group was over 13 billion rubles, or 5.8 percent of the cost of the foreign trade volume with all countries of the world (Table 1).

The role and significance of chemical goods are determined not by their proportion in the cost of foreign trade turnover but rather by the effectiveness which the economy of any country enjoys due to their use.

Chemical plant protection resources are known not only to preserve the yields of agricultural crops but also to economize on a significant quantity of manpower (for example for weeding when herbicides are used), and to thus promote an increase in labor productivity.

Use of polymers in the national economy means a great savings of natural raw materials (wool, leather, natural rubber, cotton, silk, nonferrous metals, timber etc.), promotes introduction of progressive procedures and, in the final analysis, sharply increases the effectiveness of social production.

Table 1. Proportion of Chemical Goods in the Foreign Trade of the CEMA Countries in 1980 (Percent)*

<u>CEMA Countries</u>	<u>Export</u>	<u>Import</u>	<u>Turnover</u>
Total	5.0	6.6	5.8
Including:			
Bulgaria	4.0	6.2	5.1
Hungary	6.9	13.3	10.2
GDR	10.2	5.5	7.8
Poland	3.4	7.4	5.5
Romania	10.0	6.4	8.1
USSR	3.3	5.4	4.3
Czechoslovakia	5.7	8.8	7.2

* Not including chemical fibers and pharmaceutical goods.

Chemical industry in the states of the socialist fraternity, which has become one of the leading sectors in the last two decades, satisfies all of the basic demand of these countries for chemical products and simultaneously creates the conditions for inclusion of CEMA countries in international division of labor and in development of foreign trade in chemical goods within the framework of both mutual commodities exchange and trade with other countries of the world.

It should be kept in mind in this case that in the last 10 years (1971-1980) the rate of trade in chemical goods was more than twice the rate of trade in all other goods.

Group 30 of the Unified Commodity Nomenclature of CEMA Foreign Trade (YeTN VT) occupies a significant proportion within the export structure of chemical goods in the trade of CEMA countries with all other countries. This group includes all inorganic acids and their salts, calcium carbide, chemical reagents, refrigerants, textile auxiliary compounds, aromatic hydrocarbons, caprolactam, ethyl and methyl alcohols, plastics, synthetic resins and plasticizers. In 1980 the proportion contributed by this group of goods to the cost of all exported chemical goods was 43.0 percent (it was 41.5 percent in 1970).

The increase in this proportion is connected with the commissioning of new productive capacities in the CEMA countries in 1971-1980. Thus Bulgaria introduced Europe's largest calcined soda plant. Its output capacity is 1.2 million tons per year. In 1980 Bulgaria produced 1,449,000 tons of calcined soda, of which 1,110,000 tons or 76.6 percent were exported. Large capacities producing calcined and caustic soda were placed into operation during this period in the GDR and the USSR.

According to 1980 data the proportions of soda products and other alkalis within the total chemical goods export volume were 31.3 percent (4.7 percent in 1970) for Bulgaria, 3.6 percent (2.2 percent in 1970) for the GDR and 13.0 percent (2.9 percent in 1970) for the USSR.

A large number of new enterprises and shops began producing plastics during this period. Plastic production by all CEMA countries exceeded 6.5 million tons in 1980, which means an increase of more than 2.4 times in comparison with 1970. Of this amount, almost 900,000 tons or 13.3 percent were exported. The proportion of plastics and synthetic resins in the export of chemical goods for all CEMA countries in 1980 was 8.1 percent, as opposed to 3.7 percent in 1970. This growth was especially great in the GDR, Poland, the USSR and Czechoslovakia.

The CEMA countries are continuing to increase their capacities for manufacturing mineral fertilizers. Corrected for nutrients, in 1980 their production was 37.1 million tons, which is 1.8 times more than in 1970, and more than 8.6 million tons, or 23.2 percent of the total production volume, were exported (the figure for 1970 was 19.1 percent). The principal exporting countries are the GDR, Romania and the USSR. The export quotas of these countries in 1980 were 63.1, 41.4 and 16.1 percent respectively. It should be noted in this case that the GDR predominantly exports potassium fertilizers, the USSR exports potassium and phosphorus fertilizers, and Romania exports mainly nitrogen fertilizers, as is true with the other CEMA countries.

Within the decade, export of fertilizers by all CEMA countries increased by a factor of 2.2. Mineral fertilizers are continuing to occupy a prominent position in the export of chemical goods. Thus in 1980 their proportion was 22.5 percent, to include 18.4 percent in Hungary, 25.1 percent in the GDR, 33.7 percent in the USSR and so on, as is evident from Table 2.

Taken all together, the other products shown in Table 2 play a modest role in chemical goods export of the CEMA countries. However, a significant quantity of all of these goods is produced on the basis of agreements on international specialization and cooperation. In view of this, they have great significance to the individual countries. Thus in accordance with the agreement on international specialization and cooperation in organic dyes, production of progressive brands of dyes is being developed in Poland and Czechoslovakia. The proportion of dyes in the export volumes of these countries was respectively 10.9 and 8.6 percent of the export cost of all chemical goods in 1980. Meanwhile the proportion of dyes within the total export volume of all CEMA countries is only 2.6 percent.

A similar pattern can be noted in relation to chemical plant protection resources. In accordance with agreements on international specialization and cooperation the proportion of these products in the principal exporting countries--Hungary and the GDR--is respectively 8.6 and 5.1 percent, as opposed to 3.4 percent for all CEMA countries. The main exporter of synthetic rubber is the Soviet Union, in accordance with the existing agreement on international specialization and cooperation: According to 1980 data synthetic rubber represents 7.1 percent of total Soviet exports of chemical goods. Poland, for which the proportion of synthetic rubber was 5.7 percent of the total volume of exported chemicals in 1980, should also be viewed as a prominent exporter of synthetic rubber.

Table 2. Structure of Chemical Goods Export and Import in the Trade of CEMA Countries With All Other Countries (Percent)

(1) Химические товары	(2) Год	(6) В том числе													
		Страны - члены СЭВ, всего		НРБ(7)		ВНР (8)		ГДР (9)		ПНР(10)		СССР(11)		ЧССР(12)	
		(3) экс-порт	(4) импорт	экс-порт	им-порт	экс-порт	им-порт	экс-порт	им-порт	экс-порт	им-порт	экс-порт	им-порт	экс-порт	им-порт
(1.3) Всего	1970 1980	41,5 43,0	42,1 53,2	70,1 68,9	37,8 46,1	53,9 56,0	56,4 57,2	34,0 42,6	50,6 65,3	43,7 45,3	35,7 51,1	39,4 44,2	37,8 49,5	44,6 62,8	43,6 53,5
(6) В том числе:															
(14) сопродукты и другие щелочи	1970 1980	3,3 8,2	3,0 2,4	4,7 31,3	0,1 0,3	5,9 2,5	4,5 2,9	2,2 3,6	0,6 0,2	6,2 5,4	0,3 1,0	2,9 13,0	5,3 3,6	2,9 2,6	2,5 2,9
(15) пластмассы и искусственные смолы	1970 1980	3,7 8,1	7,3 ² 7,9	6,5 5,3	9,4 ² 10,4	4,7 3,7	9,1 ² 10,4	3,7 8,4	8,2 ² 9,6	0,5 3,2	8,5 ² 4,9	3,6 4,9	6,4 ² 6,9	5,2 15,3	8,3 ² 7,4
(16) красители органические	1970 1980	2,1 2,6	4,1 ² 4,0	— 0,5	4,2 ² 4,0	— 0,1	2,7 ² 3,2	1,8 1,7	6,0 4,1	10,4 ² 10,9	3,1 ² 2,0	1,0 ² 0,7	5,5 ² 4,6	11,1 8,6	6,0 5,5
(17) лаки и краски	1970 1980	5,9 ² 5,4	7,2 ² 8,3	1,6 ² 3,8	9,6 ² 8,6	8,2 ² 2,5	4,1 ² 5,6	7,8 ² 8,9	4,6 ² 5,7	10,2 ² 13,9	7,2 ² 6,0	2,3 ² 2,3	12,6 ² 12,7	7,5 ² 4,9	3,8 ² 5,3
(18) минеральные удобрения	1970 1980	21,9 22,5	13,9 7,4	6,8 8,0	12,8 7,6	5,6 18,4	16,4 12,2	21,9 25,1	19,0 2,0	15,2 9,2	31,8 12,6	37,7 33,7	— 1,8	— 5,8	21,1 13,5
(19) химические средства защиты растений	1970 1980	4,4 3,4	5,5 6,9	7,1 3,3	9,7 8,1	5,0 8,6	6,9 6,3	7,2 5,1	3,2 3,5	3,4 1,8	2,4 4,6	0,9 1,0	7,2 10,0	6,0 1,4	3,8 4,5
(20) синтетический каучук	1970 1980	4,2 4,0	3,9 4,0	— 0,8	6,3 6,3	— 0,3	3,5 4,8	4,8 3,6	2,4 3,3	0,5 5,7	6,1 6,3	6,9 7,1	2,3 2,8	1,9 0,8	5,4 6,2
(21) автопокрышки, камеры, фелпы	1970 1980	6,4 5,5	3,5 3,0	1,9 7,3	8,4 6,5	4,8 6,4	2,9 3,4	2,5 2,4	7,3 4,6	1,7 4,9	4,8 3,6	11,9 7,3	1,3 2,0	8,0 7,4	1,2 1,9

1 For the countries indicated here, not including Vietnam, Cuba and Mongolia.
2 1975.

Key:

1. Chemical goods
2. Year
3. CEMA countries, total¹
4. Export
5. Import
6. Including
7. Bulgaria
8. Hungary
9. GDR
10. Poland
11. USSR
12. Czechoslovakia
13. Total
14. Soda products and other alkalies
15. Plastics and synthetic resins
16. Organic dyes
17. Paints and varnishes
18. Mineral fertilizers
19. Chemical plant protection resources
20. Synthetic rubber
21. Motor vehicle tires, tubes, rim bands

Motor vehicle tires, tubes and rim bands represent 5.5 percent (1980) of the chemical goods export volume of all CEMA countries. However, this indicator is 7.3 percent for Bulgaria, 6.4 percent for Hungary, 7.3 percent for the USSR and 7.4 percent for Czechoslovakia, which is evidence of the active participation of these countries in implementing multilateral and bilateral agreements on international specialization and cooperation in the production of tire industry articles.

The GDR and Poland are equally well known in the foreign markets as suppliers of paints and varnishes. In 1980 they represented 8.9 and 13.9 percent of the cost of all chemicals exported by the GDR and Poland respectively.

Significant changes also occurred during the last 10 years in the structure of imported chemical goods in the trade of CEMA countries with all other countries. The proportion of goods in group 30 of YeTN VT increased from 42.1 percent in 1970 to 53.2 percent in 1980. Importation of soda products included in this group experienced both an absolute and a relative decrease in view of their better supply to the CEMA countries owing to local production. Plastics and synthetic resins have somewhat less relative significance to import (7.9 percent) than to export (8.1 percent); however, the absolute cost of imported articles is almost 1.4 times greater than the cost of exported articles.

Goods produced by so-called low-demand chemistry, such as organic dyes, paints and varnishes and chemical plant protection resources, have greater significance to the imports of CEMA countries than to their exports. This reflects the objectively existing situation where the rate of growth of the demand of the national economies of these countries for low-demand chemical products is outstripping the rate of increase of the capacities for producing them. The proportion of these goods is especially high in the USSR's imports of chemical goods. Thus in 1980 the proportions in relation to the total cost of chemicals imported by the USSR were 4.6 percent (4.0 percent on the average for the CEMA countries) for organic dyes, 12.7 percent (8.3 percent) for paints and varnishes and 10.0 percent (6.9 percent) for chemical plant protection resources. It may be noted in this case that exports of these products by the USSR compensate for only an insignificant share of the cost of their importation: 10.9 percent (50.4 percent for the CEMA countries on the average) for organic dyes, 12.3 percent (46.4 percent) for paints and varnishes and 7.0 percent (35.0 percent) for chemical plant protection resources.

In 10 years the CEMA countries almost halved the imports of mineral fertilizers, which dropped from 13.9 percent in 1970 to 7.4 percent in 1980. An especially great decrease can be noted in the GDR--from 19.0 to 2.0 percent, in Poland--from 31.8 percent to 12.6 percent, and in Czechoslovakia--from 21.1 to 13.5 percent. These reductions are the product of the commissioning of a significant number of new mineral fertilizer production facilities and shops, predominantly possessing high output capacities. In Bulgaria, for example, the commissioning of just one combined mineral fertilizer production operation in the city of Devnya raised the output of this subsector by 70 percent in the country as a whole.

The Soviet Union, which had not been an importer of mineral fertilizers to any noticeable extent in the entire postwar period, first appeared in the world market as a customer in 1975. In 1980 it purchased about 100,000 tons of phosphorus fertilizers (corrected for phosphorus pentoxide) and more than 40,000 tons of nitrogen fertilizers (corrected for nitrogen) basically from developing countries. This attests to the USSR's great demand for this form of fertilizer. For the USSR, which produced almost 24.8 million tons of mineral fertilizers in 1980, these imports represent about 0.6 percent of the production volume and 0.68 percent of the apparent consumption volume.

It should be noted that the proportion of imported goods in the apparent mineral fertilizer consumption volume of the CEMA countries dropped from 16.7 percent in 1970 to 11.3 percent in 1980, though in absolute terms it increased during this period by almost 9 percent to more than 3.6 million tons, as is clear from Table 3.

In chemical goods imports, the proportion of synthetic rubber grew insignificantly--from 3.9 percent in 1970 to 4.0 percent in 1980, to include from 2.4 to 3.3 percent in the GDR, from 6.1 to 6.3 percent in Poland, from 2.3 to 2.8 percent in the USSR and from 5.4 to 6.2 percent respectively in Czechoslovakia. This proportion dropped from 3.5 percent in 1970 to 2.9 percent in 1980 for Hungary, and in Bulgaria it remained at the 1970 level.

Although the relative share of synthetic rubber in exports and imports of chemical goods was the same in 1980 (4.0 percent), the cost of imported synthetic rubber was compensated by exports by only 70.8 percent.

As was noted earlier, foreign trade in tire industry articles proceeds mainly on the basis of agreements on specialization and cooperation of the production of these articles. The import volume of these articles increased in 1980, as opposed to 1970, from 1.3 to 2.0 percent in the USSR and from 1.2 to 1.9 percent in Czechoslovakia, while for the CEMA countries in general it decreased, being 3.0 percent in 1980 as opposed to 3.5 percent in 1970.

The mutual commodity turnover of CEMA countries in relation to the chemical goods group more than tripled in the last 10 years, attaining about 4.7 billion rubles in 1980, to include a 3.2-time increase in exports and almost a 2.9-time increase in imports. It should be noted, however, that in 1971-1980 the rate of growth of mutual trade remained behind the rate of growth of trade in the same goods with all countries. Thus exports of chemical goods in trade with all countries increased by a factor of more than 4.3 (the figure was 3.2 in mutual trade). Correspondingly, imports increased by factors of 4.0 and 2.8.

As is evident from Table 4, mutual turnover represented 36.0 percent of the foreign trade turnover of CEMA countries in 1980 in relation to the chemical goods group. We might point out for comparison that in 1980, mutual foreign trade turnover among CEMA countries in relation to all goods was 55 percent of the cost of foreign trade turnover.

Table 3. Production, Export, Import and Apparent Consumption of Mineral Fertilizers in CEMA Countries
(Thousands of Tons, Corrected for Nutrients)

	(1) Производство		(3) Экспорт		(4) Импорт		(5) Видимое потребление	
	1970 г.	1980 г.	1970 г.	1980 г.	1970 г.	1980 г.	1970 г.	1980 г.
(6) Всего ¹	20 497	37 133	3916,2	8635,6	3332,4	3627,0	19913,2	32 124,4
(7) В том числе:								
(8) НРБ	434	652	30,3	77,0	124,3	147,3	528,0	722,3
(9) ВНР	518	1 045	33,6	206,4	796,0	851,3	1280,4	1689,9
(10) ГДР	3 245	4 735	1739,0	2989,1	184,3	50,3	1690,3	1796,2
(11) ПНР	1 629	2 239	46,9	99,3	1144,0	1328,6	2726,1	3168,3
(12) СРР	895	2 451	218,9	1015,1	29,9	150,1	706,0	1589,0
(13) СССР	13 095	24 778	1847,4	3979,1	32,8	143,2	11 280,4	20 942,1
(14) ЧССР	618	1 233	0,1	269,9	1021,1	956,2	1702,4	1919,6

¹ Not including Vietnam, Cuba and Mongolia

Key:

1. CEMA countries
2. Production
3. Export
4. Import
5. Apparent consumption
6. Total
7. Including
8. Bulgaria
9. Hungary
10. GDR
11. Poland
12. Romania
13. USSR
14. Czechoslovakia

Table 4. Relative Significance of Mutual Trade in Chemical Goods in Relation to the Total Trade of CEMA Countries in the Same Goods With All Countries (Percent)

(1) Страны — члены СЭВ	(2) Экспорт		(3) Импорт		(4) Оборот	
	1970 г.	1980 г.	1970 г.	1980 г.	1970 г.	1980 г.
Всего (5)	58,4	43,3	42,8	30,4	49,3	36,0
В том числе: (6)						
НРБ (7)	43,7	47,1	57,9	47,7	53,2	47,5
ВНР (8)	46,9	28,3	42,2	24,2	43,3	25,6
ГДР (9)	66,8	51,7	39,4	26,8	57,5	42,4
ПНР (10)	48,5	41,0	44,9	32,6	46,0	35,1
СРР (11)	38,3	26,7	31,9	21,8	34,7	24,7
СССР (12)	62,5	50,8	39,8	29,6	48,9	38,3
ЧССР (13)	61,1	44,8	47,2	38,7	57,1	41,1

Key:

- | | |
|-------------------|--------------------|
| 1. CEMA countries | 8. Hungary |
| 2. Export | 9. GDR |
| 3. Import | 10. Poland |
| 4. Turnover | 11. Romania |
| 5. Total | 12. USSR |
| 6. Including | 13. Czechoslovakia |
| 7. Bulgaria | |

As is evident from Table 4, mutual trade in chemical goods varies in significance among different CEMA countries. While in Poland and Romania mutual trade represents 25 percent of the total foreign trade turnover in goods of this group, for other countries this proportion varies from 35 to 40 percent and more. Also of interest is the fact that especially in imports of chemical goods, the proportion of mutual trade is not great, and in 1980 it was 30.4 percent for the CEMA countries in general.

This figure reflects the objectively existing situation characterized by the fact that the demand of the CEMA countries for all of the basic, mainly high-demand chemical products, is satisfied through local production and mutual trade. As far as the products of low-demand chemistry and fine organic synthesis are concerned, the volumes of some of them produced in the CEMA countries frequently fail to satisfy even the local demand of the corresponding countries.

Agreements on international specialization and cooperation in the production of chemical goods, signed by countries on a multilateral and a bilateral basis, are the foundation of mutual trade among CEMA countries. Naturally, specialized products occupy a greater proportion in the structure of mutual exports than in the trade in these goods with all countries. Thus in 1980 the proportion of organic dyes in mutual exports was 4.2 percent, while their proportion in trade with all countries was 2.6 percent; other figures were 5.6 and 3.4 percent respectively for chemical plant protection resources, 5.4 and 4.0 percent for

synthetic rubber and 8.8 and 5.7 percent for tire industry articles. In mutual imports, the proportion of specialized products is also higher than in trade with all countries. These specialized products include synthetic rubber, the proportion of which in mutual imports in 1980 was 5.3 percent, while their proportion in trade with all countries was 4.0 percent; other figures were 7.0 and 3.0 percent respectively for tire industry articles, and 9.7 and 8.3 percent for paints and varnishes. The proportion of soda products in mutual imports is more than double their share in imports from all countries, which can be explained, as was indicated above, by the commissioning of new capacities producing soda products and other alkalis in most CEMA countries. Hungary, the USSR and other CEMA countries cover a significant share of their demand for calcined soda by importing it from Bulgaria.

Mineral fertilizers occupy a similar position in mutual imports--16.6 percent, as opposed to 7.4 percent in the imports from all countries. This is evidence that the CEMA countries satisfy their demand for this form of chemical product basically through local production and mutual trade.

As far as plastics, chemical plant protection resources and other products of organic synthesis are concerned, their significance in mutual imports is somewhat lower than in imports from all countries, for the reasons indicated above.

Poland and Czechoslovakia--the largest exporters of organic dyes--contribute the greatest proportion to mutual exports (17.9 and 14.6 percent respectively). In mutual imports of dyes, meanwhile, the USSR represents the highest share--8.9 percent. A significant share of the Soviet Union's imports from CEMA countries is represented by paints and varnishes--18.9 percent, and by chemical plant protection resources--9.7 percent, which attests to the USSR's role as the main partner of the CEMA countries in trade in chemical products.

Trade of the CEMA countries in chemical products with developed capitalist countries was rather successful in the last 10 years, and it developed at a relatively high pace. Thus while exports of chemical products by the CEMA countries to all countries of the world increased by a factor of 4.3 in the indicated period, exports to developed capitalist countries increased by almost a factor of 6.7, while imports increased correspondingly by factors of 4.0 and almost 5.5.

These data reflect an objective process of decreasing tension and developing economic cooperation between the East and the West, typical of the 1970s. During these years all CEMA developed their trade in chemical goods with Western countries at a higher rate than with other countries, including those involved in mutual trade. Exceptions are Mongolia, which is oriented almost entirely on trade with CEMA countries, and Hungary and the GDR, which engage in active trade in chemicals with the developing countries. It should be kept in mind in this case that despite the high rate of this trade, developing countries occupy a small proportion in Hungary's and the GDR's trade (Table 5).

Significant changes also occurred in the export structure. The proportion of soda product exports to developed capitalist countries increased from 3.8

Table 5. Relative Significance of Different Groups of Countries in the Trade of CEMA Countries in Chemical Goods (Percent of Total for Each Country)

(1) Год	(2) Страны — члены СЭВ, всего		(5) В том числе													
	(3) экспорт	(4) импорт	(6) НРБ		(7) ВНР		(8) ГДР		(9) ГНР		(10) ФРГ		(11) СССР		(12) ЧССР	
			экспорт	импорт	экспорт	импорт	экспорт	импорт	экспорт	импорт	экспорт	импорт	экспорт	импорт	экспорт	импорт
(13) Взаимная торговля стран — членов СЭВ	1970 58,4	42,8	43,7	57,9	46,9	42,2	66,8	39,4	48,5	44,9	38,3	31,9	62,5	39,8	61,1	47,2
	1980 43,3	30,4	47,1	47,7	28,3	24,2	51,7	26,8	41,0	32,6	26,7	21,8	50,8	29,6	44,8	38,7
(14) В том числе в рамках МСКП	1970	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1980 13,3	10,2	10,1	11,5	18,0	5,6	14,0	11,4	21,9	6,5	3,7	3,6	12,3	16,5	18,5	7,2
(15) Торговля с развитыми капиталистическими странами	1970 22,0	42,6	18,3	32,6	26,0	53,6	21,9	57,5	27,9	45,4	33,4	.	14,9	35,4	26,4	41,1
	1980 29,5 ²	58,0 ²	23,3	45,0	42,8	67,7	31,9	67,0	42,0	64,4	.	.	31,4	54,2	38,9	51,2
(16) Торговля с развивающимися странами	1970 9,0	11,4 ²	28,9	8,1	20,9	1,7	5,2	0,9	19,7	9,4	37,2	.	5,1	21,9	7,0	7,9
	1980 9,5 ²	5,8 ²	20,4	5,2	18,8	2,8	9,3	2,7	12,1	2,4	.	.	10,2	11,1	7,2	7,0

- 1 Not including Vietnam, Cuba and Mongolia.
- 2 Not including Romania.

Key:

1. Year
2. CEMA countries, total
3. Export
4. Import
5. Including
6. Bulgaria
7. Hungary
8. GDR
9. Poland
10. Romania
11. USSR
12. Czechoslovakia
13. Mutual trade among CEMA countries
14. Including within the framework of international specialization and cooperation of production
15. Trade with developed capitalist countries
16. Trade with developing countries

percent in 1970 to 4.0 percent in 1980, the proportion of exported plastics increased from 1.9 to 4.6 percent, and the proportion of tire industry articles increased from 2.0 to 2.7 percent.*

Exports by CEMA to developed capitalist countries consist mainly of inorganic chemical products in YeTN VT group 30, the proportion of which in the cost of exports to these countries increased from 64.5 percent in 1970 to 71.3 percent in 1980.

As far as the structure of imports of products in the chemical goods group by CEMA countries from developed capitalist countries is concerned, they are mainly represented by the products of fine organic synthesis, special plastics, chemical plant protection resources, paints and varnishes, organic dyes and so on.**

Of interest is the significant proportion of imports of chemical products on the International Economic Organizations "Interkhim" list from developed capitalist countries. Thus according to 1980 data the proportion of chemical plant protection resources in the total cost of chemical products imported by Bulgaria, the GDR and the USSR from developed capitalist countries was 11-12 percent. This proportion varied within 6.4-7.8 percent for the other European CEMA countries.

The main trade partners of the CEMA countries are the FRG, France, Italy and England. The proportions contributed to the cost of chemical products delivered

* Data pertaining to the structure of exports by CEMA countries to the countries of West Europe in relation to the chemical goods group are taken from an investigation conducted by the UN ECE, "Trade in Chemical Products Between Eastern and Western Countries of the ECE" (ECE/CHEM/39, 11 June 1982). According to this investigation, of the total quantity of chemical goods purchased in 1979 by West European countries, the proportions contributed by imports from CEMA countries were 34.0 percent for calcined soda, 10.9 percent for caustic soda, 20.1 percent for ammonia, 17.1 percent for chlorine, 10.8 percent for calcium carbide, 23.8 percent for mineral fertilizers (including 12.8 percent for urea), 6.3 percent for sulfuric acid, 16.4 percent for aromatic hydrocarbons (including 12.6 percent for toluene) and so on. And in general, CEMA countries contributed 21.7 percent to the total cost of imports of chemical products by West European countries in the same year (disregarding their mutual trade).

** According to data in the UN ECE investigation cited above, the following were the principal products in the structure of exports by West European countries to the CEMA countries (not including the USSR) in 1978: organic products--27.1 percent, inorganic products--13.0 percent, dyes, pigments--12.5 percent, synthetic resins and plastics--22.8 percent, chemical plant protection resources--4.9 percent.

In 1980 the countries of West Europe sent over half of their exported chemical products to the CEMA countries.

by all capitalist countries to the CEMA countries in 1980 were 27.2 percent for the FRG, 14.5 percent for France, 7.0 percent for Italy and 8.4 percent for England. Thus 57.1 percent of the cost of exports by all Western countries to the CEMA countries was contributed by the four countries indicated above. However, if we account for mutual trade among the Western industrially developed countries, then the proportion of CEMA countries in the total volume of trade in chemical goods by these countries was, for their exports (or the imports of the CEMA countries), 5.3 percent in 1980 (4.4 percent in 1970), and for their imports (or exports of the CEMA countries), 3.3 percent in 1980 (2.4 percent in 1970).

According to data on CEMA countries in 1980 the proportion contributed by developed capitalist countries to the cost of chemical goods imported by the CEMA countries was 58.0 percent (42.6 percent in 1970).

The main task of the CEMA countries in the present 10-year period is to eliminate a passive balance in trade with developed capitalist countries in chemical goods. A tendency for this manifested itself as early as in the late 1970s, when the rate of exports to developed capitalist countries began to overtake the rate of imports from the same countries.

The future of the development of trade in chemical goods between CEMA countries and developed capitalist states entails creating new petrochemical complexes in countries of the socialist fraternity and increasing production of progressive forms of high-quality chemical products using low-waste, wasteless and energy-conserving procedures. These trends are especially noticeable in the current five-year plan, toward the end of which new or reconstructed production capacities will be placed into operation, to include on the basis of compensatory deals with companies in developed capitalist countries. Evidence of this can also be found in the system of bilateral and multilateral agreements on specialization and cooperation in the production of the most progressive chemical products, effective until the year 1990. The CEMA countries intend to continue developing their trade, economic, scientific and technical ties with all capitalist states, which are manifesting a preparedness to cooperate on an equal and mutually profitable footing while complying with the corresponding provisions of the Concluding Act of the Conference on Security and Cooperation in Europe.

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PRODUCTION OF INDUSTRIAL ROBOTS

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pp 6-8

RAZDOL'SKIY, M. Yu., engineer

[Abstract] Moscow's "Mashinostroitel'" experimental plant has begun producing the first industrial robots, automatic manipulators, in the chemical and petroleum industry. The design of the new "Brig-VNM" was developed by the All-Union Scientific Research Institute of Pumping Machinery based on the series-produced Brig-10B robot developed by the Brig Special Design Bureau. The Brig-VNM robot is designed for automation and mechanization of supplementary technological operations such as loading and unloading, placement of parts and blanks on equipment and removal of the parts and blanks after servicing. Technical characteristics of the device and the UTSM-663 cyclical controller which it uses are presented. A photograph of the device and brief description of its operation are included.
[279-6508]

UDC 678.4.056.6
678.4.065+007.52

FLEXIBLE AUTOMATED FACILITIES BASED ON ROBOTIZED MACHINES IN TIRE INDUSTRY

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 5, May 83
pp 8-9

PETROV, B. M., candidate of technical sciences

[Abstract] The Scientific Research Institute of the Tire Industry has developed equipment with automatic manipulators to perform a differentiated technological process increasing the level of mechanization and automation of multiposition tire manufacturing industry equipment to 88%, and 90% in continuous flow tire production lines. This equipment has been installed at many tire plants in the nation, increasing the productivity of labor to 50 to 100%. The operation of automatic manipulators used in the manufacture of tires in the Soviet Union

is briefly described. A typical unit is the ASPR-360-600 unit used in the assembly of radial tires for automobiles. Installation of this device has increased the productivity of labor by 80% and achieved an annual savings of 415,600 rubles.
[279-6508]

COAL GASIFICATION

UDC 661.961.11+661.961.6.002.62

PRODUCTION OF SYNTHESIS GAS AND HYDROGEN FROM SOLID FUELS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 260-266

GAMBURG, D. Yu. and SEMENOV, V. P.

[Abstract] Conversion to a new base of raw materials and power production, minimizing the use of petroleum and natural gas, will require an increase in capital investment, a decrease in process efficiency and an increase in manpower per ton of final product produced in the ammonia and methanol synthesis industries. However, the conversion to solid fuel as a source of raw materials and energy for the bonded nitrogen, synthetic methanol, hydrogen, synthetic liquid fuel and synthetic natural gas industries is an absolute necessity. This article compares the production costs of the production of ammonia and methanol using various sources of raw materials and energy, citing studies of the situation performed in the USA and West Germany. The energy requirements of processes for producing ammonia, methanol and hydrogen are noted and loss sources analyzed. Depending on the world market prices of natural gas, oil and coal, production of hydrogen from coal may become a major source of transportable energy for the world economy. Extensive tables report the technological characteristics of most modern industrial processes for gasification of solid fuels, the efficiency of these processes and costs per year as of 1979 for the processes. Figures 2; references 28: 11 Russian, 17 Western.
[286-6508]

UDC 662.753.11:536.7

THERMODYNAMIC EFFECTIVENESS OF CERTAIN METHODS OF PRODUCING ARTIFICIAL LIQUID FUEL FROM COAL

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 298-301

SORIN, M. V., SLIN'KO, M. G., SEMENOV, V. P. and LEYTES, I. L.

[Abstract] Large scale industrial production of synthetic fuels from raw materials other than petroleum, primarily coal, is a necessity for the future.

Means must be found to evaluate different methods of producing fuel in the earliest possible stages of research. One means is exergetic analysis based on the first two laws of thermodynamics. As an example, this work presents a thermodynamic analysis of the synthesis of liquid fuel by the Fischer-Tropsch method and the so-called mobile process. The primary distinction of the mobile process from the Fischer-Tropsch method is that liquid fuel is synthesized through an intermediate product, methanol. In the mobile process a great deal of water and air must be expended, requiring large quantities of steam and oxygen. This produces more end products as well as more side products than the Fischer-Tropsch process. The results of the calculations in this article show that of the two processes the mobile process more completely utilizes the energy of the coal consumed. The thermodynamic effectiveness of the processes depends greatly on the capability for using the side product (fuel gas). Figures 3; references 6: 5 Russian, 1 Western.
[286-6508]

NEW POSSIBILITIES FOR USING INTERFEROMETRY TO STUDY IGNITION AND COMBUSTION OF CONDENSED SYSTEMS

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received 14 Sep 82) pp 675-682

ABRUKOV, V. S. and MAL'TSEV, V. M., Chuvash State University imeni I. N. Ul'yanov, Cheboksary

[Abstract] A new approach is studied to the application of interferometry to study processes of combustion allowing the unsteady combustion rate to be determined as well as a number of integral characteristics of the combustion process and other condensed system combustion conditions. The approach is based on the possibility of rather simple determination of the mass of a thermal optical heterogeneity from its interferogram. The equations presented in the work primarily include integral characteristics, quantities characterizing the gas phase as a whole and quantities averaged over the volume according to the definition of the concept of a mean quantity. This approach to the use of interferometry was utilized to produce certain characteristics of the combustion process for a specimen of 85% ammonium perchlorate and 15% polymethylmethacrylate plus 2% Fe_2O_3 ignited by a CO_2 laser with a radiation density of $150 \cdot 10^4 \text{ W/m}^2$. Analysis of the data produced shows that the process of combustion can be considered as two successive different processes of gas production (evaporation, sublimation or thermal decomposition) followed by a strong exothermic reaction and stable combustion at approximately constant speed. The results show that interferometry allows determination of the rate of combustion during ignition as well as a number of integral characteristics of ignition and combustion. Figures 3; references 33: 17 Russian, 16 Western. [274-6508]

SOME CHARACTERISTICS OF COMBUSTION OF WATER-GASOLINE EMULSIONS IN AIR

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received 11 Oct 82) pp 683-687

MUTALIBOV, A. A., MANELIS, G. B., GEL'FAND, B. Ye., TSYGANOV, S. A., MURASHOV, O. D., SARTAYEV, P. M. and PETROV, Yu. M., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] In order to expand information concerning the processes of combustion of water-fuel emulsions and provide a more complete basis for the application of water-fuel emulsions in powerplants, the parameters of the combustion products are calculated for water-fuel emulsions with high water content in the fuel. Calculations are performed for aqueous gasoline emulsions with empirical formula $C_{70.86}H_{147.82}$, density $\rho=0.73 \text{ g/cm}^3$. The temperature, equilibrium composition and molecular mass of the combustion products were determined for $p=4.0 \text{ MPa}$, specific impulse and gas temperature at the exhaust were calculated for expansion to $p=0.1 \text{ MPa}$. The results of the calculation are presented in triangular diagrams for convenience of use. Figures 3; references 7: 2 Russian, 5 Western.
[274-6508]

UDC 536.46

EXPERIMENTAL STUDY OF INFLUENCE OF CERTAIN INHIBITORS ON DIFFUSION PROPANE FLAME

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received 17 Jun 82) pp 693-697

MAKHARINSKIY, L. Ye., GAL'CHENKO, A. G., KHALTURINSKIY, N. A. and BERLIN, Al. Al., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] A study is presented of the comparative effectiveness of various inhibitors (carbon tetrachloride, $C_2F_4Br_2$ and diallylmethylphosphonate) introduced to a diffusion propane flame considering their heat capacity and the effect of inert dilution by the flame inhibitor. The experiment was performed in a flat flame produced by opposing cylindrical nozzles. The inhibitors were introduced to the gas flow as vapors generated in bubblers. It is found that inhibitors with chemical action basically affect, apparently, only the limiting characteristics of the diffusion flame. It was found that considering their heat capacities, CCl_4 and N_2 , for example, act identically as inhibitors, i.e., the effect of CCl_4 in the diffusion flame is simply one of inert dilution. $C_2F_4Br_2$ has a chemical action on the diffusion flame as well as its inert dilution effect. Diallylmethylphosphonate has a still more clearly expressed chemical action. Figures 5; references 9: 2 Russian, 7 Western.
[274-6508]

CRITICAL COMBUSTION CONDITIONS OF MACROHETEROGENEOUS FUEL-INERT MATERIAL SYSTEMS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 269, No 6, Apr 83
(manuscript received 23 Sep 82) pp 1394-1398

BYBANIN, S. S. and SOBOLEV, S. L., Department of Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka, Moscow Oblast

[Abstract] A study is presented of the critical conditions of steady propagation of a combustion wave, i.e., conditions of transition from high temperature combustion to low temperature combustion, in a system consisting of layers of fuel and an inert material, including studies of heat exchange between the layers. Results are presented from approximate estimates based on precise solution of the problem of heat exchange, undertaken for a number of cases in previous works. The chemical reaction is considered to be a single-stage reaction, the reaction zone is assumed to be thin in comparison to the Michelson layer. The relationship between the characteristic depth of combustion of the material and its thickness is significant in computing the heat exchange. The case is studied in which the layer of inert material is thermally thick. Heat transfer into the inert material is assumed to be great. The critical thickness of the fuel layer for steady combustion wave propagation is found to depend essentially on the heat physical properties and dimensions of the inert material. Figures 2; references 5: 4 Russian, 1 Western.
[282-6508]

UDC 66.074.331:541.126

LIMITS OF IGNITION OF MIXTURES CONTAINING CARBON MONOXIDE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 301-302

EL'NATANOV, A. I., ANDREYEVA, N. V. and STRIZHEVSKIY, I. I.

[Abstract] A study is made of the limits of ignition of the mixtures of carbon monoxide and oxygen with carbon dioxide and argon present as inert gases over a broad interval of compositions. Studies were performed in a 3.6 liter 100 mm diameter cylindrical vessel with ignition by 0.15 mm diameter nichrome wire, energy of ignition 5-10 J. Ignition was detected by the change in pressure recorded by induction sensors. The area of ignition detected is significantly broader than that reported in the literature, primarily due to extension of the lower limit of ignition. Mixtures were found to be flammable at 12 vol.% to 70.9 vol.% carbon monoxide at 20°C. References 7: 4 Russian, 3 Western.
[286-6508]

DYNAMICS OF PRINTED FORM ETCHING WITH INHIBITOR

Moscow ELEKTROKIMIYA in Russian Vol 19, No 5, May 83 (manuscript received 12 Feb 82) pp 630-633

KRYLOV, V. S., ENGEL'GARDT, G. R., NAUMOV, V. A. and SEMINA, Ye. V., Institute of Electrochemistry, USSR Academy of Sciences, Moscow; Institute of Applied Physics, MSSR Academy of Sciences, Kishinev; Moscow Polygraphic Institute

[Abstract] Organic etching inhibitors slow down the process of dissolution of metal as etching depth increases. The contribution of convective diffusion to the dynamics of the process which shapes the channels etched is studied. The critical depth is calculated as a function of time and hydrodynamic mass transfer conditions. Hydrodynamic conditions are considered within the framework of the Nernst diffusion layer model. Only a multilayer model of inhibitor adsorption can explain published data. References 6: 5 Russian, 1 Western.

[273-6508]

FERTILIZERS

GROWTH OF KAZAKH CHEMICAL PLANT DISCUSSED

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 12, Dec 82 pp 50-53

[Article by T. Temirbekov, director of the Novodzhambul Phosphorus Plant: "Kazakhstan is a Major Chemical Region--A Giant is Gaining Strength"]

[Text] In the republic over recent years sectors of the economy that determine the level of technical progress have been developing at a rapid rate. Chemistry is one of these. Before the revolution, this sector did not exist in Kazakhstan. The region was considered one without prospects. But it held some of the richest stores of chemical raw materials, containing almost a complete list of Mendeleev's periodic table of the elements. It was only under Soviet power that the extraction and processing of these riches began and the chemical industry was developed.

The Aktyubinsk Chemical Combine, built with the active help and support of workers from other fraternal republics, was already a leader in the years of the pre-war five-year plans. The current growth in this sector, however, has taken place over the last 15 years. We will compare some figures to make this clear. In 1950, when the production of mineral fertilizers first began, a little over 22,000 tons were produced. In 1977, over 6 million tons were put out.

The intensive development of the Karatau phosphorite deposit has played an immense role here. Kazakhstan has become the major producer of yellow phosphorus in the country, providing more than 90 percent of this valuable product.

Working on the basin's stores are not only the enterprises of the Chimkent and Dzhambul production associations, but also plants producing fertilizers in other fraternal republics. The Novodzhambul Phosphorus Plant, a giant in the chemistry of phosphorus fertilizers, is continuing to turn out products and increase its capacities. A large portion of the fodder phosphates produced in the country is also manufactured in the republic. Dzhambul and Chimkent Oblasts, formerly agrarian regions, have not only become industrial areas, but have also turned into major chemical regions.

Aktyubinsk has become a large center for the production of chrome compounds. Mangyshlak has one of the largest plastics plants; there are oil refining enterprises in Pavlodar; Kustanay is known as a producer of synthetic fiber; and Karaganda now has a reputation for more than coal and steel. It has also be-

come a major producer of synthetic rubber and coke-chemical products. There are many shops of the nonferrous metallurgical plants that put out "multi-tonnage" products, such as sulfuric acid, and many others.

Today the chemical industry is one of the leading sectors in Kazakhstan. Products with our trademark are known not only in fraternal republics, but also abroad. Prospectors exploring the earth's depths are discovering more and more new stores of minerals and are putting them to work in the national economy of the country. This rise in the sector is the natural result of the economic policies of the party, which provide for rapid development of the eastern regions of the country; and it is also the result of the fraternal help given to Soviet Kazakhstan by workers from all the other republics.

Construction of the Novodzhambul Phosphorus Plant was started in 1973, 25 km from Dzhambul. The design was developed by the Leningrad scientific research institute "LenNIIgiprokhim" [Basic Chemical Industry State Scientific Research and Planning Institute]; the general contractor for construction was "Dzhambul-khimstroy" [Dzhambul Chemical Industry Construction Trust]. The Novodzhambul ["New Dzhambul"] plant was not named in vain. It is indeed a fundamentally new enterprise. It is well known that at all previous plants, only commercial grade phosphorite ore is used, that is, it is strictly defined in terms of condition and size. But here, for the first time anywhere in the world, scraps of phosphorus ore, the so-called fines, are put to use. Millions of tons of the material have already piled up in heaps near the operating enterprises. Putting these scraps into use will have the same effect as the discovery of a major new mine.

Already by the middle of 1974, the foundations were laid for all the basic shops in the first stage, and construction had been started on large water treatment units, watering fields, nitrogen-oxygen and steam shops with chemical water purification. In 1977 the Novodzhambul Phosphorus Plant was the largest chemical industry construction project in the country. In 1978 it became the most important project not only for construction workers, but also for plant operators. It was up to them to take over the complex of the plant's first stage. At that time the problem of training personnel was especially urgent. Everyday the time for start-up of the plant drew nearer, and many shops still were not fully staffed. There was a shortage of specialists, especially agglomeration experts. Workers from Novokuznetsk, Karaganda, Lipetsk and other cities came to help out.

It should be mentioned that for a number of reasons, the construction of the agglomeration complex was started in the middle of 1975, considerably later than the construction of the plant's other sections. There was an immense volume of work involved here. In terms of cost, it accounted for almost one-fourth of the funds allocated for construction of the entire plant. However, the selfless labor of the construction and installation workers, the adjusters and operation personnel made it possible to conduct a successful full cycle of the agglomeration machine, separation of the load and other units of the agglomeration shop by the end of October 1978. On 3 November at 4:37 pm (a day earlier than the planned deadline), the first agglomerate was obtained from ore fines that used to be considered substandard scrap. On 26 December 1978 members of a state commission signed a document stipulating

that the complex of the plant's first stage be put into operation with an annual production of 55,000 tons of yellow phosphorus, 16,000 tons of phosphoric acid, and 550,000 tons of granulated slag.

Over 60 percent of the defluorinated fodder phosphates and 50 percent of the yellow phosphorus produced in the country today come from the chemical enterprises in Dzhambul Oblast. The workers and engineering and technical personnel of our plant make a substantial contribution to this. Last year the collective received greetings from L. I. Brezhnev. He emphasized, "You have made a real contribution to fulfilling the decisions of the party and the government to utilize the immense natural wealth of the previously undeveloped regions of Kazakhstan in order to increase the production of phosphorus fertilizers, the application of which provides very high results in agricultural production. The problem of full processing of phosphorus ores from the 'Karatau' basin is also being solved successfully."

Our plant has the largest agglomeration machines operating in the country's phosphorus industry today; they have a caking area of 312 m². The agglomeration machines were manufactured in Czechoslovakia according to Soviet plans.

The new technology makes it possible to improve the working conditions over those at similar phosphorus plants by reducing gases and dust. According to data from tests that were made, the efficiency of dust removal at the agglomeration shop is 80-85 percent; for gas removal it is 85-95 percent. Furthermore, here the hot liquid slag poured off in the production of phosphorus does not go into earthen ditches, as is usually the case, but is granulated immediately; this takes place right during the process of pouring the slag from the furnaces, turning the slag into a fine sand of fragments up to 1 mm. This production is also being implemented at cement plants. The national economy receives a considerable economic effect from this utilization, since the wholesale price of slag is 1 ruble 30 kopecks per ton.

Our plant is still young. It is still under construction. But the collective of chemists is already playing an active part in resolving the tasks set by the 26th CPSU Congress and the May (1982) Plenum of the CPSU Central Committee for fulfilling the Food Program. Since the day the plant started up, the enterprise has put out over 170,000 tons of yellow phosphorus, which includes more than 100,000 tons produced in 2 years of the current five-year plan. About 73 percent of the phosphorus is sent to socialist countries: Poland, Czechoslovakia, the GDR, Hungary and Rumania. Currently the collective is working to put our plant's yellow phosphorus forward for the state Emblem of Quality.

It is well known that enterprises' success in fulfilling plan quotas is determined to a great extent by constant concern about putting new shops into operation and about reconstruction and modernization of those already in operation. This year we put into operation a shop for producing thermal phosphoric acid from sludge that contains phosphorus--agglomeration line No 3. In the beginning of October, furnace No 5 was put into operation. The start up of furnace No 6 is not far off either. We also have plans to put into operation a shop for the production of nitrogen and oxygen to meet the needs of the Dzhambul

"Khimprom" [Chemical Industry] Association, and to put into operation the planned capacities of an industrial line for the production of thermal phosphoric acid.

The prospects for the plant's growth are directed at realizing the USSR Food Program. In 1983 phosphorus furnaces Nos 7 and 8 will be put into operation, and over the course of the five-year plan, we will put into operation shops for the production of phosphoric acid, sodium and potassium tripolyphosphate, basic calcium phosphate, and potassium tripolyphosphate. Capital investments of 190 million rubles will be necessary to accomplish this.

Even so, construction of the plant will not be completed in the 11th Five-Year Plan. The long-range development plan calls for capacities of 120,000 tons of thermal phosphoric acid and 150,000 tons of sodium tripolyphosphate per year to be developed in the next five-year plan.

The creative forces of the collective are growing along with the plant. In our ideas we are already going beyond the bounds of the planning decisions. For example, practice has shown that in the process of feeding the agglomerate in for processing, a fair amount of fines, or so-called siftings, is formed. Utilization of this substance, with the help of phosphoric acid also obtained from previously substandard slag containing phosphorus, provides additional fertilizer for agriculture, which in turn results in a significant economic effect.

Quite a few innovations of this sort have been introduced since the plant started operating. I will mention the major, most effective ones.

Realization of measures to master a method for utilization of self-sintering electrodes in the RKZ-80F phosphorus furnaces on the agglomerate has made it possible to stabilize the operation of the furnaces and has increased their productivity by 5.4 percent. The annual economic effect was 786,600 rubles.

Another measure is the "optimization of the process of igniting solid fuel in the agglomeration of phosphate raw materials". Introduction of this measure in the first quarter of 1980 made it possible to obtain an economic effect of 412,470 rubles. A system for automatic regulation of the RKZ-80F furnaces' electrical system made it possible to increase productivity by 3 percent. The effect of implementing this system for the year 1980 was 247,250 rubles.

A group of automation engineers from the sectorial scientific research laboratory of the Dzhambul Technological Institute worked with specialists from our plant for several years on the development of an apparatus for controlling the transmission of electrodes on the ore-thermal furnaces. In the future this apparatus will be used in an automated system for controlling the electro-technological system of the ore-thermal furnaces.

The first step was the creation of an instrument for recording the transmission. It allowed the operators at the furnace's main panel to follow the accuracy of the transmission and to record in a journal more reliable data than what

was observed visually on the stencils of the furnace electrodes. A commission set up to check the accuracy of the readings and the instrument's efficiency determined that over a month the absolute error of the instrument was only 2 cm. Usually the operator error for the same time period would be 151 cm. Extended utilization of these instruments for recording transmission showed that they were highly reliable.

The second step was joint development of a model for automated remote control of the electrodes' transmission, which was done by a chief power engineer, A. S. Raschetnovyy, brigade leader of the electricians in shop No 4; and V. Voynovskiy, a worker in that shop. Introduction of this system will allow operators to control the transmission process from the central control panel of the furnace with a high degree of accuracy and reliability.

At our plant constant work is done to encourage workers to participate actively in creative technical work. Evidence of this is seen in the fact that according to last year's results, our plant was recognized as the leader in the oblast. There are about 200 people in our detachment of rationalizers and inventors. In the first 9 months of 1982 alone, they have made 155 rationalization proposals; 84 of them have already been implemented. Their economic effect is also impressive--65,300 rubles.

We will describe just one of these proposals. A. Vyrshchikov, chief of the section for repair of furnace equipment in shop No 16, and V. Bondyuk, deputy production chief in shop No 16, proposed a cutting tool for cutting internal openings in the flanges of the coolers. The economic effect from introduction of this rationalization proposal was 13,801 rubles. Rationalizers in shops No 2 and No 19 are no less active. A creative approach to work is especially encouraged here; every idea for efficiency receives the specialists' support.

Among the best rationalizers at the plant today are V. Sychev, V. Getts, and D. Gozhev from shop No 1; V. Vasil'yev and F. Abdullin from shop No 2; S. Sandybayev, chief of phosphorus production; and M. Dzheksymbayev, chief of shop No 4.

Further development of the enterprise is unthinkable without concern for the theoretical knowledge and practical skills of the workers and engineers, without in-depth study of the production techniques and technology, and improving each chemist's qualifications.

As mentioned above, the plant experienced serious problems with personnel when the first stage was started up. We sent workers and engineering and technical personnel for instruction at related enterprises. Today these problems are being solved more simply. We have created a department of technical instruction which provides scientific and methodological literature, educational classes, graphic teaching aids, equipment models, posters, and other instructional means. New workers at the plant go through theoretical training according to approved programs, and practical training is done not only at similar enterprises, but primarily in the shops of the plant itself.

We do not forget about improving the skills of the workers either. There are schools for teaching them advanced labor methods; and a school for young workers has been organized in which 135 people are studying. Many engineers take courses to improve their qualifications at VUZ's, as directed by our ministry.

The plant's collective is an international one. We have Kazakhs and Russians, Greeks and Koreans, Uzbeks and Azerbaijanis, Dungans and Kirghiz--representatives of 36 nationalities. They are all united by one goal and desire: to fulfill the tasks set before the plant.

The inspired work of the chemists has marked by honors: 38 people have earned government awards. P. Koslivtsev, operator of the remote control panel in the agglomeration shop, was given the Order of Labor Glory, third degree; A. Vereshchak, the plant's chief mechanical engineer, received a medal "For Labor Valor". A. Korsakov, a boiler worker, was awarded the Order of the October Revolution; S. Sandybayev, chief of phosphorus production, received the Order of Friendship among Peoples; and K. Granson, phosphorus production power engineer, earned the Order of the Red Banner of Labor.

This high appraisal of our work prompts us to continue in the future to spare no forces or energy in putting into practice the historic decisions of the 26th CPSU Congress and the country's Food Program.

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ACHIEVEMENTS, SHORTCOMINGS OF THE MINERAL FERTILIZER INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 May 83 p 1

[Article by special correspondent Ye. Leont'yeva: "For the Sake of a Generous Field"]

[Text] According to scientists' calculations, the use of mineral fertilizers in the year 2000 and the increase in their effectiveness will make it possible to realize at least a 60 percent increase in agricultural production. The return on every kilogram of nutrients will be 3.5 kilograms of grain. To do this it will be necessary to produce 54 million tons of fertilizer.

How is industry doing on fulfilling this program? It is gratifying to note that the plan for the first months of this year has been exceeded: 101.6 percent of the planned output was reached. The task of increasing the productivity of labor was overfulfilled by 2.6 percent, and 82.8 percent of the increase in industrial production is due to this. Also overfulfilled was the task of supplying the farms with phosphate nutrients and feed preservatives, which are much needed by livestock breeders, and also pesticides and materials for gypsum treatment of soils.

The Azot Associations in Nevinomyssk and Severodonetsk, the Minudobreniya Association in Voskresensk, and the Khimprom Production Association in Sumy have the best indicators. It would also be well to note the outstanding work of the Vurnary Chemical Plant in Chuvash ASSR and Beloruskaliy Mine Administration No 1. All of them received challenge Red Banners for the results of the first quarter from the Ministry of Mineral Fertilizer Production and the Central Committee of the industrial sector's trade union. Besides these, 14 other enterprises and production facilities received this high award.

It is necessary to add that good work has also been done lately by railroad workers, who had earlier received a number of reprimands. The matter of delivering and unloading cars was raised every week at selectors' meetings, with the participation of representatives of three interested ministries, which was very helpful in providing for the timely transportation of fertilizers.

More attention is being given to the storage of fertilizers. Inasmuch as kolkhozes and sovkhozes continue to suffer from a severe shortage of warehouse space at terminal points, Soyuzsel'khozkhimiya has issued recommendations for temporary storage of fertilizers in open areas. Because of adherence to these recommendations, the entire output is being successfully preserved. It is necessary to give due credit also to the USSR Committee on State Standards, which began making stricter investigations of losses.

While rejoicing in the successes, however, we must not forget the problems which face the sector, the still unresolved tasks. One of the most important of these is delivery discipline. Naturally, the results of competition were tallied with regard to this important indicator, and the leaders received awards accordingly. Unfortunately, the ministry as a whole has not managed to deal with deliveries in accordance with stipulated assortments. Furthermore, there are infractions committed in the distribution of fertilizers to the various regions of the country. This spring, Uzbekistan, Turkmenistan, and Azerbaijan are short of fertilizer salts, and Estonia and Latvia also have not received enough. According to the contracts which were made, only 30 percent of the ministry's enterprises fulfilled the plan of deliveries for the first quarter.

But the Salavatnefteorgsintez Association, subordinate to the USSR Ministry of Petroleum Refining and Petrochemical Industry, especially "distinguished itself". In the first months of the year, this Association shipped to its own republic, Bashkiria, almost 150 percent of the carbamide due it, all at the expense of underdeliveries to a number of oblasts of the Urals, the Volga region, and Siberia. In this way, deliveries to the market were fulfilled by 255 percent.

This tactic is not a new one for the Salavat chemists. They also failed to fulfill the plan of carbamide deliveries last year. And they were no better in the past, since gross violations of resource management are detected by inspectors year after year. The USSR Ministry of Agriculture just throws up its hands--no one, it seems, can do anything with them. In 1981, Salavatnefteorgsintez Association was fined 400,000 rubles, and in 1982--half a million. The question arises: how can the leaders of the enterprise allow themselves to make such arbitrariness and regionalism the norm? The point is, the Bashkir Obkom is not only failing to take appropriate measures against the offenders but in fact is undermining the organs of the USSR State Committee for Material and Technical Supply and urging the collective to violate the ties between suppliers and consumers. Of course, this is not the way to increase the value of contract discipline as an important factor in raising the effectiveness of production.

Now another example, just the opposite of the first. The collective of the Nevinnomyssk Azot Production Association in Stavropol Kray treat their customers quite differently, considering it a matter of honor to fulfill contractual obligations. If production difficulties arise, the leaders of this enterprise prefer to stint Stavropol and fully settle their accounts with neighboring oblasts. The party organs of the kray follow this principle strictly.

Another problem which is causing particular alarm is raw materials. Of the eight enterprises which failed to fulfill the plan for the first months, six did not receive on a regular basis the apatite concentrate for producing phosphorus fertilizers. Transporting it from the Kola Peninsular was and is still the weak link. While the Ministry of Railways is no longer getting reprimands for its work in transporting finished fertilizers, it is focusing much less attention on raw materials.

Still more urgent now is the question of another type of raw material--sulfur. The Soyuzsera Association was the only one which failed to fulfill the plan. More precisely, it made a mess of it, as the figures testify--69 percent--much lower than the 1971 level. In this sub-sector, a paradoxical phenomenon can now be observed: capacities are growing, but the production of raw materials is declining. It is now short 70,000 tons of sulfur, from which an equal quantity of phosphorus fertilizers could be produced. Last year, it was 160,000 tons short.

What is causing the lag? In the Carpathian piedmont, where the Yavorov Sera Production Association is located, mining conditions are not easy. And leaders of the enterprise often refer to this fact. As is well known, constant reference to the difficulties is the habit of those who do not really have their work under control. That is the case here. It is safe to say that the true reason for failing to fulfill the plan is the low level of organization of labor in the association. Clearly, it is time for the ministry's administration of labor and wages to direct careful attention to this fact. The shortcomings in Yavorov have been paid for by their neighbors, in the Rozdol Sera Association, where the development of refining capacities is being held back because of the people in Yavorov.

The state of affairs is also an unhappy one in the Gaurdak Sulfur Plant, where underground smelting is being adopted. When hot water is injected into the beds, instead of melting the sulfur, it sometimes disappears without a trace. As a result, the return from the bed is extremely low. It is necessary to state that the smelting technology is still not worked out, although it has a long history. If the situation in these enterprises does not change in the very near future, complications will arise in producing the invaluable phosphorus fertilizers of which, more than anything else, agriculture is in short supply.

Still another form of raw materials is causing problems in a number of enterprises--ammonia. Leading them all is the Tol'yatti Azot Association, the largest enterprise of the sector. Out of six high-tonnage machines installed there, only two or three are ever found to be working. Because of poor-quality repairs, breakdowns are frequent. The level of training of the staff is low, so they are unable to maintain the equipment in working condition. This situation did not just spring up; it should certainly have been foreseen by the leaders of the Soyuzazot Association, who are responsible for the fate of the enterprises entrusted to them.

The capacities for producing complex fertilizers are a long way from being fully exploited. Again the reason is raw materials--there is not enough ground phosphate rock, which is supposed to be supplied by the Karatau Association. Deliveries of this substance recently became a "bottleneck," although again the production plan was set lower than the five-year plan. The main shortcoming in the work of the Karatau Association is the lagging in the preliminary jobs which come before the ore extraction. And so the chain reaction stretches far--to the kolkhoz field.

And so the chemists have much work ahead of them. In the future, it will be necessary not only to maintain the level of the beginning of the year but also to make up the debts of past years when the plan was not fulfilled. As Minister A. Petrishchev said at a recent meeting of the board of the Ministry of Mineral Fertilizer Production, the sector is doing everything possible toward this end.

12255

CSO: 1841/280

CARPATHIAN POTASSIUM PLANT ADOPTS NEW MINING TECHNOLOGY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 May 83 p 1

[TASS article from Stebnik, Lvov Oblast: "From Mine to Mill"]

[Text] The successful adoption of advanced technology is helping the collective of a local potassium plant to fully exploit the underground riches of the Carpathian region. Two important events occurred here yesterday--the lower productive levels of the deposit began to be worked, and a powerful conveyor complex was put in motion. Now the ore has begun to go directly from the mine face to the mineral fertilizer factory.

The introduction of this transport system, extending more than two kilometers, is producing a great economic effect. In the new levels it is unnecessary to use the traditional transport system--dozens of electric trains and around 800 cars. In addition, loss of raw materials has been substantially lowered and the mining front has been expanded--it is now possible to concentrate powerful modern mechanisms in the work faces.

More than one hundred miners who formerly were needed for labor intensive operations are now mastering new occupations.

12255

CSO: 1841/280

POLITBURO DISCUSSES MICROBIOLOGICAL INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 May 83 p 1

[Unattributed article: "In the CPSU Central Committee Politburo"]

[Excerpt] The regular meeting of the CPSU Central Committee Politburo discussed the question of fulfilling the plans for feed protein deliveries and creating the capacities for producing it in accordance with the USSR Food Program.

During the discussion of this question, the great role of the microbiological industry was emphasized, also its output in creating a stable feed base for livestock farming. Some criticism was directed at the work of the Main Administration of the Microbiological Industry, which is not sufficiently business-like, purposeful, and exacting in fulfilling the planned state tasks and in adopting, in production, the achievements of science and technology and advanced forms of labor organization. There are major shortcomings in the work of the ministries and departments which provide for the construction of microbiological industry enterprises and supply them with raw materials.

The CPSU Central Committee Politburo enacted a decree specifying measures for improving the work of the microbiological industry and increasing the responsibility of leaders of all links of the economic apparatus connected with this industrial sector.

Republic central committees, kraykoms, and obkoms were entrusted with the task of establishing steady control over the carrying out of assignments in developing the microbiological industry. They are also responsible for increasing the level of organizational and political work to mobilize labor collectives to overfulfill production and delivery plans of feed ingredients for the needs of livestock farming.

12255
CSO: 1841/280

KIROVAKAN CHEMICAL PLANT SURPASSES FERTILIZER, CORUNDUM PRODUCTION QUOTAS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Apr 83 p 1

[Article by special correspondent N. Ordinyan: "Chemists on Watch"]

[Text] The shop collectives of the Kirovakan Chemical Plant imeni Myasnikyan producing mineral fertilizers are making an honorable contribution to fulfilling the Food Program. Workers of the ammonia shop have surpassed the production plan by over 1,200 tons since the beginning of the year. Over 250 additional tons of mineral fertilizers were shipped to farmers of the Transcaucasian republics by laborers of the ammonium nitrate shop.

Chemists working in other production operations of the plant have actively joined the fight for early fulfillment of the year's quotas. The collective of the corundum shop, which manufactured more than 400 kilograms of synthetic semiprecious stones in excess of the plan since the beginning of the year, was deemed the leader of the competition on the basis of the first quarter's results.

International fairs recently concluded in Austria and Switzerland and featuring synthetic stones brought new glory to Kirovakan's corundum. From this day forth, Kirovakan chemists will be exporting these articles to many foreign countries.

11004

CSO: 1841/255

FERGANA SULFURIC ACID SHOP GOING UP AHEAD OF SCHEDULE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Apr 83 p 1

[Article by A. Dzhioyev: "Big Chemistry of Fergana"]

[Text] In June of this year, 3 months ahead of schedule, builders and installers of the Novokokand Chemical Plant pledged to make a sulfuric acid facility with a capacity of 500,000 tons per year operational.

Level as a billiard table. So it has been said of the generous Fergana Basin. More than a quarter of the republic's cotton plantations are here. But mineral fertilizers must be imported here from afar, from hundreds of kilometers away. To make "white gold" cheaper, a decision was made to build a huge chemical complex beside ancient Kokand.

The sulfuric acid facility is only the first generation of this complex. Next year an ammophos operation with a capacity of 700,000 tons is to be placed into operation.

It must be stated that the present construction start is not at all anything new to Uzbek installers. They have erected more than one such facility in the republic. Moreover this is already the 38th facility in the country as a whole that makes use of equipment designed by machine builders of the Polish Peoples Republic. The operation is very compact, and it is highly effective.

I went to visit the facility together with the acting chief of the "Khimprom-montazh" Administration of the Uzbek SSR Ministry of Installation and Special Construction Work, V. Nozdrin.

"In our work, we never come across two absolutely identical facilities," noted Vladimir Vasil'yevich. "Assembly procedures are continually changing. Each time our specialists find ways to modernize, improve and simplify them, and consequently to make the work faster. And so this sulfuric acid facility differs in this sense from its predecessors. Let's make a comparison: In Samarkand for example, it took the collective of the Almalyk 'Promtekhmontazh' Administration of Specialized Trust No 93 an entire year to install and roll piping for heat exchangers. But at the Almalyk Chemical Plant this time was almost halved. And here we have managed to almost quadruple the pace of

similar operations! High organization of labor is not the only factor involved. Of course, before beginning their work the assemblers carefully prepared themselves and studied the previous experience. During assembly, people and equipment were competently maneuvered. But still, what played the decisive role was inquisitive creative inquiry, engineering know-how. Thus the assemblers themselves designed and built a special machine tool for working and cleaning pipe ends. Such discoveries are perhaps one of the principal factors of success."

A socialist competition, the tone of which is being set by cavalier of the orders of the October Revolution and the Red Labor Banner, brigade leader R. Nazyrov, assembly veteran K. Kosidi and many others, has taken on considerable momentum in the construction of this important national economic facility. Providing working room for associates on time and even ahead of schedule has become the ultimate goal of the "workers' relay." Here is one of the clear examples of such coordination. During erection of the chemical water treatment plant building, responding to a proposal from the assemblers the builders first erected the foundation not beneath the building framework, as had been planned, but beneath the oversized production equipment. This made it possible to assemble and install the equipment as enlarged blocks, and more than twice as fast as foreseen by the timetable.

"However, we still experience disappointing interruptions in the work of the construction conveyer," V. Nozdrin shared his anxieties. "It will soon be time to begin the final adjustments, but the assemblers are still having trouble finishing their welding jobs: If one thing isn't lacking, it's another. Being 3 months ahead of schedule is not a bad margin. It would be a shame to lose it."

11004
CSO: 1841/255

CHANGE IN HYGROSCOPICITY OF UREA WITH ADDITIVES

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 3, May-Jun 83 pp 36-37

ANTONEVICH, A. U., LIMONOV, V. Ye., KOLESNIK, L. F. and ABROSIMOVA, A. M.

[Abstract] Finely dispersed bentonite, kaolin and silicon oxide powders, wastes from the production of superphosphate and potassium production slime were added at 0.1-0.5% of the mass of urea to the surface of urea granules to change hygroscopicity. The lowest rate of water absorption was obtained when the granules were treated with kaolin, the highest following treatment with clay slime. Tables illustrate the rate of sorption of water and hygroscopic points of urea with and without treatment with the various powders. Possible mechanisms of the alteration of hygroscopicity by the treatments are suggested. It is noted that an increase in the hygroscopic point decreases the rate of sorption of moisture from the atmosphere, decreasing flaking of the product and NH_3 loss upon hydrolysis of urea in the presence of moisture.

[287-6508]

PRODUCTION OF FERTILIZERS FROM EFFLUENTS OF GALVANIZING PLANTS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNKA in Russian No 5, May 83 p 15

TROFIMOV, V. N. and ZHUMATOVA, N. G., engineers, and PUSTOVALOV, N. N., candidate of Chemical Sciences, Chelyabinsk Branch of All Union Scientific Research Institute of Hydrogeology (VUDGEO)

[Abstract] An attempt was made to preserve valuable material from the effluent of galvanizing plants. For one, it was shown that it should be possible to recover nonferrous metals such as copper, nickel and zinc in the form of their hydroxides. In addition, the mineral fertilizer--ammonium nitrate--could be recovered for agricultural application. Finally, the reprocessed calcium and magnesium hydroxides could be used as additives to construction materials. References 1 Russian.

[291-7813]

ELECTRON PARAMAGNETIC RESONANCE OF PEROXIDE RADICALS IN TWO MILLIMETER WAVE BAND

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received 12 Apr 82) pp 621-627

KRINICHNYY, V. I., SHUVALOV, V. F., GRINBERG, O. Ya. and LEBEDEV, Ya. S.,
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] A study is made of identification of peroxide radicals based on the primary g -tensor values as determined by two-millimeter EPR spectra. The correlation of g -factor shift with the donor-acceptor properties of one of the substituents is studied. The characteristics of the spectra obtained are described and illustrated. Use of two-millimeter wave band EPR spectroscopy is found to allow now only correct measurement of all three main values of the peroxide radical g -tensor, but also recording of other radicals usually not observed in the three-centimeter microwave band. Each radical corresponds to a point in coordinates of g_{xx} , g_{yy} and g_{zz} . The points do not overlap. The conformation of the radical in its matrix significantly influences the main g -tensor values of peroxide radicals. The primary values of g -tensor as measured in the two-millimeter EPR band can thus be used as individual characteristics of peroxide radicals. Figures 2; references 7: 2 Russian, 5 Western.
[274-6508]

THERMAL STABILITY OF POLYIMIDES BASED ON NITROGEN-CONTAINING DIAMINES AND DIANHYDRIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 23 Oct 81) pp 949-954

SAZANOV, Yu. N., FEDOROVA, G. N., NEKRASOVA, Ye. M. and KISELEVA, T. M.,
Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Polyimides are synthesized with high nitrogen content and their thermal stability is determined in oxidizing and inert media. Most of the polyimides studied have high 5 and 10% weight loss temperatures, 500-550°C. Many have minimal weight loss up to 500°C, indicating that there are no low-molecular-weight products in the polymer. The 50% weight loss temperature is over 600°C in almost all cases. The temperature at which thermal destruction begins is decreased by 10 to 30° in many cases in a vacuum, with intensive gas liberation beginning at 610-620 and 700-720°C. At 900°C a coke product remains, retaining the initial shape of the specimen. Some 60 to 65% of the initial mass of the specimen remains in the coke residue, regardless of polyimide chemical structure. Content of nitrogen in the residue is 55-60% of its initial content. It is concluded that nitrogen atoms not included in the imide ring participate in the formation of volatile products of thermal destruction, while the imide ring nitrogen basically remains in the charred residue. References 12: 8 Russian, 4 Western.
[270-6508]

ORGANOMETALLIC COMPOUNDS

COORDINATION COMPOUNDS OF MANGANESE (II) WITH CYANURIC ACID

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 28, No 5, May 83
(manuscript received 28 Jun 82) pp 1206-1212

KHARITONOV, Yu. Ya. and AMBROLADZE, L. N., Moscow Institute of Chemical
Technology imeni D. I. Mendeleev

[Abstract] A series of coordination compounds of Mn(II) with cyanuric acid were synthesized by reacting Mn(II) salts with the acid in aqueous or ethanol solutions at pH ca. 4. Reactions of Mn(II) chloride, sulfate, thiocyanate, or acetate with the acid in Mn(II) salt: acid ratios ranging from 1:2 to 1:4 proceeded according to the following equation: $MnX_2 + 2L + nSolv \rightarrow MnL_2(Solv)_n$, where Solv = solvent molecule, X = Cl, NCS, CH₃COO, or 1/25O₄, and L = cyanuric acid. The following compounds were synthesized which contained two molecules of the neutral (not deprotonated) cyanuric acid per Mn(II) atom: MnL₂Cl₂·0.5H₂O, MnL₂SO₄·H₂O, MnL₂(NCS)₂·C₂H₅OH, and MnL₂·(CH₃COO)₂·3H₂O. IR spectra of the products demonstrated that the cyanuric acid molecules are coordinated via several of the oxygen atoms and serve in the capacity of bridges. Figures 2; references 13: 8 Russian, 5 Western. [271-12172]

ORGANOPHOSPHORUS COMPOUNDS

UDC 547.717:546.18

TERNARY HETEROCYCLIC ORGANOPHOSPHORUS COMPOUNDS

Moscow USPEKHI KHIMII in Russian Vol 52, No 5, May 83 pp 787-811

GOLOLOBOV, Yu. G., GUSAR', N. I. and TARASEVICH, A. S., Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A brief review is presented of largely Western literature of the chemistry of the relatively recently demonstrated ternary [i.e., a three-membered ring, with p at least one of the member elements] heterocyclic organophosphorus compounds. Initial consideration is given to the simplest compound in this class, the unsubstituted phosphiranes obtained by the reaction of α, ω -dihalogenalkanes with alkali metal phosphides in liquid ammonia. Subsequently, coverage is accorded to rings with tetra- and penta-coordinated phosphorus and substituted phosphorinanes, the physicochemical characteristics of such compounds derived from evaluation of IR and NMR data, thermolytic data information on of the phosphorinane ring in various reactions, etc. References 76: 12 Russian, 64 Western.
[272-12172]

UDC 547.241

HYDROPHOSPHORYL ACETYLENE-ALLENE REGROUPING OF ALKINYLYHYPOPHOSPHITES - MEANS OF SYNTHESIS OF UNSATURATED PHOSPHONOUS ACIDS AND THEIR DERIVATIVES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 269, No 6, Apr 83
(manuscript received 24 Oct 82) pp 1377-1380

YUDELEVICH, V. I., BELAKHOV, V. V., KOMAROV, Ye. V., IONIN, B. I., and PETROV, A. A., corresponding member, USSR Academy of Sciences, All-Union Scientific Research and Technological Institute of Antibiotics and Medicinal Enzymes, Leningrad

[Abstract] It was shown that upon esterification of hypophosphorous acid with acetylene alcohols, 1,2-alkadienephosphonous acids with active P-H bonds are formed. The hydrophosphoryl acetylene-allene regrouping thus discovered, in contrast to reactions known earlier, is founded upon compounds with a 4-coordination phosphorus atom and includes the PIV \rightarrow pIII stage. The reaction is performed with azeotropic distillation of water from a mixture of hypophosphorous

acid and the corresponding propargyl alcohol in benzene. The reaction cannot be performed without removal of water, even though stage III of the reaction is irreversible. This indicates a high rate of hydrolysis of the propargylphosphites and significant displacement of equilibrium in the direction of the A tautomer, incapable of acetyleneallene isomerization. References 10: 4 Russian, 6 Western.
[282-6508]

UDC 541.6:542.91:547.558.1:547.558.2

STRUCTURE OF PRODUCT OF REACTION OF PHENYLPHOSPHINE WITH PHENYLDICHLOROARSINE AND WITH PHENYLARSINE OXIDE

Moscow IZVESTIYA AKADEMII NAUK: SERIYA KHIMICHESKAYA in Russian No 5, May 83 (manuscript received 28 Jun 82) pp 1152-1155

YERASTOV, O. A., ROMANOVA, I. P., YEFREMOV, Yu. Ya., IL'YASOV, A. V., ZYABLIKOVA, T. A., ISMAYEV, I. E., CHADAYEVA, N. A. and MUSIN, R. Z., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] A study was made of the reaction of phenylphosphine with phenyldichloroarsine and with phenylarsine oxide. Both reactions produced the same product crystallized from C_6H_5N , melting point and elemental composition as reported in an earlier work. The elemental composition and molecular weight of the product, 848 with the initial charge, 890 with a larger charge, allowed a selection to be made between possible structures. A structural diagram of the proposed product is presented. The mass structure of a similar compound, which consists of rings consisting of P and As atoms, has not been previously described in the literature. PMR spectra are described. The end product is 1,2,3,4,5,6-hexaphenyl-1,3,5-triphospha-2,4,6-triarsacyclohexane. NMR spectra using ^{75}As revealed no arsenic nuclei signals, apparently a result of the great expansion of the line due to quadrupole interactions. This is also the probable reason for the lack of spin-spin splitting in the spectra. References 13: 1 Russian, 12 Western.
[290-6508]

INTERACTION OF DIALKYLTRIMETHYLSILYLPHOSPHITES WITH CARBON SUBOXIDE

Moscow IZVESTIYA AKADEMII NAUK: SERIYA KHIMICHESKAYA in Russian No 5, May 83
(manuscript received 15 Dec 82) pp 1205-1206

KIBARDIN, A. M., GRYAZNOV, P. I., GAZIZOV, T. Kh. and PUDOVNIK, A. N., Institute
of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR
Academy of Sciences

[Abstract] The reaction of trivalent phosphorus with carbon suboxide was studied, and it was found that diethyltrimethylsilyl- and dipropyltrimethylsilylphosphites interact with carbon suboxide in pentane at -60°C to form a new class of organophosphorus compounds--1,3-bis(trimethylsilyl)-1,3-bis-(dialkylphosphone)allenes. The IR spectra of the compounds produced were studied. The compounds are thermally unstable and decompose to form a complex mixture of products when heated, requiring film distillation purification at temperatures of 60°C , pressure 0.06 mmHg. References 1 Russian.
[290-6508]

PESTICIDES

UDC 66.026

SYNTHESIS AND USE OF CATAPINE ANALOGS BASED ON NATURAL BASE FRACTIONS

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 3, May-Jun 83 pp 38-39

PETRENKO, D. S., DUBININA, V. K. and KHASKIN, I. G.

[Abstract] Catapine analogs were produced from fractions of moist pyridine bases, less than half as costly as pure pyridine. Synthesis of the analogs by hydrochloric acid titration involved preliminary determination of the quantity of base equivalents per unit volume of the pyridine fraction. Synthesis was performed in a three-necked 500 ml flask with a stirrer, thermometer and reflux cooler. An equivalent mixture of polybenzylchlorides and pyridine fraction was introduced, heated with stirring for 6 hours in a boiling water bath then cooled to 65°C and various quantities of benzene and water were added. After mixing for one hour and layer separation the aqueous layer was removed and evaporated. Insoluble synthesis wastes were obtained from the benzene layer. Condensation of the heavy pyridine fraction occurs with relatively low yield. The brown analogs produced are soluble in water and concentrated sulfuric acid. The catapine analogs are equal in bactericidal properties to type K-1 catapine. They have effective inhibiting properties, making them promising for use in production. They are easily soluble in acid, quite pure, have no sharp odor and are satisfactory for commercial use.

Figures 3.
[287-6508]

COMPOSITION OF PETROLEUM DISTILLATE FRACTIONS OBTAINED FROM BITUMINOUS ROCK

Moscow NEFTEKHIMIYA in Russian Vol 23, No 2, Mar-Apr 83 (manuscript received 5 Jun 81) pp 160-165

AYGISTOVA, S. Kh., FAZLIYEV, D. F., SADYKOV, A. N., KHARLAMOV, V. A., NIKITOVA, N. V. and ZOBNINA, A. A., All-Union Scientific Research Institute of Hydrocarbon Raw Materials

[Abstract] Results are presented from a study of the composition of petroleum distillate fractions obtained from bituminous rock by various methods, using IR spectroscopy and gas-liquid chromatography. The objects of the study were the -350, 350-420°C fractions of petroleum (of the Mordovo-Karmal area in Tatariya) obtained by intrastratal combustion, steam-thermal pumping and natural influx, as well as 10 lower boiling fractions from the same petroleum obtained by steam injection in a bituminous stratum. The results show that the content of paraffin hydrocarbons and long chains are relatively less than in the corresponding fractions of Romashkino petroleum. The composition of the Mordovo-Karmal petroleum studied varied significantly as a function of method of extraction. The distillate fractions obtained by intrastratal combustion contain carbonyl compounds and almost twice the low boiling fraction of petroleum obtained by natural influx as a result of oxidative cracking in the stratum. The relative content of carbon atoms in the aromatic rings of the 350-420°C fraction simultaneously increases. The same fractions obtained by steam injection at comparatively low temperatures have elevated carbonyl group content and silica gel resin content. Intrastratal combustion produces petroleum with elevated relative content of C₁₀-C₁₄ n-alkanes and low C₁₅-C₂₀ content, while petroleum obtained by steam objection has more C₁₄, C₁₆ and C₁₇, less C₁₂, C₁₃, C₁₈-C₂₀ alkanes. Figures 2; references 11: 10 Russian, 1 Western.
[259-6508]

p-CHLOROPHENYLTHIOACETAMIDES AS ADDITIVES TO LUBRICATING OILS

Moscow NEFTEKHIMIYA in Russian Vol 23, No 2, Mar-Apr 83 (manuscript received 30 Mar 82) pp 268-271

KULIYEV, A. B., KURBANOV, M. M., ALIYEV, F. Yu. and KULIYEV, F. A., Institute of Chemistry of Additives, AzSSR Academy of Sciences

[Abstract] Earlier works demonstrated that phenylthioacetamides are good anticorrosion additives for lubricating oils. Continuing this work, p-chlorophenylthioacetamides were synthesized by the interaction of p-chloroacetophenone with sulfur and various amines in the Wilgerodt-Kindler reaction. The structure of the compounds synthesized was confirmed by IR and PMR spectroscopy. The influence of these compounds on the anticorrosion, antiwear properties and thermal oxidative stability of DS-11 lubricating oil was studied by preparing solutions of the additives in the oil at concentrations of 0.5 to 1.5% by mass. The compounds were found to have good anticorrosion and antiwear properties. Like other sulfur-containing additives, these compounds cause some deterioration in the thermal oxidative stability of the base oil. They are somewhat superior to phenyl-thioacetamides in thermal oxidative stability and equal in anticorrosion and antiwear properties. References 3 Russian.

[259-6508]

UDC 665.7.038.64

INFLUENCE OF MOLECULAR-MASS DISTRIBUTION OF ETHYLENE-VINYL ACETATE COPOLYMERS ON THEIR PROPERTIES AS DIESEL FUEL AND FUEL OIL DEPRESSORS

Moscow NEFTEKHIMIYA in Russian Vol 23, No 2, Mar-Apr 83 (manuscript received 10 Dec 81) pp 272-275

TERTERYAN, R. A., IVANOV, V. I., FILIPPOV, A. A., and LIVSHITS, S. D., All-Union Scientific Research Institute of Petroleum Refining

[Abstract] A study is made of the influence of molecular-mass characteristics on the depressor properties of ethylene-vinyl acetate copolymers. Studies were performed on a Waters gel chromatograph with tetraline as solvent. The specimens studied were statistical ethylene-vinyl acetate copolymers synthesized by radical copolymerization of monomers on continuous laboratory installations at pressure of 30 to 200 MPa. The copolymers were added to type "L" diesel fuel to study their depressor properties. It was found that the best depressors were copolymers with mean molecular mass $2.5 \cdot 10^3$ - $5 \cdot 10^3$ and $5 \cdot 10^3$ - $10 \cdot 10^3$ for diesel fuel, $10 \cdot 10^3$ and $20 \cdot 10^3$ for fuel oil. If the copolymer contains more than 10% fraction with mean molecular mass $2 \cdot 10^6$ the filterability coefficient of the fuel plus additive increases greatly. Figures 2; references 4 Russian.

[259-6508]

NATURE OF SULFUR IN PETROLEUM (REVIEW)

Moscow NEFTEKHIMIYA in Russian Vol 23, No 2, Mar-Apr 83 (manuscript received 10 Feb 82) pp 276-282

GONCHAROV, I. V., Western Siberian Scientific Research Institute of Geological Prospecting

[Abstract] A critical review is presented of various points of view concerning the nature of sulfur present in petroleum and some considerations are outlined to clarify certain aspects of the complex and multistaged process of sulfuration of petroleum. Studies of the origin of sulfur include that it is inherited from living biological systems, that the sulfur compounds in petroleum are products of the reaction of elementary sulfur and petroleum compounds in the presence of carbonates, or that organic sulfur compounds are formed by microbiological reduction of sulfates. It is concluded that organic sulfur compounds are formed, in the stage of accumulation of the initial organic material, by reduction of sulfates and interaction of the reduction products with the initial organic matter. The degree of sulfuration of organic material depends primarily on the presence of iron in the system, the quantity of which is controlled by the pH of the aqueous medium. Secondary formation of petroleum in deposits by biodegradation and retrograde processes has a great influence on the content of sulfur. However, it is not new formation of sulfur compounds but rather redistribution of these compounds which occurs in this stage. Biodegradation causes an increase in total sulfur content plus an increase in the fraction of thiophene structures in comparison to sulfide structures. References 32: 27 Russian, 5 Western.
[259-6508]

UDC 665.7.032.57

MOST IMPORTANT EXPERIMENTAL INDUSTRIAL AND DEMONSTRATION INSTALLATIONS FOR CONVERSION OF FUEL SHALES

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR: KHIMIYA in Russian Vol 32, No 2, Apr-May-Jun 83 (manuscript received 10 Oct 82) pp 81-97

EPIK, I., Estonian SSR Academy of Sciences

[Abstract] This review discusses the world's largest experimental industrial installations for conversion of fuel shales, built in Estonia, as well as foreign installations for conversion of fuel shale, including the Parachute Creek unit and several others in Colorado. Methods of thermal conversion of shale are compared. Analysis shows that the specific capital investment in shale mining and processing for the production of shale tar is 20 to 25% lower for processing of lump shale than for processing of shale fines in units with solid heat transfer media. The great variety of shale deposits in the USSR makes both domestic and foreign work in the area of interest to Soviet researchers. Figures 14; references 16: 6 Russian, 10 Western.
[275-6508]

THERMAL DECOMPOSITION OF KUKERSITE IN THE PRESENCE OF HEAVY WATER

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR: KHIMIYA in Russian Vol 32, No 2, Apr-May-Jun 83 (manuscript received 6 May 82) pp 98-101

NECHAYEV, I. and UROV, K., Institute of Chemistry, Estonian SSR Academy of Sciences

[Abstract] Heavy water was used to determine the role of water in thermal decomposition of kukersite as a representative fossil fuel. Thermal destruction of flotation kukersite concentrate (88.2% organic matter) was performed in a rocking autoclave with a concentrate:water ratio of 1:2 at 350°C, maximum pressure 15 MPa, 6 hours. It was found that the yield of resin is significantly higher for thermolysis in a water suspension than for the dry concentrate, the resin is heavier, enriched in oxygen and oxygen compounds. Water participates in thermal destruction of kukersite kerogen as a chemical agent. The hydrogen of the water is bound into the products of destruction primarily at the place where the chemical bonds in the initial kerogen are split. Nonaromatic hydrocarbons and phenols are the least converted products of kukersite thermolysis. Figure 1; references 8: 4 Russian, 4 Western. [275-6508]

UDC 621.892.097.004.12:543.422

STABILITY OF OILS IN AVIATION EQUIPMENT SYSTEMS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 83 pp 24-26

BEDRIK, B. G. and YAKOVLEVA, A. F.

[Abstract] The authors studied the chemical stability of IPM-10, MS-8RK and AMR-10 oils by IR spectroscopy after various times of service in aviation equipment. Analysis of the spectra indicated that the base of the oil as well as certain additives were absorbed. The rate of absorption basically did not change with increasing operating time of the oil. The exception was a phenol antioxidant additive in MS-8RK and IPM-10 oils. The data obtained on thermal oxidative stability and content of antioxidants indicate that the oil samples have a satisfactory level of thermal oxidative stability, though this decreases with increasing time in service. The results of the study clearly showed deterioration in performance of the oil with increasing usage life and indicate that the method can be used to refine oil change intervals. Figure 1; references 4 Russian. [278-6508]

EVAPORATION OF SYNTHETIC OILS IN A MOTOR

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 5, May 83 pp 26-28

NEPOGOD'EV, A. V., MITIN, I. V. and VIPPER, A. B., Ryazan Experimental Plant, All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] The evaporation rate of oil was measured in motor tests with the addition of 0.25% organosilicon fluid which does not evaporate during engine operation. Evaporation thus caused an increase in organosilicon fluid content in the oil, which was used to calculate the quantity of oil which had evaporated. Oil evaporation rate depends primarily on cylinder temperature. As temperature in the Petter W-1 engine cylinder rose from 130 to 185°C, evaporation rate of the M-6z/10B oil increased by a factor of 7; when temperature increased to 100-150°C in the crankcase it did not further change. The results indicated that the main factor influencing evaporation of oils in an engine is the fractional composition. Synthetic and mineral oils of similar fractional composition evaporate at approximately the same rate. The rate of evaporation of oil depends greatly on cylinder temperature. The advantage of synthetic and semisynthetic oils over mineral thickened oils is greater, the higher the cylinder temperature. Figures 2; references 4 Russian. [278-6508]

UDC 665.7.038.5:620.197:665.12

INFLUENCE OF PRODUCTS BASED ON HIGHER FATTY ACIDS ON OPERATIONAL PROPERTIES OF REACTION FUELS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 5, May 83 pp 34-36

LYKOV, O. P., VISHNYAKOVA, T. P., SASHEVSKIY, V. V. and ORAKOVA, I. Ye., Moscow Institute of the Petrochemical and Gas Industry imeni I. M. Gubkin

[Abstract] Synthetic fatty-acid based products were introduced to a specimen of T-8 fuel, density 787 kg/m³, evaporation limits 176-267°C, total sulfur content 0.011%, iodine numbers 0.13 gI₂/100g, acidity 0.23 mgKOH/100 ml. Resin content 1.5 mg/100 ml, thermal stability 1.8 mg/100 ml (quantity of sediment). The additives were the C₁₇-C₂₀ synthetic fatty acid fraction, isocarboxylic acids extracted from the C₁₇-C₂₀ fraction by acetone, still residue from production of synthetic fatty acids and acid still residue obtained by extraction in cold methanol. The products significantly increased the antiwear properties of T-8 fuel. At low contents (0.003-0.005% by mass) the maximum effect is achieved by still-residue acids, at higher contents (0.01% by mass) by still-residue. At a content of 0.003% the diameter of a wear spot is reduced by a factor of 1.8 to 2, the critical seizure load and wear criterion increases by 1.5 and 3.5-4.6 times, respectively. The products have no negative influence on the operating properties of the fuels at up to 0.003%. At 0.005% they increase fuel acidity above permissible levels. Figures 2; references 3 Russian. [278-6508]

EFFECTIVENESS OF ANTIWEAR ACTION OF LOW SOLUBILITY DIALKYLPHENOLSULFOACID AMIDES

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 5, May 83 pp 36-38

SUSHKO, Ye. B., BELOV, P. S. and TROFIMOV, V. A., Moscow Institute of the Petrochemical and Gas Industry imeni I. M. Gubkin

[Abstract] A study is made of the effectiveness of antiwear action of dialkylphenolsulfoacid amides in motor oils. The objects of the study were N-dialkylamides of 2-hydroxy-3,5-dialkylbenzenesulfoacids. Derivatives of 2-hydroxy-3,5-dialkylbenzoic (dialkylsalicylic) acids were synthesized to determine the influence of amide fragment structure on the properties of the compounds. The amides and amine salt of dialkylphenolsulfoacids are superior in antiwear effectiveness to commercial additives type PMS, high alkaline calcium sulfonate L-59 and ASK. Figures 2; references 9: 6 Russian, 3 Western. [278-6508]

UDC: 661.715.2-404
662.753.15

SYNTHESIS OF HYDROCARBONS FROM CARBON MONOXIDE AND HYDROGEN

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 266-270

LAPIDUS, A. L.

[Abstract] The products of gasification of solid fossil fuels, particularly mixtures of oxides of carbon plus hydrogen, are convenient raw materials for the production of organic products such as fuels. This article briefly outlines the history of hydrocarbon synthesis from CO and H₂. The synthesis mechanisms suggested to date are quite varied and a number of the specifics of the processes have yet to be studied and explained. There is apparently no general and universal mechanism. The composition of hydrocarbons produced in the Fischer-Tropsch process depends on the catalyst used and the working conditions. Synthetic hydrocarbons have been produced from CO and H₂ at the Novocherkassk Synthetic Products Plant since 1952. Synthesis gas was at first produced by gasification of anthracite, more recently by conversion of natural gas. The planned capacity of the plant is 50,000 tons per year. The primary end products are low octane gasoline and high quality diesel fuel plus solvents, raw materials for oxidation and the production of detergents as well as reagents, standard cetane, solid paraffins widely used in electronics, medicine and machine building. Studies that determine the most efficient method of synthesis must continue. References 16: 13 Russian, 3 Western. [286-6508]

PRODUCTION OF OXYGEN-CONTAINING ORGANIC COMPOUNDS FROM MIXTURES OF CARBON MONOXIDE AND HYDROGEN

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 270-274

LOKTEV, S. M.

[Abstract] The history of synthesis of oxygen-containing organics from CO and H₂ is briefly outlined. The Institute of Petrochemical Synthesis, USSR Academy of Sciences has developed a process for producing higher alcohols from CO and H₂ on fused iron catalysts at 20-24 MPa, 160-190°C, CO:H₂ ratio 1:2.5. The process is performed in a stationary bed of fused iron catalyst. The process has been tested on a pilot industrial scale, fed by a gas produced by steam-oxygen conversion of natural gas using methanol for synthesis. Studies have been performed to improve the productivity of the process as well as its selectivity, developing several new versions of synthesis, which are listed in a table. The selectivity of the process and fractional composition of synthesis products have been greatly improved by addition of small quantities of acetylene (0.5-1%) to the initial gas. Achievements of Italian and American companies in such fields as single stage synthesis of dimethylether are reported but not described. Researchers are also studying the possibility of direct synthesis of formaldehyde, acetaldehyde, acetic acid, methylacetate, methylacrylate, methylmethacrylate, ketene, glycolic acid, glioxal and other oxygen-containing compounds from CO and H₂. No specific examples are described. References 35: 19 Russian, 16 Western. [286-6508]

METHANOL AS A RAW MATERIAL FOR THE PRODUCTION OF ORGANIC COMPOUNDS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, May 83 pp 290-292

LEONOV, V. Ye., LOBODIN, S. S., SHTEFAN, A. S., METELKIN, V. A., PIVEN', A. P. and RYZHAK, I. A.

[Abstract] A study is made of the use of methanol for the production of organic compounds and synthetic motor fuel components. A method has been developed in the USSR for direct utilization of methanol for the production of formaldehyde, significantly improving technical and economic indicators of the process. Synthesis of acetic acid by carbonylation of methanol is becoming increasingly important in industry. Since 1981, acetic acid has been produced in the USSR by the method developed by the Monsanto Company. A flow diagram of the process is presented. Synthesis of acetic acid by isomerization of methylformate at 200°C, 5 MPa, is in development. Commercial production of sebacic acid from monomethyl adipate has been performed in the USSR since the late 1970's using a domestic technology which is not described. It is considered promising to

use methanol for the production of traditional petrochemical products such as olefins. Zeolite catalysts are being developed in the USSR for conversion of methanol to hydrocarbons. Methanol is thus already an important raw material for industrial production of formaldehyde and thermo-setting plastics, acetic and sebacic acids, ethers and esters, chloromethanes and methylamines. Figure 1; references 49: 20 Russian, 29 Western.
[286-6508]

THERMOPHYSICAL PROPERTIES OF IRRADIATED POLYMERS

Moscow USPEKHI KHIMII in Russian Vol 52, No 5, May 83 pp 830-853

BRISKMAN, B. A., Scientific Research Physicochemical Institute imeni
L. Ya. Karpov

[Abstract] A review is presented of the thermophysical properties of polymers subjected to gamma quanta, electrons, or neutrons. Determinations of the effects of irradiation on the specific heat, heat conduction, and thermal conductivity were carried out on partially crystalline (polyethylene, polypropylene, polyfluoroethylene) and amorphous (polystyrene, polymethacrylate) polymers. Evaluation of the analytic data showed that the variable changes in heat conductivity obtained with the former class of polymers were largely dependent on radiation-induced structural alterations, while the decrease seen with the amorphous polymers was attributable to anisotropic phenomena. Thermal conductivity was not significantly affected. In the case of composite materials heat conduction was decreased in the irradiated samples at temperatures ranging from -100°C to 180°C ; in the case of 'kriosil' the effects of radiation were temperature-independent, but for BK-9 material the radiation dose-dependent decrease in heat conduction at -100°C was twice as great as at 100°C .

[272-12172]

PROPERTIES OF POLYVINYL FLUORIDE SYNTHESIZED IN PRESENCE OF FREON F-113

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 83
(manuscript received 29 Apr 81) pp 40-42

SIRLIBAYEV, T. S. and TIRKASHEV, I., Tashkent Order of Labor Red Banner
State University imeni V. I. Lenin

[Abstract] A characterization is provided of polyvinyl fluoride (PVF) synthesized by gamma irradiation (Co^{60} source, 20-70 r/sec, 20°C) of vinyl fluoride and freon F-113 (1,2,2-trifluorotrchloroethane) and obtained in

yields of 8.8 to 97.6%, depending on the ratio of vinyl fluoride to F-113. The PVF samples were soluble in organic solvents with a boiling point greater than 100°C (dioxane, N.N'-dimethylformamide, N-methylpyrrolidone, cyclohexanone). The molecular weight, viscosity, and degree of polymerization of the PVF specimens decreased proportionately as the ratio of vinyl fluoride to F-113 progressed from 0.8:0.2 to 0.2:0.8. The pour point was found to range from 180 to 193°C, while the maximum loss of mass after heating for 10 h at 300°C was 36.8-50.2% in air and 20.1-38.4% under vacuum. Figures 3; references 5 Russian.
[266-12172]

UDC 678.743.22(088.8)

2,2'-DI-1,6,7-TRIHIDROXY-3-METHYL-5-ISOPROPYL-8-ALDEHYDONAPHTHYL (GOSSYPOL):
EFFECTIVE NATURAL STABILIZER/ANTIOXIDANT OF PLASTICIZED POLYVINYL CHLORIDE,
PART 2

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 83
(manuscript received 18 Mar 81) pp 42-46

RAKHIMOV, I., ABDULLIN, M. I., FATKHULLAYEV, E. and MINSKER, K. S., Bashkir State University imeni 40-Letiya Oktyabrya; Tashkent Polytechnical Institute imeni A. R. Beruni

[Abstract] Studies were conducted on the effects of gossypol (2,2'-di-1,6,7-trihydroxy-3-methyl-5-isopropyl-8-aldehydonaphthyl) incorporated into polyvinyl chloride (PVC) as a stabilizer and antioxidant. Tests conducted at 448°K under dry N₂ (thermal destruction) and O₂ (thermooxidative destruction) showed that the samples with gossypol sustained a significantly lower loss of HC₁; in addition, gossypol was much more effective in PVC samples plasticized with dioctylphthalate than in unplasticized PVC samples. The effectiveness of gossypol as a stabilizer and antioxidant in PVC was potentiated by the fact that it also inhibited oxidation of dicarboxylic acid ester plasticizers. Figures 5; references 5 Russian.
[266-12172]

UDC 541.64:539.2

COLOR-TEMPERATURE CHARACTERISTICS OF HEAT-INDICATING POLYURETHANE-LIQUID
CRYSTAL FILMS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE,
KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 4, Apr 83
(manuscript received 7 Jan 83) pp 52-54

LIPATOV, Yu. S., academician, Ukrainian SSR Academy of Sciences, TSUKRUK, V. V., SHEVCHENKO, V. V., SHILOV, V. V. and TISHCHENKO, V. G., Institute of Chemistry of High Molecular Weight Compounds, Ukrainian SSR Academy of Sciences

[Abstract] Color-temperature characteristics of thin (20 μm) polyurethane-cholesterol liquid crystal heat-indicating films were investigated to determine

the utility of films based on cholesterol esters possessing a mesophase in the 28-32° and 31-36°C range. Analysis of $(1/\lambda)(d\lambda/dt)$ slopes, which represent the sensitivity of the films to changing temperature, yielded values on the order of 0.6-0.7 deg⁻¹, while the relative coefficient of reflection (K) showed a decrease from 16-18% at 400 nm to 6-8% at 700 nm. The latter figures represented a 10-15% improvement over currently available systems. The high flexibility and thinness of the polyurethane films should considerably expand the practical applications of such films. Figures 2; references 6: 4 Russian, 2 Western.

[265-12172]

UDC 541.182,644:551.508

SPECIFIC ADSORPTIVITY AND SYNTHESIS OF POLYMETHYLSILOXANE FILMS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 4, Apr 83
(manuscript received 4 Jun 82) pp 64-66

CHERNENKO, Zh. V., SLINYAKOVA, I. B. and SAMODUMOVA, I. M., Institute of Physical Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] A description is provided of certain characteristics of a polymethylsiloxane film designed for coating piezoelectric crystal detectors in automatic gas analyzers. The film withstood washing with water, ethanol and heptane without desorption from the piezoquartz surface. An insignificant weight loss after multiple alcoholic washings on the order of 5-7% was ascribed to loss of a small molecular weight fraction which dissolved in the alcohol. The effective pore diameter was calculated at 1.5 nm, and the absorption isotherms obtained for benzene and hexane were similar to those obtained at 20°C for various organic gases and water. Ethanol adsorption was two to three-fold greater than for hexane, and that for diethylamine was greater by an order of magnitude vis-a-vis the value for hexane. Nitromethane adsorption exceeded that of hexane only in the range of monolayer saturation ($p/p_g = 0.2$). The high specificity exhibited for ethanol, diethylamine, and nitromethane was presumably due to residual hydroxyl groups on the surface of the film. Consequently, this type of film can be recommended for use as a specific adsorbent for nitrogen-containing substances and, in addition, has the advantages of not swelling or dissolving in organic solvents. Figures 2; references 9: 3 Russian, 6 Western.

[265-12172]

THERMODYNAMICS OF STATISTICAL p-OCTYLMETHACRYLATE AND N-VINYLCARBAZOLE COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 10 Aug 81) pp 914-920

ARBUZOVA, A. P., BESKLUBENKO, Yu. D., LIPATOV, Yu. S., PRIVALKO, V. P., PAS'KO, S. P. and FEDOROVA, L. N., Institute of High Molecular Weight Compound Chemistry, Ukrainian SSR Academy of Sciences; Kiev State University imeni T. G. Shevchenko

[Abstract] Results are discussed from an experimental study of the thermodynamic characteristics of statistical copolymers of p-octylmethacrylate (OMA) and N-vinylcarbazole (VC), the homopolymers of which differ significantly in equilibrium macromolecule flexibility and glass point while having almost the same mass of repeating chain elements. The results indicate that the specific volume and coefficients of volumetric thermal expansion and isothermal compressibility of statistical OMA and VC copolymers decrease with increasing VC content. The nature of the variation of these characteristics as a function of characteristic indicates an increase in the block nature of the copolymer with increasing VC content. Quantitative agreement is observed between experimental and theoretical results, confirming that the actual nonvalent interaction between segments of the macromolecules in the polymer melts is averaged, meaning that the effective interaction potential approximates the spherically symmetrically potential on which the theory is based. Figures 6; references 23: 5 Russian, 18 Western.
[270=6508]

UDC 541.64:542.954

STRUCTURE OF CROSS-LINKED POLYMERS BASED ON OLIGOISOPRENE DIHYDRAZIDES AND EPOXY OLIGOMER

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 10 Sep 81) pp 921-929

SHILOV, V. V., LIPATOV, Yu. S., BOGDANOVICH, V. A., KOCHETOV, D. P., and GRISHCHENKO, V. K., Institute of High Molecular Weight Compound Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] New three-dimensional structure polymers based on oligoisoprene dihydrazides and epoxy oligomers have recently been synthesized. This article presents a study of the structure of cross-linked polymers based on oligoisoprene dihydrazides with various molecular masses and epoxy resin. The oligoisoprene compounds were obtained in a laboratory autoclave by radical polymerization of isoprene initiated with azo-bis-isobutyrohydrazone in methanol at 368K. Polymers were produced by mixing the initial oligomers at 333-353K with subsequent evacuation of the mixture to remove the air. The polymers were cured

at 383K for 10 hours between two plates of ground glass. The specimens were studied by broad angle radiography. Regular packing of phase division micro-volume is observed. The degree of segregation of components of these polymer systems is not over 20 to 30%. The polymers consist of alternating areas rich in rigid-chain or flexible-chain components. These microareas are the results of incomplete phase separation. Though the epoxy diene grids are quite heterogeneous, the degree of segregation of components in these systems is less than in styrene-butadiene-styrene block copolymers. The formation of the cross-linked structure greatly inhibits the process of phase separation. These are neither single phase nor two-phase systems. The properties of the material are determined to a great extent by the processes of formation, development and stabilization of characteristic microscopic volumes which are quite different in composition from the equilibrium phase. Figures 4; references 30: 9 Russian, 21 Western.
[270-6508]

UDC 541.64:542.952

KINETIC SPECIFICS OF SYNTHESIS OF POLYMERS WITH TERMINAL FUNCTIONAL GROUPS
IN PRESENCE OF OXIDATION-REDUCTION SYSTEMS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 8 Nov 81) pp 961-969

MIN'KO, S. S., PUCHIN, V. A., KUCHER, R. V., TOKAREV, V. S., DIKIY, M. A.
and PANCHENKO, Yu. V., Lvov Polytechnic Institute imeni Leninskiy komsomol

[Abstract] A study is presented of the specifics of synthesis of polymers with terminal functional groups in the presence of an initiating oxidation-reduction system: functional hydroperoxide-dienol-iron naphthenate. Styrene was used to study the kinetic regularities of polymerization, benzoin was used as the dienol compound. Polymerization was performed in benzene at 333K. An equation is derived for the polymerization rate and integrated assuming equivalent concentrations of hydroperoxide and benzoin to produce an equation for kinetic description of polymerization. Figures 5; references 15 Russian.
[270-6508]

RADIATION-CHEMICAL AND THERMOCHEMICAL CURING OF α -OXIDE-BASED COMPOSITIONS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 12 Nov 81) pp 970-974

VISHEV, Yu. V., FURMAN, Ye. G., MELESHEVICH, A. P., KUZNETSOVA, V. M. and VALATINA, O. A., Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, Ukrainian SSR Academy of Sciences

[Abstract] A study is presented of structure formation in a composition by both radiation chemical and thermochemical methods in a thin layer up to 200 μm thick. Specifics of the structures formed by both methods of curing are determined and analyzed. The composition studied consisted of an epoxy-diane resin, acrylic acid, methylacrylate, low-molecular-weight polyamide and a plasticizer. The weight relationship of the components was 100:15:75:160:45. The monomer-oligomer composition was cured on plates of steel or aluminum. It was found that processes of radiation-chemical and thermochemical formation of coatings followed different mechanisms and that the coatings formed differ in their properties. Radiation-chemical curing occurs by polymerization of double bonds. Thermal curing results from the interaction of carboxyl, amine and epoxy groups. Radiation chemical curing produces a more rigid structure. Figures 6; references 8 Russian.
[270-6508]

UDC 541.64:539.2

STUDY OF POLYMER SORBENT STRUCTURE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 9 Dec 81) pp 1020-1024

BULYGIN, A. N., VINOGRADOV, Ye. L., LUK'YANOV, A. Ye., MAL'KO, Ye. I., and TAGER, A. A., All-Union Scientific Research Institute of High Purity Bio-preparations; Ural State University

[Abstract] An attempt is made to describe the sorption of low molecular substances by polymer sorbents under various conditions: 1) nonporous sorbents which swell in the sorbate with active centers; 2) nonporous swelling sorbents with low activity centers; 3) porous nonswelling sorbents; and 4) porous swelling sorbents with active centers. Sorption isotherms were produced on a vacuum installation with a spring quartz microbalance with a sensitivity of $2.4 \cdot 10^{-3}$ kg/m at 298K. Sorption of low molecular substances by polymer sorbents involve several mechanisms including formation of a solid sorbate solution (mechanism 1), dissolution of the sorbate in a system of flexible polymer chains (mechanism 2) and polymolecular adsorption on pore walls when the sorbent structure changes due to swelling (mechanism 3). The studies showed that the area of p/p_s within which mechanisms 1 and 2 overlap is quite broad,

while the contribution of mechanism 1 is small for all p/p_s . This allows a simplified equation to be used to describe the actual sorption isotherms. Calculations performed on a Wang 2200 VP computer by the method of least squares determined the values of H , χ_1 , K and c_a which most closely matched experimental values of the sorption isotherms. Figures illustrate the experimental and theoretical sorption isotherms for water vapor on the various types of sorbents. Within the framework of the concept of the superimposition of various sorption mechanisms it is possible to describe sorption phenomena strictly in various polymer-sorbate systems. Figures 3; references 10: 9 Russian, 1 Western.
[270=6508]

UDC 678.746.22:677.862.25:
66.085.33

SPECIFICS OF RADIATION EMULSION COPOLYMERIZATION OF STYRENE AND α -METHYLSTYRENE

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 14-16

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

[Abstract] A study is made of the process of production of a copolymer of styrene plus α -methylstyrene by radiation polymerization and the process is compared with the ordinary process, the potassium persulfate-initiated emulsion method of producing the copolymer. One distinguishing feature of radiation emulsion copolymerization of styrene and α -methylstyrene is the decrease in the number of latex particles as process temperature rises. This is characteristic of all radiation emulsion polymerization processes and results from the increase in reaction rate with increasing temperature with near constant radical formation rate. The increase in molecular mass of the copolymer with increasing temperature indicates that reactions of transfer to monomers and impurities are not significant, since the transfer constants usually increase with increasing temperature. The molecular mass of the copolymer increases with increasing emulsifier concentration and decreases with increasing radiation dose and content of α -methylstyrene in the monomer phase. The molecular mass of the copolymer can be regulated by introducing small quantities of tert-dodecylmercaptan to the monomer phase. Cost factors are estimated. Figures 3; references 10: 5 Russian, 5 Western.
[276-6508]

INFLUENCE OF PRODUCTION CONDITIONS OF MODIFIED HIGH IMPACT POLYSTYRENE ON STRUCTURE AND PHYSICAL-MECHANICAL PROPERTIES

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 18-20

ABRAMOV, V. V., YENAL'YEV, V. D., AKUTIN, M. S., CHALAYA, N. M. and MEL'NICHENKO, V. I.

[Abstract] A study is made of the influence of modifying copolymers introduced under various extrusion conditions on the structure and certain physical and mechanical properties of high impact polystyrene. Introduction of modifying copolymers most greatly influences α and ϵ . The results are explained by the structure of the specimens produced under various extrusion conditions and its relationship to the properties of the modifying copolymers. There is a definite correlation between the structure of the modified polymer and its properties. If the particle size of the copolymer added is 0.5 to 0.8 μm the strength and deformation characteristics are improved. Figure 1; references 6: 5 Russian, 1 Western.

[276-6508]

PROPERTIES OF ESTER EPOXY POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 22-23

FIRSOVA, L. I., SHOLOGON, I. M., KLEPANOV, M. S. and KARAT, L. D.

[Abstract] A study is made of the properties of polymers produced by curing of diglycidyl ester of methyltetrahydrophthalic acid and other diglycidyl esters of more complex structure. The curing agents used were an aromatic diamine, a fatty aromatic diamine and isomethyltetrahydrophthalic anhydride. The molecular mobility of the polymers was studied by dielectric relaxation. The dielectric loss angle tangent and dielectric strength were measured at 50 Hz to 200 KHz at temperatures of -100 to +200°C. The study of molecular mobility showed that introduction of oxyethylene groups connecting the hydroaromatic rings to the epoxy compound molecule increases molecular mobility. The thermomechanical properties correlate with relaxation parameters. Introduction of the oxyethylated bridge to the epoxy resin molecule reduces the glass point. The tensile strength and relative elongation at rupture are largely determined by the structure of the initial epoxy resin. As n increases, elasticity increases. The length of the oxyethyl bridge connecting the hydroaromatic rings greatly influences the curing process. As n increases, reactivity of the epoxy compounds with amine curing agents decreases, the gel formation period and activation energy of the curing process increases. Figures 2; references 3: 1 Russian, 2 Western.

[276-6508]

PROPERTIES OF POLYALLOMERS CONTAINING POLYPROPYLENE, POLYETHYLENE AND POLYBUT-1-ENE

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 24-25

POPOV, V. P., NETKACH, L. A., DUVANOVA, P. P. and MALIKOV, V. N.

[Abstract] Compositions of various crystallizing polymers produced by successive synthesis are called polyallomers. Polyallomers successfully combine the properties of the phases which compose them. The properties of polypropylene plus polybutylene polyallomers are compared in this article with the properties of polypropylene plus polyethylene polyallomers. Specimens were synthesized in a laboratory autoclave with $TiCl_3-Al(C_2H_5)_2Cl$ as catalysts. In the first stage polypropylene was produced at $60^\circ C$, propylene pressure 0.4 MPa, 2-4 hr with 3 to 5 vol.% hydrogen. The temperature was then decreased to $28-30^\circ C$ and butene was polymerized in the presence of 5 to 15 vol.% hydrogen in hexane gasoline fraction, bp $60-85^\circ C$. The reverse sequence was also used. The initial properties of PP+PB polyallomer can be determined by the additive rule. For PP+PE the properties are below additive. PP+PB polyallomers have higher E , σ_t , thermal stability and shape retention under stress, allowing them to be used for manufacturing hot water pipes and heat exchange apparatus. The polyallomer is also cold resistant, so that pipes are unlikely to crack if the water they contain should freeze. PP+PE polyallomer is more suitable for the manufacture of flexible, elastic products operating at low temperature, for example cold water pipes, impact resistant cast products, motor vehicles parts and containers. Figures 2; references 6: 5 Russian, 1 Western. [276-6508]

UDC 678.743.22.048

MEANS FOR INCREASING PHOTOSTABILITY OF POLYVINYLCHLORIDE

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 33-35

STRELKOVA, L. D., ZEGEL'MAN, V. I., FEDOSEYEVA, G. T., TITOVA, V. A., KOLESOV, S. V., PETROV, V. V. and MINSKER, K. S.

[Abstract] A study was made of the influence of the content of internal unsaturated oxygen-containing groups, impurities in the monomer, special additives introduced in the polymerization stage and degree of monomer conversion on the photostability of polyvinylchloride polymer. Experiments were performed on films 0.25 ± 0.05 mm thick produced by pressing at $180^\circ C$, 8 MPa, 90 s from powdered suspension PVC specimens. Lauryl peroxide was used as the initiator, the protective colloid was methocell. The water: monomer ratio was 1:1.5, temperature $50^\circ C$. The experiments showed that modification of internal unsaturated oxygen-containing groups with tri-(2-ethylhexyl)phosphite significantly increases the photostability of PVC films and inhibits cross

linking of macromolecules. Still greater resistance to UV radiation is achieved by breaking down internal unsaturated oxygen-containing groups with dienes or by modification of PVC with epoxy compounds. An important requirement for PVC to obtain photostable materials is the minimum possible number of unsaturated oxygen-containing groups in synthesis of the polymer, plus the use of vinylchloride protected from butadiene impurities and careful use of additives to improve the thermal stability of PVC, which can reduce the service life of products under natural conditions (phenol, styrene). Figures 2; references 5 Russian.
[276-6058]

UDC 678.766:66.046

INFLUENCE OF HEAT TREATMENT ON ELECTRICAL PROPERTIES OF THERMOSETTING POLYBISMALEINIMIDAMINE

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 35-37

KOTUKHOVA, A. M., KANDYBKO, A. M., CHEGODAYEV, P. P., KALINCHIKOV, V. Ye. and DOLMATOV, S. A.

[Abstract] A study is made of the influence of heat treatment on the electrical properties of polybismaleinimidine produced by interaction of N_{1N}^1 -metaphenylenebismaleinimide and 4,4-diaminodiphenylether in a molar ratio of 2:1. The powdered oligomer was used to prepare specimens 50 mm in diameter and 1.5 mm thick by direct pressing at 523 K, 50 MPa. Specimens were heat treated in air at 523K, 0 to 20 hours. The optimal time of heat treatment for the production of a material which can be used as electric insulation is 6 hours. Structural products should not be heat treated at all. Figures 3; references 10: 8 Russian, 2 Western.
[276-6508]

UDC 541.64:542.952

RADICAL POLYMERIZATION OF ACRYLIC MONOMERS IN THE PRESENCE OF HIGHLY DISPERSED ACTIVE FILLERS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 269, No 6, Apr 83
(manuscript received 27 Sep 82) pp 1386-1390

YELISEYEVA, V. I., ASLAMAZOVA, T. R. and MOROZOVA, Ye. M., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] New data are presented on radical polymerization of acrylic monomers in the presence of highly dispersed fillers which are active (interact with the monomer). Studies of radical polymerization in such systems are continued in this article by studying the mechanism of action of the active filler on radical polymerization in a model system consisting of aerosil plus alkyl-methacrylate. Acrylic monomers filled with highly dispersed polymer fillers

such as polyvinylchloride, insoluble in the monomers, are studied. The monomer used was β -diethylaminoethylmethacrylate, the amino group of which can interact with PVC. The study of the temperature variation of polymerization rate in both systems studied without filler and with various filler concentrations established that the filler has no catalytic effect on polymerization of the monomers. EPR was used to study the rate of accumulation of macroradicals in filled and unfilled specimens to determine the mechanism of the accelerating effect of the active fillers. The results indicate that the presence of both mineral and polymer active fillers accelerates the process, causing an increase in radical formation rate not accompanied by a change in total activation energy of the polymer. The mechanism of action in both cases is apparently similar, possibly the steric factor. Introduction of active polymer filler results in a multiplication of the polymerization rate while simultaneously improving the mechanical properties of the composite polymer formed. Figures 3; references 6: 3 Russian, 3 Western.
[282-6508]

UDC 541.64:547.564.4

COPOLYMERIZATION OF ACRYLIC AND METHACRYLIC MONOMERS BASED ON AMINOPHENOLS WITH STYRENE AND METHACRYLIC ACID

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 49, No 5, May 83
(manuscript received 14 Jul 81) pp 530-534

PASKAL', L. P., POCHINOK, V. Ya. and SYROMYATNIKOV, V. G., Kiev State University imeni T. G. Shevchenko

[Abstract] Considering the promise of acrylic and methacrylic monomers based on aminophenols, monofunctional groups obtained from oxyanilides of carboxylic acids as monomers for photopolymerization, a study was made of the possibility of their copolymerization with styrene and methacrylic acid. Copolymerization was performed at 80°C in DMF with monomer mixtures amounting to 10% of the mass of the solvent. Azodiisobutyric acid dinitrile at 1% of the total monomer mass was used as the initiator. The copolymers were purified by reprecipitation from organic acids in methanol. The process of copolymerization is found to be complex, related to the presence in the monomer molecules of two active centers with different reactivities. The reaction may occur at either center. Furthermore, interaction of the styrene radical with a nitrogroup is possible, leading to deactivation of the reaction centers. The data in general agree with the theoretical concepts related to the structure of the monomers and allow their behavior in photopolymerizing composites of various compositions to be predicted. Acylaminophenyl-(meth)-acrylates are quite reactive monomers with slight electron acceptor properties. The specifics of their behavior can be explained by the capability of the acylamino group for complex formation. Figure 1; references 13: 7 Russian, 6 Western.
[289-6508]

INFLUENCE OF POLYMER SURFACE LAYERS OF FILLER ON GLASS POINT OF EPOXY COMPOSITIONS

Kiev UKRAINSKIY KHMICHESKIY ZHURNAL in Russian Vol 49, No 5, May 83
(manuscript received 22 Mar 82) pp 539-542

IL'INA, Z. T., BRYK, M. T. and KHVOROV, M. M., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences

[Abstract] A study is made of the variation in glass point of cured compositions based on epoxy-diane resin type ED-20 as a function of filling with dispersed titanium. Surface layers of epoxy resin were initially formed on the filler surface. The selection of epoxy resin as a filler modifier and binder results from the fact that the polar nature of the carbon-carbon-oxygen bond in the α oxide ring in combination with its high tension supports reactivity of the epoxy resin in various reactions with the active centers of the surface filler, and from the fact that introduction of the filler with preformed surface layer of epoxy resin to the cured composition containing epoxy resin binder allows more detailed determination of the influence of the structure of the surface layer on the relaxation properties of the entire composite system. The maximum dielectric loss angle tangent characterizing dipole-group losses for the cured composites filled with titanium with various surface states increased and shifted toward the area of higher temperatures as frequency increased. However, dipole-segment processes in the metal-filler systems correlating with the T_c of the polymer could not be studied in detail due to the great increase in losses at temperatures over 80-90°C resulting from the exponential growth of conductivity. Relaxation characteristics of the polymer composites are determined not only by the degree of filling with dispersed filler, but also by the nature of the surface layers and methods of their formation on the filler particles. Figures 2; references 7: 6 Russian, 1 Western.
[289-6508]

UDC 621.315.61

INFLUENCE OF POLYPROPYLENE RHEOLOGY ON COMPOSITE PAPER-FILM DIELECTRIC PRODUCTION

Kiev KHMICHESKAYA TEKHOLOGIYA in Russian No 3, May-Jun 83 (manuscript received 12 Dec 82) pp 34-36

REZANOV, G. V. and TSEBRENKO, M. V., KTILP [Kiev Technological Institute of Light Industry?]

[Abstract] A study was made of the rheologic properties of a number of polypropylene specimens in order to select and recommend an industrial polypropylene specimen for manufacture of a composite paper-film dielectric by extrusion.

Seven batches of PP produced by various plants were studied. The viscosity characteristics were determined on a microviscosimeter. Elastic properties were determined from the swelling of extrudates upon annealing. The drop in viscosity was greater, the higher the polydispersion of the polymer. Specimens differed considerably in both viscosity and elasticity. Specimens manufactured by the Groznyy Branch (of Plastopolimer Scientific Production Association) were recommended for manufacture of a composite dielectric by extrusion of the PP melt onto moving paper. Italian (montedisson) polypropylene, though suitable in terms of melt viscosity, had elasticity which was too high for the manufacturing process. The recommendations were tested by manufacturing a pilot batch, producing good quality materials. Figures 2; references 6 Russian.

[287-6508]

STRUCTURING OF POLYDIMETHYLVINYLSILOXANE RUBBER WITH OLIGOORGANOSILANE WITH FUNCTIONAL GROUPS AT THE SILICON ATOM

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 5, May 83
(manuscript received 26 Dec 81) pp 1030-1034

ZHDANOV, A. A., LEVIN, V. Yu., SLONIMSKIY, G. L., KVACHEV, Yu. P.,
GRITSENKO, O. T., DELAZARI, N. V., CHERNYAVSKAYA, N. A., MIKHLIN, V. E. and
OBOLONKOVA, Ye. S., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov,
USSR Academy of Sciences

[Abstract] A study is made of the possibility of structuring organosilicon rubber type SKTV-1, a polydimethylsiloxane rubber containing 0.5 mol% methylvinylsiloxane links with oligoorganosilane. Studies were performed on films produced by pouring a mixture of the rubber with oligoorganosilane from a 20-25% benzene solution into an aluminum foil cuvette, removing the solvent and holding the remaining film in the cuvette at 473K for 6 hours. It is found that the increase in σ_r and E of organosilicon rubber with the introduction of oligoorganosilane results from two causes: structuring of the rubber and the development of a two phase system in which one phase consists of the rubber cross linked by the oligoorganosilane and peroxide, while the other is the structured oligoorganosilane. The use of oligoorganosilane as a cross linking agent thus increases the strength characteristics of organosilicon rubbers. It is quite probably that this possibility of producing structured organosilicon rubbers will be realized in filled systems as well. Figures 7; references 6: 5 Russian, 1 Western.

[270-6508]

COMPOSITES BASED ON MIXTURES OF FLUOROPOLYMERS AND FLUORORUBBERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 83 pp 21-22

BUGORKOVA, N. A., PYASETSKAYA, L. V., KUCHANSKAYA, T. G., SHNUROVA, L. N. and MULIN, Yu. A.

[Abstract] Vinylidene fluoride plus hexafluoropropylene copolymers synthesized with various ratios of the monomers were studied. A copolymer with a high content of vinylidene fluoride occupied an intermediate position between plastic and rubbers, while a copolymer containing about 70 mol.% vinylidene fluoride is a rubber. Compatibility of the polymers was evaluated based on light transmission of 10% solutions of the initial copolymers and their mixtures in various ratios as well as their tendency toward layer separation. The tensile strength, relative elongation at rupture and residual elongation were measured. The compositions were found to be easy to work, producing materials with good protective and mechanical characteristics, nonflammable and useful for the application of chemically stable coatings to elastic substrates. [276-6508]

UDC 678.7-9:539.26

ORIENTATION EFFECTS IN SALT RUBBER-VULCANIZATES WITH ALKYL CARBOXYMETHYL-METHACRYLATE GROUPS

Moscow KAUCHUK I REZINA in Russian No 5, May 83 (manuscript received 1 Feb 82) pp 11-12

MARCHENKO, V. S., ZHURAVLEVA, I. P., NEZABUDKINA, O. A. and KURLYAND, S. K., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] An x-ray study of orientation behavior of vulcanizates based on BEF-101 rubber, a copolymer of butadiene and isopropylcarboxymethyl-methacrylate (100:10) was undertaken to determine the molecular mechanism responsible for high strength. The rubber mixtures were prepared in laboratory roll mills of raw rubber (100 parts), stearic acid (4), santocure (3) and calcium hydroxide (14). The filled mixtures contained 30 mass parts technical carbon. Orientation effects in the stretched rubbers were studied by high angle x-ray diffraction. As the rubbers were stretched both filled and unfilled vulcanizates increased the degree of orientation and correspondingly decreased the angle of disorientation of molecular axes. This is explained as follows: as vulcanization occurs saponification of ester groups causes the formation of calcium glycolates and salts which create insoluble associates, the nodes of the vulcanization grid. As loading continues the associates may break down due to separation of salt groups associated with the most highly stressed rubber macromolecules. The separated salt groups attach to other associates leading to fixation of newly formed macromolecule orientation associates in the direction

of the applied load. The higher temperature stability of salt vulcanizates type BEF-101 apparently results from the presence in the salt nodes of calcium glycolate formed in the process of vulcanization and creating additional hydrogen bonds from the hydroxides. Figures 3; references 4 Russian. [288-6508]

UDC 678-9

INFLUENCE OF RUPTURE CONDITIONS ON THERMOMECHANICAL ACTIVATION OF OXIDATION OF STRUCTURED CIS-POLYISOPRENE

Moscow KAUCHUK I REZINA in Russian No 5, May 83 (manuscript received 26 Mar 82) pp 12-14

SOLOV'EV, M. Ye., ZAKHAROV, N. D. and KAVUN, S. M., Yaroslavl Polytechnical Institute

[Abstract] Processes occurring upon rupture of vulcanizates were studied using cis-polyisoprene type SKI-3. Series of vulcanizates extracted for 24 hours with acetone were ruptured by cutting on a high speed drop hammer at 0.05 to 60 m/s, temperature 20 to 127°C. The oxidation of the cut chips of varying thickness was evaluated by volumetric alkalimetric titration in isopropanol plus water, the structure of the vulcanization grid was determined by sol-gel analysis. Thermal oxidation inhibitors were introduced to the vulcanizate during swelling in a solvent. It was found that increasing cutting speed leads to an increase in hydroxyl and carboxyl group content in the rupture products with a simultaneous increase in the degree of elastomer destruction. It was found that the absolute quantity of antioxidant used did not change with a change in its initial concentration by up to a factor of 2, indicating that in the presence of the inhibitor the length of the kinetic oxidation chains decreases to 1. Increasing the speed of rupture of vulcanizate leads to an increase in the degree of oxidation and destruction of the products by increasing both the number of radicals generated in the process of rupture (initiation speed) and due to the contribution of thermal oxidative destruction reactions. When thermal oxidative destruction inhibitors are present at low rupture speeds there is an increase in the concentration of functional groups and the degree of destruction of elastomers due to chain breaking at the radicals, while at high rupture speeds the probability of thermal oxidative destruction decreases. Figures 3; references 7 Russian. [288-6508]

1,2,3,4-TETRAHYDROQUINOLINES--NEW EFFECTIVE RUBBER STABILIZERS

Moscow KAUCHUK I REZINA in Russian No 5, May 83 (manuscript received 29 Jan 82)
pp 18-19

ZHUKOVA, I. I. and SIDOROVA, L. A., Scientific Research Institute of the Tire Industry

[Abstract] Existing dihydroquinoline ozone stabilizers such as flectol flakes, permanax 45, etc., stain rubber and materials which come in contact with them. The authors therefore tested 1,2,3,4-tetrahydroquinolines containing aryl, alkylaryl, cycloalkyl and alkoxy groups as rubber stabilizers. They were synthesized from 2,2,4-trimethyl-1,2-dihydroquinoline and 6-methoxy-2,2,4-trimethyl-1,2-dihydroquinoline, anhydrous benzene, toluene, cyclohexane, $AlCl_3$ (as catalysts) in a Friedel-Crafts reaction. They were tested in filled and unfilled rubbers type NK and SK as individual stabilizers or in combination with diaphene FP in comparison with acetonyl and quinol. The results indicate that 1,2,3,4-tetrahydroquinolines are quite effective in comparison to presently used dihydroquinolines, particularly in combination with diaphene FP. References 7 Russian.

[288-6508]

MISCELLANEOUS

UDC 541.1+539.58+536.711+
534.22

SPEED OF SOUND, COMPRESSIBILITY AND IMPACT ADIABATIC CURVE OF CUBIC CRYSTALS

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received
26 Nov 81) pp 652-656

PROTASOV, I. D., Institute of Chemical Physics, USSR Academy of Sciences,
Moscow

[Abstract] It is interesting to determine the volumetric isentropic and isothermal speeds of sound, compressibilities and parameters of the impact adiabatic curves to determine the similarity of isothermal and isentropic characteristics of materials at high temperatures and pressures, as well as the limits of linearity of the relationship between speed of a shock wave and mass velocity of matter. The isentropic speed of sound and K_S are determined using an expression for free energy of condensed matter. The impact adiabatic curve relates the pressure and density on both sides of a shock discontinuity considering the conservation of mass, momentum and energy. The propagation velocity of a disturbance through matter and the mass velocity of the matter are compared with the speeds of sound calculated by various equations. Results are presented in tabular form for pure aluminum. References 10: 9 Russian, 1 Western.
[274-6508]

UDC 535.343.2

LOW FREQUENCY RAMAN SPECTRA OF DOPED ALKALI HALIDE SINGLE CRYSTALS

Moscow KHIMICHESKAYA FIZIKA in Russian No 5, May 83 (manuscript received
18 May 82) pp 657-662

TSYASHCHENKO, Yu. P. and DANCHUK, V. D., Kiev State University imeni
T. G. Shevchenko

[Abstract] A discussion is presented of local oscillation spectra in alkali halide crystals with and without gaps in their natural phonon spectra doped with various anions, which were measured for the first time. The broad set

of impurity ions having different local symmetry in the crystalline lattices and corresponding changes in the number and polarization of low frequency lines in the Raman spectra allowed the spectra to be identified by a simple quasimolecular model. Typical low frequency Raman spectra of the crystals are presented. The spectra consist of rather sharp lines, in many cases with clear polarization all falling either within the spectral area corresponding to the gap in the phonon spectrum or the area of frequencies above the maximum phonon frequency of the alkali halide crystals. They are therefore obviously local oscillation bands excited by the doping impurities/ It is considered that the impurity ions do not perform libration-rotary movements in the crystals. A quasimolecular model is therefore used to interpret the observed low frequency oscillation spectra, in which the quasimolecule consists of an impurity center and surrounding matrix lattice ions. Figure 1; references 17: 12 Russian, 5 Western.
[274-6508]

CSO: 1841

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