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ADSORPTION

UDC 541.183

INFLUENCE OF CONDITIONS OF HIGH TEMPERATURE TREATMENT OF STYRENE-DIVINYLBENZENE COPOLYMERS ON POROUS STRUCTURE OF ADSORBENTS MADE FROM THEM

Kiev KHMICHESKAYA TEKHOLOGIYA in Russian No 3, May-Jun 84  
(manuscript received 27 Dec 83) pp 23-25

BURUSHKINA, T. N., ALEYNIKOV, V. G. and STAVINSKIY, V. B., Department of Surface Chemistry, Institute of Physical Chemistry, UkSSR Academy of Sciences

[Abstract]. A study was made of the formation of porous structures in carbon adsorbents obtained by high temperature (to 900°C) pyrolysis of styrene-divinylbenzene copolymer. It is shown that by altering the pyrolysis conditions to prevent build-up of non-volatile matter in the pores, it is possible to control pore structure both quantitatively (pore size) and qualitatively (distribution of pore volume). Figures 5; references 7: 6 Russian, 1 Western.  
[231-12765]

UDC 541.1.546.59.183.2

SORPTION SELECTIVITY OF HEAVY METAL COMPLEX IONS ON ACTIVATED CHARCOAL

Kiev UKRAINSKIY KHMICHESKIY ZHURNAL in Russian Vol 50, No 6, Jun 84  
(manuscript received 6 Jul 82, after revision 12 Dec 83) pp 588-592

IVANOVA, L. S., GRABCHAK, S. L., ALEKSEYENKO, R. K. and GRABOVSKIY, A. I., Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev

[Abstract] The adsorption of gold, silver, copper, zinc, iron, nickel and cobalt from cyanate, thiocyanate, ammonia, acetate, citrate and thiourea solutions was investigated. In these solutions, the metals were in form of complex ions. The adsorption of above metal cyanates on activated carbon could be arranged in the following order: Au>Ag>Ni>Co>Cu>Zn; the adsorption from citrate solution decreased as follows: Ag>Fe>Cu; thiocyanate complex

ions were adsorbed in the following order: Ag>Fe>Zn>Ni and the ammonia and acetate complexes had the following tendency to adsorption: Ag>Cu>Co>Ni>Zn. The data showed that activated carbon is the most selective adsorbent for gold and silver as well as for the metals with high oxidation-reduction potential: iron and copper. The mechanism for this binding can be represented as an interaction of the central atom of the complex ion with neighboring adsorption centers of the carbon. Figures 2; references 13: 12 Russian, 1 Western.  
[323-7813]

UDC 541.183

#### HYDROTHERMAL MODIFICATION OF ALUMINUM-ZIRCONIUM ADSORBENTS WITH DIFFERENT COMPOSITIONS

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 6, Jun 84  
(manuscript received 21 Sep 82) pp 596-599

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imeni L. V. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev

[Abstract] The goal of this work was to study the effect of hydrothermal treatment on the porous structure of coprecipitated aluminum-zirconium adsorbents with 5, 10, 35, 50, 75, 90 and 95% Al<sub>2</sub>O<sub>3</sub> treated for 6-25 hrs in temperatures ranging from 100 to 400°C. These coprecipitates were obtained by adding a 3 M ammonium solution to a 0.5 M zirconyl nitrate solution mixed with 1 M aluminum nitrate solution, bringing the pH gradually to 9. Hydrothermal treatment made it possible to regulate the porous structure of these adsorbents. The texture of the binary starting materials and the texture of hydrothermally modified samples did not appear to be an additive function of their component parts. Figure 1; references 6 (Russian).  
[323-7813]

UDC 541(183.12 + 64)

#### EFFECT OF CHEMICAL COMPOSITION OF SOLOZA K CARBOXYL CATION EXCHANGE RESINS ON THEIR ADSORPTION CHARACTERISTICS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 27 Sep 82) pp 1188-1193

MAL'KO, Ye. I., BOLDYREV, A. G., VINOGRADOV, Ye. L., DUMPIS, Yu. Ya. and TAGER, A. A., All-Union Scientific Research Institute of Ultra Pure Biopreparations

[Abstract] Soloza K carboxyl cation exchange resins are ternary copolymers based on a hydrophilic component--methacrylic acid (MAA), a hydrophobic

component and a crosslinking agent. Varying the relationship between the hydrophilic and hydrophobic components leads to substantial changes in the properties of these adsorbents. The effect of chemical composition and of the ionic form of the cation exchange resin on the porosity and chemical properties was studied by physical-chemical methods and by gas chromatography adsorption. When the chemical composition of the studied exchange resins Soloza K-50/40 and Soloza K-6/40 was changed, it led to a change in their porous structure and adsorption properties. The porosity did not change noticeably when the ion exchange resin form was altered from the hydrogen to the sodium form, but the adsorptional properties of their surfaces were affected. Figures 2; references 5 (Russian).  
[307-7813]

UDC 661.666 4

#### IRREVERSIBLE ADSORPTION OF CHROMYL CHLORIDE BY TECHNICAL CARBON

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 24 Jan 83) pp 511-514

KRASNOBRYZHIIY, A. V. and SMIRNOV, Ye. P., Leningrad Technologic Institute  
Imeni Lenosvet

[Abstract] The products obtained in an irreversible adsorption of chromyl chloride ( $\text{CrO}_2\text{Cl}_2$ ) on technical carbon were studied as a function of the reaction conditions and the state of carbon surface. It was shown that with an increased temperature the Cr(VI) component in these products was diminished due to the oxidation-reduction processes occurring at the same time. The interaction between  $\text{CrO}_2\text{Cl}_2$  and the carbon surface was independent of the presence or absence of protogenic functional groups, because the chlorine atoms did not react with such functional groups. Calcinations of chromium containing preparations by heating to 1073 K led to lower content of Cr(VI), while showing no effect on total chromium content. Figures 3; references 7: 6 Russian, 1 Western.  
[313-7813]

UDC 541.128+546.57

CONDITIONS OF FORMING SILVER CENTERS IN SILVER/GAMMA ALUMINA CATALYSTS

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 84  
(manuscript received 9 Jan 84) pp 11-15

VOROB'YEV, V. N., KORONTSEVICH, A. Yu. and ABLYAYEV, E. Sh., Institute of Chemistry, UzSSR Academy of Sciences

[Abstract] Conditions for the formation of various centers with  $\text{Ag}^0$ ,  $\text{Ag}^{2+}$  and  $\text{Ag}^{3+}$  in gamma alumina were determined at 20-1100 C with silver content varying from 0.3 to 35 mass percent. Samples were analyzed by x-ray diffraction and by diffusion reflection on a Specord M 40 spectrophotometer. Samples with 10-30 mass percent Ag when calcined from 300-900 C showed a diffraction peak attributed to weakly-crystallized silver aluminate; this disappeared at temperatures over 1000 C. Spectral analysis indicates that when samples containing over 10 mass percent Ag are calcined over 300 C,  $\text{Ag}_2\text{O}_{1+x}$  oxides are formed which contain a substantial quantity of excess oxygen and  $\text{Ag}^{2+}$  ions. At temperatures over 500 C, the silver aluminate content sharply rises and delta alumina forms due to the modifying effect of the added silver. At higher temperatures, the silver compounds decompose with the formation of  $\text{Ag}^0$ . Spectral complexity also indicates the presence of an additional structure, and  $\text{Ag}^{3+}$  is proposed. Higher mass percent of silver brings further spectral changes, indicating a complex chain of phase changes in the silver-gamma alumina system. Figures 2; references 6: 5 Russian, 1 Western.  
[309-12672]

INFLUENCE OF ALKALINE EARTH METALS ON REDUCTION OF NICKEL-ALUMINUM CATALYSTS

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 84  
(manuscript received 16 Jan 84) pp 62-63

RIZAYEVA, N. G. and VOROB'YEV, L. N., All-Union Scientific Research  
Chemico-Technological Institute of the Medical Industry

[Abstract] Thermal-programmed reduction of catalysts with 10 mass percent NiO showed a single hydrogen absorption peak with a maximum at 800 C, dependent on surface ions of Ni<sup>2+</sup> from a solid solution of these ions with gamma alumina. Samples with 30 mass percent NiO showed two additional absorption peaks at 400 and 680 C corresponding to octahedrally coordinated Ni<sup>2+</sup> ions in the surface layers. Introduction into the catalyst of alkaline earth metals significantly lowered the 800 C peak with the appearance in lower temperature regions of numerous new peaks. The appearance of a narrow peak at 300-350 C was attributed to free nonstoichiometric Ni oxide formed on the substrate surface. In the 400-700 C region, absorption peaks were probably associated with a -Ni-O-Ni- bonding. The modified substrate also had surface structures of the type MeAl<sub>2</sub>O<sub>4</sub> and MeO. This allows for tailored regulation of the reduction process. Figure 1; references 2 (Russian).  
[309-12672]

UDC 543.8:535.243:547.333.4

SPECTROPHOTOMETRIC DETERMINATION OF DECAMETHOXIN USING EOSIN

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84 (manuscript received 4 Jan 82)  
pp 412-414

ZHEBENTYAYEV, A. I., Department of Analytical and Toxicological Chemistry,  
Vitebsk State Medical Institute

[Abstract] In order to find an analytical method more sensitive than silver nitrate titration, the reaction of decamethoxin (1,10-decamethylene-bis-[N-dimethylcarbamoyloxymethyl]ammonium)dichloride) with eosin was investigated. The colored association product formed in 5-10 minutes and was stabilized in solution by 10-20% ethanol. Absorbance of the product was highest at pH 2.0-3.5. The wavelength maximum of the product was at 535-545 nm, with the greatest difference between its spectrum and that of eosin at 550-555 nm. Isomolar series and equilibrium shift measurements indicate that the decamethoxin to eosin ratio is 1:2. The data indicate that decamethoxin interacts with eosin via its hydroxyl groups and that both electrostatic and donor-acceptor interactions are involved. The product exhibits Beer's law behavior between 0.3 and 4.0 micrograms/ml. The method possesses excellent accuracy and reproducibility. Figures 4; references 4 (Russian).  
[276-12126]

DEVELOPMENT OF STANDARD SAMPLES FOR CHEMICAL COMPOSITION OF SODA ASH AND  
BARIUM SALTS

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 3, May-Jun 84  
(manuscript received 21 Nov 83) pp 10-12

IVKOV, A. G. and KNIGAVKO, I. P., Scientific-Research Institute of Basic  
Chemistry

[Abstract] Recommendations are presented for possible use as State standard  
samples for soda ash, barium chloride and barium carbonate analysis. A  
comparison of analysis results from different enterprises shows wide dis-  
crepancy in evaluations ranging from "scrap" to "high quality product" for  
the same sample. This is due to the lack of standard specifications for  
these products. References 10 (Russian).  
[231-12765]

STUDY OF QUALITY INDEXES OF UREA WITH ADDITION OF UREA-FORMALDEHYDE

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 3, May-Jun 84  
(manuscript received 3 May 83) pp 12-13

KOLESNIK, L. F., ABROSIMOVA, A. M., IVAKHNENKO, M. T. and ZHEREBNOY, Yu. M.,  
Severodonetsk Production Association "Azot"

[Abstract] Pelletized urea, as produced at the "Azot" Production Association,  
has low strength and high losses due to attrition are sustained during  
transport and storage. A study shows that pellet strength can be increased  
significantly by adding 0.15-0.20% urea-formaldehyde during the last stage  
of urea production. Figures 4; references 6 (Russian).  
[231-12765]

## PHYSICAL-CHEMICAL STUDY OF PHOSPHORITES FROM CENTRAL KYZYLKUMY

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 27 Apr 82) pp 969-973

NABIYEV, M. N., ABDURAKHMANOV, E. and AMIROVA, A. M., Institute of  
Chemistry, UzSSR Academy of Sciences

[Abstract] Granular phosphorites from Central Kyzylkumy consist principally of phosphatized organic material with a 30-70% content of the phosphate. Other nonphosphate minerals are: calcite, quartz, gypsum, hydrohettite, montmarillonite and pyrite. Specimens from Sardara and Dzheroy were studied by chemical and physical analytical methods. The Sardara material showed a 0.76 ratio of  $Fe_2O_3$  to  $P_2O_5$  and a 14.5 ratio of  $Al_2O_3$  to  $P_2O_5$ , with insignificant amounts of insoluble residue; this material could be used directly in production of mineral fertilizers. Dzheroy ore showed a low level of phosphate, high level of carbonate and a ratio of  $Fe_2O_3$  to  $P_2O_5$  of 22.4. Other physical methods used in sample analysis (x-ray phase analysis, thermal behavior, IR spectroscopy) made it possible to identify mineralogic composition of these phosphorites and to evaluate the relationship of various component minerals. Figures 3; references 13 (Russian, 1 by Western author). [303-7813]

UDC 541.123

PHYSICAL-CHEMICAL PROPERTIES OF AMMONIUM NITRATE--MONOAMMONIUM PHOSPHATE--WATER SYSTEM AT A N: $P_2O_5$  RATIO OF 1:1

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 23 Aug 82) pp 974-978

SORINA, G. A., BEZLYUDOVA, L. I., MUSHKINA, Ye. V., KOZLOVSKAYA, G. M. and  
TSEKHANSKAYA, Yu. V.

[Abstract] In an attempt to develop new technology for the production of complex binary N-P fertilizers, determination was made of the physical-chemical properties of the system: ammonium nitrate--monoammonium phosphate--water in which the ratio of N: $P_2O_5$  was 1:1. The following properties were measured: solubility, density, viscosity, boiling temperature, heat capacity and heat of water evaporation from this system in the concentration range of the salt from 30 to 70%. All of these newly developed characteristics are tabulated. Figure 1; references 8 (Russian). [303-7813]

CATALYSIS

UDC 541.128.13

SOME PATTERNS OF SELECTIVE OXIDATION OF METHANE WITH SIMPLE AND COMPLEX  
OXIDE CATALYSTS

Kiev TEORETICHESKAYA I EKSPERIMENTAL'NAYA KHIMIYA in Russian Vol 20, No 3,  
May-Jun 84 (manuscript received 9 Nov 83) pp 311-317

GOLODETS, G. I., BORKO, V. A. and GOMONAY, V. I., Institute of Physical  
Chemistry imeni L. V. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev;  
Uzhgorod State University

[Abstract] Partial oxidation of methane produces formaldehyde, but without selective catalysis more complete oxidation results in low product yields. The mechanisms and kinetics of oxidation were studied for a range of oxide and phosphate catalysts in a temperature range of 823-923 K. The Mn and Fe phosphates showed the highest relative catalytic activity, while Al and B phosphates were the most selective. The relative speed of product formation by surface reduction indicates that the classical reduction-oxidation mechanism is not applicable. Catalysts with a high bonding energy for surface oxygen tend to promote oxidation with an alternating mechanism in which oxygen reacts not with free centers Z [a reduced active center] but with hydrocarbons bonded with ZO in a  $ZRO_x$  complex, but this tends to produce full oxidation. A more complex seven-stage process is proposed for phosphate catalysis allowing for both partial and full oxidation routes. Figures 5; references 8 (Russian).

[321-12672]

## HYDROGENATION OF UNSATURATED HYDROCARBONS IN PRESENCE OF IRON ACETYLACETONATE WITH ALUMINUM AND TIN CHLORIDE ADDITIVES

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 26 Jan 83) pp 185-187

BELOV, P. S., BORUNOVA, N. V., IGNATOV, V. M., BEGUM DIL AFROZA, PETUKHOV, V. A., MIRONOVA, I. L. and FREYDLIN, L. Kh., Moscow Institute of Petrochemical and Gas Industry imeni I. M. Gubkin; Institute of Organic Chemistry, USSR Academy of Sciences

[Abstract] The effect of  $\text{AlCl}_3$  and  $\text{SnCl}_2$  additives on catalytic properties of  $\text{Fe}(\text{AcAc})_3$  (acetyl acetonate of iron) was studied based on hydrogenation of olefines and dienes. It was shown that addition of  $\text{SnCl}_2$  had an insignificant effect on the activity of  $\text{Fe}(\text{AcAc})_3$ . By itself, the  $\text{Fe}(\text{AcAc})_3$  catalyst is not very active in hydrogenation of the C=C bonds; addition of  $\text{AlCl}_3$  to ethanol solution of  $\text{Fe}(\text{AcAc})_3$  did not improve the situation. Increased activity was observed, however, when the system  $\text{Fe}(\text{AcAc})_3\text{-AlCl}_3$  was formed in presence of olefines or dienes. Maximum hydrogenation rate was observed with the Al:Fe ratio of 3; in case of dienes, the hydrogenation rate increased as the ratio of Al:Fe increased from 1 to 5. Figures 2; references 6: 2 Russian, 4 Western.  
[272-7813]

## CONVERSION OF 4,4-DIMETHYL-1,3-DIOXANE INTO ISOPRENE IN PRESENCE OF BISMUTH PHOSPHATES

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 6 Apr 83) pp 221-224

NOVIKOVA, L. A., IVANOVA, N. G., CHUDINOVA, N. N., BALAGINA, G. M. and SHARF, V. Z., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences; Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences

[Abstract] The properties of bismuth ortho and polyphosphates as catalysts for the acid catalyzed conversion of dimethyldioxane into isoprene were investigated. The results showed that bismuth tetrapolyphosphate exhibited a relatively low activity, while the orthophosphates appeared to be more reactive. The highest activity was exhibited by precipitated  $\text{BiPO}_4$ ; at  $280^\circ\text{C}$  the conversion of 4,4-dimethyl-1,3-dioxane (DMD) reached 99% with an 80.5% yield of isoprene.  $\text{BiH}(\text{PO}_3)_4$  also showed adequate activity and selectivity: at  $200^\circ\text{C}$  DMD conversion was 61.4% with 40.5% yield of isoprene and at  $250^\circ\text{C}$  these values increased to 93.7 and 76.7% respectively. These

catalysts led to increased coke formation during the process. During the conversion process of DMD the activity of the bismuth phosphates decreased; this could be reversed by treatment of the catalyst with phosphoric acid vapor. Introduction of bismuth orthophosphate into the calcium phosphate catalyst did not increase the activity of the latter. Figure 1; references 7: 6 Russian, 1 Western.  
[272-7813]

UDC 66.092.14:661.716.1:541.127

#### PYROLYSIS OF ISOBUTANE-ETHANE MIXTURES

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 1 Apr 83) pp 214-220

SHEVEL'KOVA, L. V., GUSEVA, I. N. and NAMETKIN, N. S., Institute of  
Petrochemical Synthesis imeni A. V. Topchiyev, USSR Academy of Sciences

[Abstract] In an attempt to elucidate the mechanism of thermal decomposition of saturated hydrocarbons, pyrolysis of model binary mixtures of isobutane with ethane and isobutane with hydrogen were studied. Pyrolysis was performed in a vacuum system in temperature range of 700-850°C and 13.3±1.33 kPa pressure. It was shown that isobutane exhibited an initiating action of ethane breakdown, and ethane inhibited the decomposition of isobutane. Hydrogen was also shown to be an initiator of isobutane breakdown. The analysis of experimental data showed that the formation of principal products during the pyrolysis of the above mixtures did not follow the additivity principle. Hydrogen appeared not to have any effect on the yield of principal products obtained from pyrolysis of isobutane (propylene, isobutylene and ethylene). Figures 5; references 6: 3 Russian, 3 Western.  
[272-7813]

## THERMAL STABILITY OF HYDROCARBON ANTIOXIDANTS OF COMPLEX MOLYBDENUM TYPE COMPOUNDS

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 20 Jul 83) pp 250-259

NECHITAYLO, N. A., DZYUBINA, M. A., KUZ'MINA, G. N., ZAYMOVSKAYA, T. A.  
and SANIN, P. I., Institute of Petrochemical Synthesis imeni A. V. Topchiyev,  
USSR Academy of Sciences

[Abstract] Thermal and thermooxidative stability of molybdenum complexes  $[(C_4H_9)_2NC(S)S]_2Mo_2SO_3$  and  $[(C_4H_9)_2NC(S)S]_2Mo_2S_3O$  were studied in a dynamic and isometric system of sample heating in presence of oxygen and in an inert medium. The first complex began to break down at 280°C in argon and in air. The second complex decomposed at 245°C in argon and at 180°C in air. The process activation energy for the first complex was 393 kJ/mole and for the second it was 210 kJ/mole. Under the isothermal conditions the breakdown temperature for these complexes was lower than under dynamic conditions. For the first complex in air it was 210°C and for the second--180°C. Figures 5; references 22: 9 Russian, 13 Western.  
[272-7813]

UDC 665.033.53

## NITROGEN COMPOUNDS OF SAMOTLOR CRUDE OIL

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 6 Jan 83) pp 273-276

BEYKO, O. A., OGORODNIKOV, V. D., SAGACHENKO, T. A. and TSOY, L. A.,  
Institute of Petroleum Chemistry, Siberian Department, USSR Academy of  
Sciences

[Abstract] Nitrogen compounds isolated from Samotlor crude oil by the complex formation method with  $TiCl_4$  were studied. It was shown that they consist of heterocyclic aromatic compounds with secondary amine impurities. The weakly basic nitrogen compounds contain carboxylic acid amines and the neutral ones--the pyrrole derivatives. Nitrogen compounds from the Samotlor deposits show and insignificant level of alkyl substituents (1-2) and a large number of carbon atoms (8-9). References 9: 8 Russian, 1 Western.  
[272-7813]

## EFFECT OF PREPARATION CONDITIONS ON PROPERTIES OF COPPER-CONTAINING CATALYSTS FOR HYDRATION OF ACRYLONITRILE

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 3, May-Jun 84 pp 16-18

MIKHAYLISHIN, I. O., YAVNA, I. M., MOKRIVSKIY, T. M. and TOLOPKO, D. K.

[Abstract] In the production of acrylamide by hydration of acrylonitrile over copper-containing catalysts, 3-30% ethylene cyanohydrin may be formed as a side product. A study was made of the effects of the temperatures at which copper is oxidized and reduced to form the catalyst on the latter's activity and selectivity. Low selectivity is apparently due to overheating during the reduction. Optimum temperature range is 180°-200°C. Figure 1; references 10: 6 Russian, 4 Western.

[231-12765]

## CATALYTIC AND ADSORPTIVE CHEMICAL PURIFICATION OF NOBLE GASES, HYDROGEN AND METHANE FROM OXYGEN

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 84 pp 373-374

BARABASH, A. S., GOLUBEV, A. A., KAZACHENKO, O. V., OVCHINNIKOV, B. M. and FILIPPOVA, T. P.

[Abstract] Results are presented on the purification of noble gases, hydrogen and methane from traces of oxygen by catalysis ( $\text{Pd}/\text{Al}_2\text{O}_3$  and  $\text{Ni}/\text{Cr}_2\text{O}_3$ ) and by adsorption ( $\text{Ni}/\text{SiO}_2$ ,  $\text{NiCr}_2\text{O}_3$  and  $\text{CrO}/\text{SiO}_2$ ). Although these methods are described in the literature, the published data shows only  $10^{-6}$  -  $10^{-7}$  eqv.  $\text{O}_2$  depth of purification. This is much less than what may be theoretically expected. In the present work, these catalysts and adsorbents were used in a 40X400 mm reactor to treat argon, xenon, methane and hydrogen. A 2-phase electron-capture type detector was used to monitor purity of the gases to a sensitivity of  $10^{-10}$  eqv.  $\text{O}_2$ . The results show that  $10^{-8}$  or less eqv.  $\text{O}_2$  may be achieved if the background piping in the equipment is reduced to a minimum and more sensitive equipment for measuring the purity of the gases is used. References 2 (Russian).

[317-12765]

## USE OF CHELATES Cu(II) AND Ni(II) AS MICHAELIS REACTION CATALYSTS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 28 Apr 83) pp 662-665

POTAPOV, V. M., SOLOZHENKO, Ye. G. and PANOVA, G. V., Moscow State  
University imeni M. V. Lomonosov

[Abstract] The potential of using Cu(II) chelate compounds as catalysts for the addition of aniline to the activated  $\text{-HC=CH-}$  bond in  $\omega$ -nitrostyrene was studied. The catalyst increased the yield of the final product by about 50%. These Cu(II) chelates were formed with (-)-3-methylhydroxymethylenecyclohexanone, (+)-hydroxymethylenecamphore, Schiff bases of salicyl aldehyde with (-)-propylenediamine and enaminoketone (+)-hydroxymethylenementone. Ni(II) chelates from Schiff bases appeared to be more reactive. The order of the mixing of reagents appeared to have a definite effect on the yield of the final product. The use of optically active chelates yielded only racemates as the end products. References 11: 7 Russian (1 by Western authors), 4 Western.

[313-7813]

## OPTICALLY ACTIVE CHELATES Cu(II) FROM ENAMINOKETONES AND SCHIFF BASES--AS CATALYSTS FOR ADDITION OF ANILINE TO BENZYLIDENEACETOPHENONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 28 Apr 83) pp 665-669

POTAPOV, V. M., PANOVA, G. V. and SOLOZHENKO, Ye. G., Moscow State  
University imeni M. V. Lomonosov

[Abstract] In continuation of the preceding report (this journal issue, pp 662-665), addition of aniline to benzylideneacetophenone in presence of optically active Cu(II) chelates was studied. The reaction was carried out at room temperature in absolute benzene, using stoichiometric relationship of the reagents and 1.5 mole-% of the catalyst. The highest yield (59%) of the product was obtained with the catalyst prepared from enaminoketone (+)-hydroxymethylenementone with glycine. Several of the catalysts studied yielded an optically-active final product:  $\beta$ -anilino- $\beta$ -phenylpropiophenone, albeit in different yields. References 15: 10 Russian, 5 Western.

[313-7813]

COMBUSTION

UDC 774.342

NEW DATA ON REACTIVITY AND STRUCTURE OF COALS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 18 May 83) pp 3-11

RUS'YANOVA, N. D., POPOV, V. K., BUTAKOVA, N. I., GAGARINOVA, L. M.,  
CHARUSHNIKOV, K. A. and BUBNOVSKAYA, L. M., Eastern Scientific-Research  
Institute of Coal Chemistry

[Abstract] The concept of coal being a polymer having aromatic and heterocyclic structures surrounded by functional aliphatic and hydroaromatic groups joined by methylene, oxygen and sulfur linkages is not supported by recent data. Any economical method for coal liquefaction must therefore be based on a new concept of its structure. In the present work, coals are shown to be capable of hydrogen addition under mild conditions. The reactivity of coals and coal extracts with various brominating reagents was studied and the resulting new data are used to formulate new concepts on the structure of coal. Figures 6; references 35: 19 Russian, 16 Western.  
[230-12765]

UDC 541.128:552.57

FEATURES OF ELECTRONIC REDUCTION OF ORGANIC COMPOUNDS MODELING FRAGMENTS OF COAL MATTER

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 23 Mar 83) pp 12-18

GAGARIN, S. G. and KRICHKO, A. A., Institute of Mineral Fuels

[Abstract] Electronic reduction being a possible means of coal liquefaction, a study was made of the results obtained by computing the distribution of electron density in molecules of pyrene, diphenyl, phenyl-naphthyl and naphthyl-naphthyl esters and their esters and their anion radicals. Structural features are noted of model compounds capable of splitting ester linkages during electron capture. Quantum chemical calculations confirm the stability of condensed aromatic fragments of the organic matter of coals during electronic charging. This is due to the specificity of free molecular orbital

structures modeling such groups. Structural features were determined which facilitate reactivity of organic structures, including ester linkages in destruction-type reactions during electron reduction. Figures 2; references 19: 9 Russian, 10 Western.  
[230-12765]

UDC 552.57.566 094.3

EFFECT OF INHIBITORS ON OXIDATION PROCESS OF COALS UNDER VARIOUS CONDITIONS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 10 Nov 82) pp 45-48

SHENDRIK, T. G. and KOMPANETS, V. A., Institute of Physical-Organic Chemistry and Coal Chemistry, UkSSR Academy of Sciences

[Abstract] Oxidation of three Donets coals of various stages of metamorphism in the presence of alpha-naphthylamine, hydroquinone and ionol as radical-reaction inhibitors was studied at 80°-200°C. It was established that these typical inhibitors suppress radical-chain oxidation processes at average temperatures, but act as mild oxidation initiators at 180°-200°. The initiating action of the antioxidants depends on the structural features of the coals at the various stages of metamorphism. Figures 3; references 9: 8 Russian, 1 Western.  
[230-12765]

UDC 662.642:662.612:620.197.5

ELECTROCHEMICAL PROTECTION OF COALS FROM SELF-HEATING AND AUTOIGNITION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 17 Mar 82) pp 49-54

ALEKSANDROV, I. V., BURKOV, P. A., KAMNEVA, A. I. and KHOKHLOV, Yu. I., Moscow Chemical-Technologic Institute imeni D. I. Mendeleev

[Abstract] Cathode polarization using insignificant amounts of external direct current electrical energy was successfully employed to prevent self-heating and autoignition in coal piles of 450-500 cubic meters. This new method is said to be more effective than previously-used methods for suppressing oxidation-reduction processes in large coal piles. Figures 4; references 10 (Russian).  
[230-12765]

HYDROGENATION OF COALS IN PRESENCE OF STATIONARY-BED ALUMINA-COBALT-MOLYBDENIC CATALYSTS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 2 Jan 83) pp 80-83

DEMBOVSKAYA, Ye. A., KARMANOVA, Ye. L., YULIN, M. K., ZAYDMAN, N. M. and MILOVA, L. P., Institute of Mineral Fuels

[Abstract] Brown coals of the Irsha-Borodin deposit from Kansk-Achinsk were hydrogenated over a stationary-bed wide-pored alumina-cobalt-molybdenic catalyst prepared at the Institute of Catalysis of the Siberian Department, USSR Academy of Sciences. Coal liquefaction to 82-84% was achieved and found to be dependent on the porous structure and concentration of active components in the catalyst. References 8: 4 Russian, 4 Western, [230-12765]

UDC 541.128.34:541.44:542.941.7:546.262.3-31

HYDROGENATION OF GAS MIXTURES HAVING HIGH CONTENT OF OXIDES OF CARBON IN PRESENCE OF POLYMETALLIC CATALYSTS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 28 Feb 83) pp 84-87

LUNIN, V. V., KRYUKOV, O. V., BRUK, I. A. and LAPIDUS, A. L., Moscow State University imeni M. V. Lomonosov; Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences

[Abstract] Experiments show that it is possible to hydrogenate gas mixtures obtained by treating solid fuels and containing 20-70% oxides of carbon to give a synthesis gas suitable as a substitute for natural gas. The hydrogenation was conducted over zirconium-nickel hydride catalysts. References 11: 6 Russian, 5 Western. [230-12765]

UDC 662.747

STUDY OF HIGH TEMPERATURE GASIFICATION OF COAL IN STREAM

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 21 Dec 82) pp 115-119

ZHOLUDOV, Ya. S. and AFANASENKO, L. Ya., Institute of Problems of Modeling  
in Power Engineering, UkSSR Academy of Sciences

[Abstract] Results are presented of experiments on continuous gasification of pulverized Kansk-Achinsk brown coals at 1900-2000°K and 2300-2400°K and 0.1 sec residence time with a methane-oxygen-air mixture. Under the experimental conditions, the CO + H<sub>2</sub> content reached 0.56 (at 1900-2000°K) and 0.68 (at 2300-2400°K) of equilibrium, depending only slightly on the reagent ratio. Figures 3; references 8: 5 Russian, 3 Western.  
[230-12765]

UDC 532.546

HYDRODYNAMIC CHARACTERISTICS OF IMPREGNATED GRAPHITES AND COMPOSITE MATERIAL  
TKM

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 84  
(manuscript received 12 Mar 82) pp 136-143

KURSHIN, A. P., Central Aerohydrodynamic Institute imeni N. Ye. Zhukovskiy

[Abstract] Basic hydrodynamic characteristics were determined for some industrial grades of impregnated graphite and some samples of composite material TKM [expansion unknown] reinforced with carbon-graphite fibers. The resulting data made it possible to compute flow characteristics through the structures. The relationship of hydrodynamic characteristics to porosity and structural features of the samples was analysed. Figures 3; references 6 (Russian).  
[230-12765]

COMPUTATION OF FLASH POINT TEMPERATURES OF GASES AND VAPORS OF SILICON-ORGANIC COMPOUNDS IN AIR

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 84 pp 340-341

NUZHDA, L. I., GLIKIN, M. A. and KOL'TSOVA, L. N.

[Abstract] Production enterprises employing silicon-organic compounds (silanes) are exposed to high danger from fire, and the flash points of these compounds thus become an important parameter in classifying these enterprises in terms of fire hazards. Experimental determination of the flash points is somewhat laborious and a computational method is therefore desirable. Although the literature contains a number of such methods for determining flash points, they are not suitable for silanes. In the present work a formula is presented which was checked experimentally against silane and a number of substituted silanes. The root mean square of departure of calculated values from experimental did not exceed 7.5°C and the formula is proposed as being sufficiently accurate for computing flash points of silanes. References 7: 6 Russian, 1 Soviet-bloc.  
[317-12765]

EFFECT OF ADDITIONS OF ACIDS ON THERMAL DECOMPOSITION OF CONCENTRATED SOLUTIONS OF AMMONIUM NITRATE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 84 pp 348-349

MOSHKOVICH, Ye. B., STRIZHEVSKIY, I. I., RUCHKINA, M. I., TUMANOVA, V. I. and PODSHIVALOVA, G. N.

[Abstract] The first stage in the production of ammonium nitrate is the preparation of its solutions, which are capable of being acidulated if the ammonia feed rate is allowed to drop. In the interests of safety a study was made of the effects of adding sulfuric, nitric and phosphoric acids to concentrated solutions of ammonium nitrate. It was determined that in all cases acidulation of the solution results in a noticeable increase in the rate of thermal decomposition and heat emission, and therefore the probability of spontaneous thermal decomposition is increased. Figure 1.  
[317-12765]

ELECTROCHEMISTRY

UDC 661.94:621.384.6

ELECTRON ACCELERATOR AS OZONE GENERATOR

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 84 pp 362-363

MAKAROCHKINA, L. M., BUSLAYEVA, S. P., FILIPPOV, M. T., VANYUSHKIN, B. M.  
and KURYATNIKOV, Yu. I.

[Abstract] Large-scale electron accelerators are being used more and more in various industrial processes such as hardening of protective coatings and treating waste effluents, and the ozone thus formed, unless recovered, pollutes the air. Experiments were conducted on a ELIT-1 accelerator of 0.8 Mev and 0.3 mA to determine the feasibility of using such accelerators for useful production of ozone. The results show that relatively inexpensive accelerators of 0.25-0.3 Mev of high capacity may be economically used to generate ozone for some other ancillary process. Figure 1; references 2: 1 Russian, 1 Western.  
[317-12765]

DEVELOPMENT OF MEANS OF STABILIZING GRAPE JUICE BY USING CATION EXCHANGE RESINS IN ELECTROMAGNETIC FIELD

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 84  
(manuscript received 20 Jul 83) pp 41-43

RIZAYEV, N. U., SADYKOV, A. M., SHAGIAKHMEDOVA, R. and UBAYDULLAYEV, Sh.,  
Tashkent Institute of Textile and Light Industry

[Abstract] To forestall the clouding of grape juice, cation exchange resins KU-1 and KU-2 were used in magnetic fields of 0-4000 oerstads. Resin KU-2 gave the best results. Magnetic fields of 3200-3400 oerstads provided optimum stabilization and increased the speed of the ion exchange by 3-4 times, removing Ca, Mg, K and Fe. Samples treated in a magnetic field showed higher titrated acidity; levels of Ca and Mg were about a third the value for juice processed without a magnetic field.  
[309-12672]

## FREE RADICALS

UDC 541(64 + 515):547.458

### MECHANICALLY INITIATED FREE RADICAL REACTIONS IN POLYSACCHARIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 15 Dec 82) pp 1311-1317

ABAGYAN, G. V. and BUTYAGIN, P. Yu., Institute of Physical Studies, ArSSR  
Academy of Sciences; Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Chemical structure of mono-, di- and polysaccharides is suitable for development of free radical chain reactions. Development of each link in the chain is accompanied by formation of  $-CH_2-$ ,  $=CO$ ,  $-O-CO-$  groups and by liberation of low molecular weight compounds. These processes are best studied by means of EPR. In the present paper free radical reactions taking place during mechanical degradation of cellulose are reported. Among the volatile products only  $CO$ ,  $CO_2$  and  $H_2O$  were identified by mass-spectroscopic methods leading to an assumption that the primary mechanical split in the early stage of cellulose degradation occurs at  $C_1-O-C_4$  glucoside bond leading to formation of primary terminal radicals. When the temperature reached 273 K, conversions of primary terminal radicals ceased and a secondary radical was formed, with the free valence in the middle of the chain at carbon atom  $C_{(1)}$ . The secondary radical ion  $-O-\dot{C}_{(1)}-O-$  is stable in vacuum at below room temperatures. When heated to 370 K it is destroyed. Figures 4; references 13: 11 Russian (1 by Western author), 2 Western.  
[307-7813]

UDC 546.662/669'23'151

SYNTHESIS AND RADIOLOGICAL STUDY OF NEW IODOSELENIDES OF SOME RARE EARTH METALS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 29, No 5, May 84  
(manuscript received 20 May 83) pp 1128-1130

PROTSKAYA, I. V., TRIFONOV, V. A., POPOVKIN, B. A., NOVOSELOVA, A. V.,  
TROYANOV, S. I. and ASTAF'YEV, A. V., Moscow State University  
imeni M. V. Lomonosov

[Abstract] Iodoselenides of rare earth elements with LnSeI composition were obtained by prolonged annealing of elements in sealed quartz ampules evacuated up to 1Pa, sublimated and studied radiographically. Results of chemical analysis of crystals obtained, which show their composition conforms to the LnSeI formula, are shown in tabular form. LnSeI compounds obtained are hygroscopic, increase in weight by 2-10 percent upon placement in air at room temperature for 4 days while changing from a brick-orange color to become opaque. Use of the method of generation of the second harmonic of laser emission showed that the GdSeI, TbSeI, HoSeI, YbSeI and LuSeI structures are non-centrosymmetric. References 11: 3 Russian, 8 Western.  
[232-2791]

UDC 546.3-19'11

INFLUENCE OF PARTIAL REPLACEMENT OF NICKEL OR YTTRIUM BY OTHER METALS ON HYDROGEN ABSORPTION BY COMPOUND OF  $YNi_3$

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 29, No 5, May 84  
(manuscript received 10 Dec 82) pp 1136-1141

BURNASHEVA, V. V. and TARASOV, B. P., Institute of New Chemical Problems,  
USSR Academy of Sciences

[Abstract] Results of a study of absorption characteristics of  $YNi_{2,5}T_{0,5}$  (where T=Al, V, Cr, Mn, Fe, Co, Ni, Cu) and  $R_{0,1}Y_{0,9}Ni_3$  (where R=Ca, Sc, Ti, Y) are presented and discussed. Compositions of hydride phases, obtained by hydrogenation at constant pressure of 5 MPa, showed that the hydride phases contain 3.5-4.4 atoms of hydrogen. Partial replacement of nickel by Al, V, Cr, Mn, Fe, Co, Cu or of yttrium by Ca, Sc, Ti does not

increase the absorption capacity of  $YNi_3$  compounds but makes it possible to change the thermal stability of the forming hydride phases. Figures 4; references 17: 9 Russian, 8 Western.  
[232-2791]

UDC (546.821:546.831):542.938:546.175-323-145.2

INTERACTION OF TITANIUM AND ZIRCONIUM DURING HYDROLYSIS IN NITRATE SOLUTIONS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 29, No 5, May 84  
(manuscript received 7 Dec 82) pp 1164-1167

GUROV, A. A., SINEGRIBOVA, O. A. and YAGODIN, G. A., Moscow Chemical Engineering Institute imeni D. I. Mendeleev

[Abstract] Various aspects of interaction of zirconium and titanium in nitrate solutions are described and discussed. Stabilization of nitrate solutions of titanium by zirconium provides highly concentrated nitrate solutions of titanium with low acidity which remain stable for 1.5-2 months. Increase of zirconium concentration in such solutions increases their stabilization. Stabilization results from interaction of hydrolyzed compounds of zirconium and titanium. Precipitates settling out of mixed zirconium-titanium nitrate solutions as a result of their prolonged holding represent basically their own mass of hydrated polymerized titanium dioxide. Figures 2; references 11 (Russian).  
[232-2791]

UDC 66.094.3

GAS PHASE OXIDATION KINETICS OF CARBON FIBER

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 12 Feb 82) pp 1077-1083

KOBETS, L. P., KUZNETSOVA, M. A., NIKITENKO, Zh. T. and POLYAKOVA, N. V.

[Abstract] Activated surfaces of carbon fibers obtained by liquid or gas-phase processes increase their adhesion to the polymer binder along with increasing their strength. The goal of this study was to determine the kinetics of oxidation of carbon fiber by means of hot air, to analyze the mechanism of the chemical process and to refine the relationship between the properties of the filler surface and the strength of reinforced plastics. It was shown that in the hot air oxidation process of carbon fiber at  $700 \pm 150^\circ\text{C}$ , there occurs a degree of mass loss and the characteristics of mass transfer in the reaction zone is changed. The degassing of the fiber and the

relative concentration of oxygenated components reach the lowest values, while microporosity, specific surface and energy of activation--the highest. The study fiber had micropores with radii of about 25 Å in the peripheral layer, while in the internal layer these radii reached 150 Å. A linear correlation was observed between the total porosity accessible to methanol molecules and the strength of the epoxide made from it. Figures 3; references 6 (Russian).  
[303-7813]

ION EXCHANGE PHENOMENA

UDC 661.183

STUDY OF RATE OF MOVEMENT OF WATER IN ION-EXCHANGE COLUMNS

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 3, May-Jun 84  
(manuscript received 5 Feb 84) pp 25-27

VERENKO, V. D., ANIKINA, N. A., NOVAK, A. G., FROLOVA, Ye. I. and NOVOSAD, G. Ye.,  
Kiev Food Institute

[Abstract] A study was made of the rate of movement of water in a conventional cylindrical ion-exchange column and in an experimental tear-drop shaped column. Data were obtained using KU-2 and KU-2X8 ionites in  $\text{Na}^+$ ,  $\text{H}^+$  and  $\text{NH}_4^+$  forms under static (stationary bed) and dynamic (fluidized) conditions. The results show that changing the profile of the column causes changes in the flow characteristics of water through the ionite. Also, pressure is not in linear relation to height in the cylindrical column, but varies depending on the grade and form of ionite used. Changing the profile also caused changes in pressure gradient in the ionite layer. Figures 6; references 8 (Russian).  
[231-12765]

X-RAY STRUCTURAL ANALYSIS OF TRIS(ETHYLPHENYLAMIDO) PHOSPHAZOHYDRIDE  
(EtPhN)<sub>3</sub>P=NH AND NATURE OF PHOSPHOROUS-NITROGEN BOND

Kiev TEORETICHESKAYA I EKSPERIMENTAL'NAYA KHIMIYA in Russian Vol 20, No 3,  
May-Jun 84 (manuscript received 24 Nov 83) pp 328-336

ANTIPIN, M. Yu., STRUCHKOV, Yu. T. and YEGOROV, Yu. P., Institute of  
Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences,  
Moscow; Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev

[Abstract] The length  $r_{PN}$  of the phosphorous-nitrogen bond in phosphazo compounds decreases with the increase of electronegative groups on the P atom, but increases with substitution of groups on the N atom. A general relationship between the bond length and the force constant  $K_{PN}$  has not been established due to a paucity of data on these compounds. At 153 K, the basic cell of the investigated phosphazohydride was determined to be monoclinic and the N-P bond to be 1.552Å. Tables of atom coordinates and bond lengths indicate approximately equal P-N bond lengths and angles for the other three N atoms. Comparisons with published data on other phosphazo compounds allows calculation of an empirical formula  $K_{PN} = 2.70 (r_{PN} - 0.936)^{-3}$ . Figures 2; references 32: 15 Russian, 17 Western.  
[321-12672]

ORGANOMETALLIC COMPOUNDS

UDC 541.49+542.924

THERMAL BEHAVIOR OF COPPER, NICKEL AND COBALT FORMATES IN AMMONIA ATMOSPHERE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 29, No 5, May 84  
(manuscript received 27 Dec 82) pp 1214-1216

LAZERKO, G. A., TORKEYLO, Ye. M. and ZARETSKIY, M. V., Belorussian State  
University imeni V. I. Lenin

[Abstract] A search for new methods of reducing temperatures of dissociation of copper, nickel and cobalt formates without changing the composition of solid products of reaction involved a study of their behavior in an ammonia atmosphere in a wide range of temperatures (-20 to 300°C) by thermogravimetric, gravimetric and differential thermal methods combined with X-ray analysis. At -20 to 60°C, the formates interact with gaseous ammonia, forming aminocomplexes of various composition, depending upon the nature of the cation and the temperature. At 125-230°C, formates are decomposed up to metals with temperature being reduced by about 50° in an ammonia atmosphere. Data obtained indicate methods of reducing temperature of decomposition of formates which methods can be used for practical purposes. Figures 3; references 6 (Russian).  
[232-2791]

ORGANOPHOSPHORUS COMPOUNDS

UDC 547.241+547.26'118

SYNTHESIS OF TETRAETHYLDIAMIDOPHOSPHONYLETHANAL

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNLOGIYA in Russian Vol 27, No 4, Apr 84 (manuscript received 11 Jun 82)  
pp 487-488

PAVLOV, V. A., SOKOLOV, M. P., MOSKVA, V. V. and ZYKOVA, T. V.,  
Department of Organic Chemistry, Kazan Chemical Technology Institute  
imeni S. M. Kirov

[Abstract] Tetraethyldiamidophosphonylethanal was synthesized by reacting the tetraethyldiamide of methylphosphonic acid with butyllithium, followed by ethylformate and subsequent hydrolysis using 1% hydrochloric acid. Intermediates and products were monitored by IR and  $^1\text{H}$ - or  $^{31}\text{P}$ -NMR. The product is in equilibrium between enol and aldehyde forms, with the ethylene protons in the trans configuration. On dilution with chloroform to 0.05 M the IR indicated a transition from the enol to the aldehyde form. The aldehyde was reacted with diethylamine to give the corresponding enamine.

References 4 (Russian).

[276-12126]

UDC 592.91:547.1'118

STRUCTURE OF PRODUCTS OF ACYLATION AND PHOSPHORYLATION OF DIMETHYL-2-OXOPROPYL PHOSPHONATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 27 May 83) pp 1016-1020

SAKHIBULLINA, V. G., POLEZHAYEVA, N. A. and ARBUZOV, B. A., Scientific-  
Research, Chemical Institute imeni A. M. Butlerov; Kazan State University  
imeni V. I. Ul'yanov-Lenin

[Abstract] Metal derivatives of dimethyl-2-oxopropyl phosphonate can be acylated with carboxylic acid halides such as acetyl chloride, methyl chloroformate, benzoyl chloride and p-nitrobenzoyl chloride to form

O-substituted products of Z-configuration. Phosphorylation of sodium and potassium salts of dimethyl-2-oxopropyl phosphonate with cyclic acid chlorides of triple-coordinated phosphorus also takes place at the oxygen atom to form E- and Z-isomers. References 21: 13 Russian, 8 Western.  
[296-12765]

UDC 547.26'118

#### REACTIVITY OF CYCLOPHOSPHOROUS ACIDS IN ELECTROPHILIC ADDITION REACTIONS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 7 Apr 83) pp 1020-1030

OVCHINNIKOV, V. V., CHEREZOV, S. V., CHERKASOV, R. A. and PUDOVNIK, A. N.,  
Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] Cyclophosphorous acids are shown to be capable of electrophilic addition without catalysts to systems having a nucleophilic double bond by the Markovnikov rule. Products having phosphite structure were isolated and identified from reactions of pyrocatechin- and salicylphosphorous acids with styrene. This indicates that it is possible for the latter to react in the tautomeric phosphite form with the P<sup>III</sup> atom and demonstrates their high acidity as compared to other cyclophosphites. It is also shown that regio-isomers and skeletal isomerization products may form during the reaction of cyclophosphorous acids with beta-alkoxystyrene and anetol. References 29: 23 Russian, 6 Western.  
[296-12765]

UDC 547.341

#### REACTIVITY OF HYPOPHOSPHITES, PART 7: SYNTHESIS OF 1,2-ALKADIENEPHOSPHONOUS ACIDS AND THEIR DERIVATIVES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 3 Jun 83) pp 1031-1037

BELAKHOV, V. V., YUDELEVICH, V. I., KOMAROV, Ye. V., IONIN, B. I. and PETROV, A. A., All-Union Scientific-Research Technologic Institute of Antibiotics and Enzymes for Medicinal Use, Leningrad; Leningrad Technologic Institute imeni Lensovet

[Abstract] Several 1,2-alkadienephosphonous acids and their derivatives were synthesized by a previously discovered hydrophosphorylated acetylene-allene rearrangement. Arylammonium salts of 1,2-alkadienephosphonous acids were found to have low antifungal activity in comparison to such known antifungal compounds as polyenic antibiotics and organophosphorus chemotherapeutic agents. The minimal suppressant concentration of the above arylammonium

salts was 12.5-100 mg/ml, depending on the species of fungal microorganism. Figures 2; references 10: 9 Russian, 1 Western.  
[296-12765]

UDC 547.26'118

REACTIONS OF DIARYLISOCYANATOPHOSPHITES WITH C-ACETYL- AND C-ETHOXYCARBONYL-N-ARYLNITRILE IMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 6 Jun 83) pp 1037-1041

PANEVIN, A. S., TRISHIN, Yu. G., GALISHEV, V. A., BATURIN, A. A.,  
CHISTOKLETOV, V. N. and PETROV, A. A., Leningrad Technologic Institute of  
the Cellulose-Paper Industry

[Abstract] Diarylisocyanatophosphites react with C-acetyl- and C-ethoxycarbonyl-N-arylnitrile imines as a 1,3-dipolar system to form 4,4-diaroxy-1-aryl-3-acetyl-(ethoxycarbonyl)-1,6-dihydro-6-oxo-4-phospha-1,2,5-tirazine manifesting a lower reactivity than diphenylphosphinic acid isocyanate.  
References 6 (Russian).  
[296-12765]

UDC 547.341

REACTION OF DIETHYL ESTER OF 1-PHENYL-2-BROMOETHENYLPHOSPHONOUS ACID WITH DERIVATIVES OF ALKYLIDENE- AND ARYLIDENEMALONIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 13 Jun 83) pp 1041-1045

MAYOROVA, Ye. D., PLATONOV, A. Yu. and CHISTOKLETOV, V. N., Leningrad Technologic Institute of the Cellulose-Paper Industry

[Abstract] Diethyl(1-phenyl-2-bromoethenyl)phosphonite reacts with derivatives of alkylidenemalonic acids by 3 + 2 = 5 addition. Intermediate cyclic ilides eliminate bromide anion to form functional substituted organophosphorus five-membered heterocyclics of the 1-oxophosphol-2-ene series.  
References 4: 3 Russian, 1 Western.  
[296-12765]

## SYNTHESIS AND STUDY OF DISSOCIATION OF GLYCINE-N-METHYLENEPHOSPHONIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 5 May 83) pp 1045-1048

BARUSUKOV, A. V., MATKOVSKAYA, T. A., YAROSHENKO, G. F., ALLAKHVERDOV, G. R.  
and DYATLOVA, N. M., All-Union Scientific-Research Institute of Chemical  
Reagents and Ultra-Pure Chemical Substances, Moscow

[Abstract] Glycine-N-methylenephosphonic acid was synthesized and identified by paramagnetic resonance spectra. Potentiometric titration was used to determine protonation constants for the acid at various temperatures. Thermodynamic functions for the formation of the acid in aqueous solutions were computed. The acid is useful as a complexon to recover metals. References 10: 6 Russian, 4 Western.  
[296-12765]

## SYNTHESIS AND STRUCTURE OF 3-ARYL-2-(p-FLUOROPHENYL)AMINO-1,3,2-OXAZAPHOSPHOLANES AND PHOSPHORINANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 13 Apr 83) pp 1049-1051

MILLIARESÌ, Ye. Ye., KHARSHAN, M. A., PREOBRAZHENSKAYA, E. A. and  
NIFANT'YEV, E. Ye., Moscow State Pedagogic Institute imeni V. I. Lenin

[Abstract] Previously unknown 3-aryl-2-(4-fluorophenylamino)-1,3,2-oxazaphospholanes and phosphorinanes were prepared. NMR-spectra were used to show that in a number of the synthesized oxazaphospholanes, the oxazaphospholane ring manifests acceptor properties, but the oxazaphosphorinane ring does not. Transfer of electronic influence from the 3-aryl group to the fluorine atom in 2-(p-fluorophenylamino) group was not observed. The work is a continuation of an effort to detect electron effects through the N-P-N bond. References 7: 4 Russian, 3 Western.  
[296-12765]

PHOSPHORUS-CONTAINING ENAMINES, PART 2: PHOSPHORYLATION OF N-VINYL-SUBSTITUTED TERTIARY AMIDES, LACTAMS AND CYCLIC IMIDES WITH PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 23 Feb 83) pp 1051-1060

ROZINOV, V. G., IZHBOLDINA, L. P., PENSIONEROVA, G. A., DONSKIKH, V. I., MALYSHEVA, S. F., GLUKHIKH, N. G., SERGIYENKO, L. M. and RATOVSKIY, G. V.,  
Institute of Petro- and Coal Chemical Synthesis, Irkutsk State University  
imeni A. A. Zhdanov

[Abstract] Phosphorus-containing enamines and enamides have biological properties and are useful as intermediates in synthesis. Tertiary N-vinyl-amides, N-vinyl lactams and cyclic N-vinyl imides react with  $PCl_5$  in a manner similar to that of alkenes to form unsaturated organophosphorus E-isomeric compounds with carbonyl group remaining intact. Phosphorylation products of hexachlorophosphates of 2-(N-amido)ethene-1-trichlorophosphonium, having alkyl or benzyl substituents at the nitrogen atom, rapidly react further to include the carbonyl group. Aryl substituents at the nitrogen atom suppress these reactions. Acid dichlorides of 2-(N-amido)-ethene-1-phosphonic acid were isolated and identified. References 12: 11 Russian, 1 Western.  
[296-12765]

UDC 539.193:547.242

STUDY OF NITROSYL ETHYL XANTHOGENATE COMPOUNDS OF Cr(I) WITH P(III)-CONTAINING ORGANIC LIGANDS BY EPR

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 7 Jun 83) pp 1069-1073

CHUYKOVA, A. I., IVANTSOV, L. Ye., AKHMETOV, N. S., KONDRAT'YEVA, O. I.  
and OVCHINNIKOV, I. V.

[Abstract] In a study of complex formation of nitrosyl ethyl xanthogenates of chromium with organic derivatives of trivalent phosphorus by electron paramagnetic spectra, three types of complexes with coordination of one and two tertiary phosphine molecules were detected. Monomeric complexes with two organophosphorus ligands appeared as cis- and trans-isomers. A ligand substitution scheme is proposed for the reaction of nitrosyl sulfur complexes of chromium with organic derivatives of trivalent phosphorus. The change in EPR spectra of the complexes was found to be a linear function of the change in electronegative properties of the ligand. Figures 4; references 7 (Russian).  
[296-12765]

## KINETICS OF REACTION OF PHENOXYMETHYLPHOSPHONIC ACID WITH GLYCIDYLMETHACRYLATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 18 Apr 83) pp 1156-1160

KHARDIN, A. K., TUZHIKOV, O. I., KHOKHLOVA, T. V., V'YUNOV, K. A. and PAVLICHENKO, L. V., Leningrad Technological Institute imeni Lensovet; Volgograd Polytechnical Institute

[Abstract] A study was made of the quantitative regularities in the reaction of alkylphosphonic acids with asymmetric alpha-oxides using phenoxymethylphosphonic acid and glycidylmethacrylate as an example. In this reaction, phenoxymethylphosphonic acid opens up the alpha-oxide ring in accordance with Krasuskiy's rule. The reaction proceeds according to an Ad 2 mechanism, including intermediate formation of an acid-oxide complex. References 10: 7 Russian, 3 Western.

[296-12765]

UDC 564.185+547.230

## REACTIONS OF 1-AMINOADAMANTANE, 1-AMINO METHYLADAMANTANE AND 2-AMINO-ADAMANTANE WITH PHOSPHORUS PENTACHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 5, May 84  
(manuscript received 26 Jul 83) pp 1201-1202

YURCHENKO, R. I., KLEPA, T. I. and KIRSANOV, A. V., Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev

[Abstract] Monomeric trichlorophosphazo compounds are formed when 1-amino- or 2-amino-adamantane reacts with phosphorus pentachloride in boiling chlorobenzene. Despite the presence of hydrogen atoms in the alpha and beta positions in 1-aminomethyladamantane, chlorination did not take place under the experimental conditions. The phosphazo compounds are readily hydrolysed with air moisture to form amidodichlorophosphates in quantitative yield. References 4: 3 Russian, 1 Western.

[296-12765]

## N-1-(2-DIALKOXYPHOSPHONYL)VINYL-3-OXYTRIAZOLES

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 5, May 84  
(manuscript received 8 Jul 83) pp 1202-1204

Liorber, B. G., Khamatova, Z. M., Urmancheyeva, G. V., Pavlov, V. A. and  
Zykova, T. V., Kazan Chemical-Technologic Institute imeni S. M. Kirov

[Abstract] To investigate the reactivity of semicarbazones of phosphorylated acetaldehydes, a study was made of their reaction with ortho-formic acid ester. While it was expected that diazoles or triazoles would form owing to the presence of various reaction sites, only N-1-(2-dialkoxyphosphonyl)-vinyl-3-oxytriazole was detected in the NMR and IR spectra. References 3: 2 Russian, 1 Western.  
[296-12765]

UDC 547.26'118

1,3,4-BICYCLOPHOSPHITE OF 2-DESOXY- $\alpha$ -D-RIBOPYRANOSE

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 5, May 84  
(manuscript received 30 Sep 83) pp 1206-1207

Nifant'yev, E. Ye., Koroteyev, M. P., Zharkov, A. A. and Lutsenko, A. I.

[Abstract] 1,3,4-Bicyclopophosphite of 2-desoxy- $\alpha$ -D-ribopyranose was synthesized using the unprotected natural sugar 2-desoxyribopyranose, with the phosphocyclic group being formed from alcoholic and glycosidic hydroxyl groups. The structure of the compound was confirmed with NMR spectra. References 2 (Russian).  
[296-12765]

UDC 547.26'118

## 1,3,2-DIAZAPHOSPHOCYCLOALKANES

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 54, No 5, May 84  
(manuscript received 4 Aug 83) pp 1207-1208

Nifant'yev, E. Ye., Zavalishina, A. I., Smirnova, Ye. I. and Kofanova, N. V.,  
Moscow State Pedagogic Institute imeni V. I. Lenin

[Abstract] Previously unknown 7-9-membered 2-alkoxy 1,3,2-diazaphosphocycloalkanes were synthesized by re-amination of corresponding diamides with ethylphosphorous acid tetraalkyldiamides. A parallel study of phosphorylation of the diamides with Menshutkin's acid chlorides gave poor results.  
[296-12765]

## NEW PHOSPHONE CONTAINING COMPLEXONS BASED ON 1,3-DIAMINOPROPANOL AND INVESTIGATION OF ITS ACIDIC DISSOCIATION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 26 Apr 83) pp 518-525

SAMAKAYEV, R. Kh., DYATLOVA, N. M., YAROSHENKO, G. F., ZHADANOV, B. V.,  
MATKOVSKAYA, T. A. and POLYAKOVA, I. A., All-Union Scientific Research  
Institute of Chemical Reagents and Ultrapure Compounds (IRYeA), Moscow

[Abstract] Synthesis of a new phosphone containing complexons from the 1,3-diaminopropanol series was reported. This new complexon contained aminomethylenephosphonic groups along with a hydroxyl: 2-hydroxypropylene-1,3-diamino-N,N'-N',N'-tetramethylenephosphonic acid [DPP(H<sub>8</sub>L)]. It was obtained by the reaction of 1,3-diaminopropan-2-ol with formaldehyde and PCl<sub>3</sub>. Dissociation constants were determined for this compound along with IR spectra in water solution and in the pH range of 1-14. A possible mechanism for acid-base dissociation of DPP was proposed. The neutral form of DPP(H<sub>8</sub>L) dissociates without addition of base to the zwitter ion type H<sub>6</sub>L<sup>-2</sup>; then upon addition of alkali the four PO<sub>3</sub>H groups dissociate. The betaine protons split at the very end. Figures 2; references 17: 11 Russian (2 by Western authors), 6 Western.  
[313-7813]

UDC 547.241

## PHOSPHOALKYLATED 2-AMINOTHAZOLES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 6 Apr 83) pp 525-530

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

[Abstract] Investigating various phosphoalkylated 2-aminotriazoles (2AT) it was shown that benzaldehyde diacetal reacted in alcohol with diethylphosphite and 2AT in presence of BF<sub>3</sub> etherate yielding O-ethyl-α-(2-aminothiazolyl)-benzylphosphonic acid. Condensation of diethylphosphite, 2AT and a four-fold excess of orthoether gave N,N'-bis(2-thiazolyl)-formamidine. Addition of dialkyl phosphites to corresponding Schiff bases in alcohol, catalyzed by sodium alkoxide gave low yields of O,0-dialkyl-α-(2-aminothiazolyl)-benzylphosphonates. Low yields were explained by instability of the Schiff bases. Using the NMR <sup>1</sup>H methodology, it was shown that introduction of a nitrogroup into the para position of a phenyl ring of thiazolylaminobenzylphosphonates leads to a partial deuteration of the proton at the α-carbon atom and at the S-CH fragment of the thiazolyl cyclo. Figure 1; references 5: 3 Russian, 2 Western.  
[313-7813]

## NITRATION OF 1-OXO-1-PHENYL-2- AND 3-PHOSPHOLENES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 14 Mar 83) pp 530-535

YEFREMOVA, I. Ye., BERESTOVITSKAYA, V. M. and BERKOVA, G. A., Leningrad State Pedagogic Institute imeni A. I. Gertsen

[Abstract] Nitration of 1-oxo-1-phenyl-3-methyl-2-phospholene (I) and 1-oxo-1-phenyl-3,4-dimethyl-3-phospholene (II) was studied in relationship to the nature of the substituent on the phosphorus atom and the position of the double bond in the heterocycle. It was shown that nitration of II occurs at 16-18°C in diethyl ether and excess nitrogen tetroxide, yielding 1-oxo-1-phenyl-3,4-dimethyl-3,4-dinitrophospholone and an unstable nitrate of 1-oxo-1-phenyl-3,4-dimethyl-3-hydroxy-4-nitrophospholone. In contrast to II, I cannot be nitrated with nitrogen tetroxide. Thus it was shown that this nitration reaction depends on the position of the double bond in the ring. Figures 2; references 11: 9 Russian (3 by Western authors), 2 Western. [313-7813]

UDC 547.1'118

## REACTION OF PHOSPHINOUS ACID THIOESTERS WITH BENZALDEHYDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 9 Mar 83) pp 535-540

AL'FONSOV, V. A., NIZAMOV, I. S., BATYYEVA, E. S. and PUDOVNIK, A. N.,  
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan  
Branch, USSR Academy of Sciences

[Abstract] Oxygen esters of the P<sup>III</sup> acids react with aldehydes and ketones in presence of trimethylchlorosilane to yield  $\alpha$ -siloxyphosphonate derivatives. When P<sup>III</sup> thioesters were used, the results were different. S-ethyl-di-phenylthiophosphinite (I) reacted with benzaldehyde in presence of equimolar quantity of trimethylchlorosilane yielding  $\alpha$ -ethylthiobenzyl-diphenylphosphine sulfide, diphenylchlorophosphine and hexamethyldisiloxane. Several models were tried unsuccessfully in an attempt to find the mechanism of the formation of these final products. Only when I was reacted with benzaldehyde and trimethylsiloxychlorosilane, the product was  $\alpha$ -trimethylsiloxybenzyl-diphenylphosphine sulfide. S-ethylphenylthiophosphinite reacted analogously with benzaldehyde. Evidently, a coordination of silicon atom from the halosilane takes place with the carbonyl oxygen prior to the nucleophilic attack of the phosphorus atom on the carbonyl carbon atom. References 7: 5 Russian (1 by Western author), 2 Western. [313-7813]

## REACTIONS OF TRIVALENT PHOSPHORUS ACID THIOESTERS WITH CHLOROACETIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 6 Apr 83) pp 540-545

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

[Abstract] The reaction of ethylphenylthiophosphinous acid ethyl ester with trichloroacetic acid yielded ethylphenylthioethylphosphinate, ethylphenylchlorophosphinate, thioethyl ester of dichloroacetic acid and dichloroacetyl chloride. This appeared to be a general reaction scheme for a series of mono-, di- and trithioesters of trivalent phosphorus acids. Reaction of thiophosphinites with trichloroacetic acid used at a 1:1 ratio leads to the formation of corresponding chlorophosphinate, thiophosphinate, thioether of dichloroacetic acid and dichloroacetyl chloride. Chlorophosphines react with trichloroacetic acid yielding chlorophosphinate and dichloroacetyl chloride. The reaction of trivalent phosphorus acid thioesters with chloroacetic acids occurs by replacement of thioalkyl group by a chlorine atom forming acid chlorides of the corresponding P(III) acids, thioesters of carboxylic acids and oxidation products of the starting materials. Figure 1; references 19: 11 Russian (2 by Western authors), 8 Western. [313-7813]

## SYNTHESIS BASED ON VINYLHYDROXYSPIROPHOSPHORANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 9 Mar 83) pp 552-556

KUDRYAVTSEVA, T. N., KARLSTEDT, N. B., PROSKURNINA, M. V., FROLOVSKIY, V. A.  
and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Reaction of alkenylhydroxyspirophosphoranes with electrophilic reagents can go in the 1-6 or 1-2 direction. The first case is exemplified by reaction of 5-vinyloxy-1,4,6,9-tetraoxa-2,3,7,8-tetramethyl-5-phosphospiro[4,4]-nonane (I) with bromine to yield 2-(1',2'-dimethyl-2'-bromethoxy)-2-oxo-4,5-dimethyl-1,3,2-dioxaphospholone; the second--by reaction of I with N-bromosuccinimide to yield 5-(2'-bromo-1'-succinimidoethoxy)-1,4,6,9-tetraoxa-2,3,7,8-tetramethyl-5-phosphospiro[4,4]nonane. A series of 5-alkoxy-substituted tetraoxaspirophosphoranes was synthesized by reacting I with alcohols and glycols. References 4: 1 Russian, 3 Western. [313-7813]

## KINETICS OF DIPHENYLPHOSPHINIC ACID HYDRAZIDE REACTION WITH ARYLISOCYANATES IN BENZENE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 12 May 83) pp 570-574

YANCHUK, N. I. and BODNARUK, M. I., Ternopol State Pedagogic Institute  
imeni Ya. A. Galan

[Abstract] Reactions of diphenylphosphinic acid hydrazide with arylisocyanates in benzene were studied at different temperatures attempting to elaborate general kinetic patterns for these reactions and to evaluate structural changes in the phenylisocyanate molecule on its reactivity. The kinetics of these reactions followed the equation of irreversible reactions of the second order. The effect of substituents of different electronic nature at the arylisocyanates on their reactivity could be described by Hammett's equation. Study of the kinetics of these reactions indicated that they occur by forming cyclic complexes in the transition state resulting from the hydrogen bond formation between the oxygen or nitrogen atom of the isocyanate fragment and the hydrogen of the hydrazide iminogroup. The same mechanism held for the reactions of diphenylphosphinic acid hydrazides with aromatic isocyanates during the entire temperature range studied and for all members of the study series. References 15: 11 Russian (1 by Western author), 4 Western.  
[313-7813]

## ENTHALPIES OF MIXING OF ARSENIC TRICHLORIDE WITH SOME UNSATURATED HYDROCARBONS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 54, No 3, Mar 84  
(manuscript received 13 Jun 83) pp 574-577

TSVETKOV, V. G., KRYLOV, V. A. and NIKOLAYEV, A. Ye., Scientific Research Institute of Chemistry, Gorkiy State University imeni N. I. Lobachevskiy; Institute of Chemistry, USSR Academy of Sciences, Gorkiy

[Abstract] To characterize relative capability of unsaturated hydrocarbons to form  $\pi$ -complexes, enthalpies of their mixing with  $AsCl_3$  were determined calorimetrically. With cyclohexane, the  $AsCl_3$  enthalpy of mixing was positive in the entire range of concentrations. On the basis of the determined enthalpies of mixing, the following relative series was established for their ability to form  $\pi$ -complexes with  $AsCl_3$ : cyclohexane < heptene < cyclooctatetraene < cyclohexene < phenylacetylene < benzene < 1,1-diphenylethylene <  $\alpha$ -methylstyrene < 8-methylnaphthalene < 1,3-cyclohexadiene < toluene < mesitylene <  $\alpha$ -methylnaphthalene < 2,3-dimethyl-1,3-butadiene < 1,5-cyclooctadiene. On the basis of calorimetric data it was concluded that  $AsCl_3$  does not form stable coordination compounds with liquid  $SbCl_5$ ,  $TiCl_4$ ,  $VOCl_3$ ,  $S_2Cl_2$  or  $SOCl_2$ . Figure 1; references 18: 13 Russian (3 by Western authors), 5 Western.  
[313-7813]

PESTICIDES

UDC 66.012.2/.7:66.001.57.001.6"313"

MODELS FOR PREDICTING EXPENDITURES FOR EXPERIMENTAL-DESIGN OPERATIONS DURING DEVELOPMENT OF CHEMICAL MEANS OF PLANT PROTECTION

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 84 pp 376-378

BORTSOV, A. N., ZATSEPIN, V. M. and PROMONENKOV, V. K.

[Abstract] Mathematical models were constructed for predicting expenditures on experimental-design operations for the production of new chemical means of plant protection. The models were constructed by analysis of existing technical and economic data on experimental-design operations. The analysis showed that the available statistical information is not adequate to pinpoint the effects of certain factors on expenditures for experimental operations. For example, the effect of the capacity of an experimental installation can be figured only through its raw material expenditures. Improved economic and technical information on experimental-design operations will make it possible to make more accurate predictions. References 7: 6 Russian, 1 Western.  
[317-12765]

## PETROLEUM PROCESSING TECHNOLOGY

### CONSTRUCTION DELAYS CAUSE LOSSES

Moscow SOVETSKAYA ROSSIYA in Russian 3 Aug 84 p 3

[Article by special correspondents V. Avdevich and Yu. Levitskiy:  
"'Disproportion.' Torch's Warning Light"]

[Text] Irkutsk-Angarsk-Zima--A unique plant intended to produce 300,000 tons of ethylene per year was put into operation a year and a half ago at the "Angarsknefteorgsintez" Production Association of the Ministry of the Petrochemical Industry. However, this extremely large-scale complex has been working at half capacity for all this time, since the recipient, the Zima chemical plant of the Ministry of the Chemical Industry, proved unprepared to receive the quantity of the product established by the plan. Our newspaper discussed this disproportion and its consequences in the article "Disproportion" (1 March 84). What has changed since then? What measures have been taken to eliminate the discord between related industries, which is so harmful to the economy?

Letters received by the editors from L. I. Osipenko, First Deputy Minister of the Chemical Industry, and L. A. Bychkov, USSR Deputy Minister of the Oil Refining and Petrochemical Industry, unfortunately had no answers to these questions. From the first page to the last, they presented in detail what had already been reported in the article. In repeating the suggestions made by the newspaper, for example, Deputy Minister L. A. Bychkov writes:

"...For eliminating the disproportion which has developed in the production and consumption of ethylene, it is necessary to speed up construction of the second phase of the Zima chemical plant." The idea is clear: since the construction of new facilities is entrusted not to "our" ministry but to the Ministry of the Chemical Industry, problems involved with the construction of new facilities must be assigned to just that related department. We read the answer of L. I. Osipenko, and here is what we find: "The second phase of the Zima chemical plant was designed to go into operation in 1987. However, due to the inadequate capacity of construction and assembly organizations, the start-up of new plants will be accomplished later." When? One can only guess.

Thus, two ministries have avoided answering the newspaper's questions. A letter written by USSR Gosplan member M. G. Vasil'yev also failed to clarify the situation: "New industrial plants of the second phase are scheduled to go into operation at the Zima chemical plant during the 12th Five-Year Plan...."

However, a five-year plan, after all, has a beginning, a middle and an end. When specifically will all work on the planned facilities be completed? Once again the question has no answer.

Such difuseness and uncertainty necessarily point to the idea that even at the ministries and at the USSR Gosplan, as before, there is no concrete program of action.

...The enormous area set aside for construction of the buildings where vinyl chloride is to be produced with Angarsk ethylene remains empty.

"When will operations begin?" we asked G. T. Babayev, Director of the Eastern Siberian Construction Administration, created based on the "Zimakhimstroy" trust, which has been abolished.

"Next year," he answers. "We are scheduled to get a million rubles."

Is that all? But 126 million rubles is to be invested in building the vinyl chloride plant, after all. In that case, how many years is this construction project going to last?

Grigoriy Timofeyevich shrugs, as if to say that the situation surprises him, too. And then, as if wanting to digress from an unpleasant subject, he adds:

"The newspaper article helped us to strengthen the administration's construction industry base. For example, all the bridge cranes which were impossible to get from suppliers before are now in place. As a result, we are already completing development of a reinforced concrete products plant and increasing its productivity this year...."

Nevertheless, why is the annual contribution of builders to the construction of the second phase of the vinyl chloride plant so small? It turns out that the problem lies in the inadequate capacities of the administration. Zima chemical plant Deputy Director L. Ye. Selivanov pointed out to us the "distribution" of construction and assembly operations by years. According to his calculations, not a million rubles, as the contractors propose, but ten times that amount must be assimilated next year on construction of the vinyl chloride buildings. In order to ensure start-up of all the production capacity of the second phase of the plant during the 12th Five-Year Plan, it is necessary, in increasing annual volume, to bring the level up to 89 million rubles.

Is this workable? No. In any case, that is the opinion of construction administration director G. T. Babayev. He assured us that he could raise the "ceiling" for assimilation of capital only up to 50 million rubles. The administration collective lacks both physical forces and material resources for more. Moreover, the situation is complicated by the fact that complete planning and budget documentation still has not reached the Zima chemical combine. Thus, one can assume with high probability that with the present capacities of the builders, not all the production complexes of

the second phase of the enterprise will be turned over for start-up during the 12th Five-Year Plan. What then is the basis for the confidence of USSR Gosplan member M. G. Vasil'yev?

Meanwhile, the disproportion which has developed at petrochemical enterprises of the Irkutsk Oblast brings the state more and more losses every day. The article "Disproportion" cited the following calculation: "If the ethylene plant built at Angarsk operates with a half load as before, the annual losses to the national economy will amount to tens of millions of rubles." Ethylene burning in a torch, we recall, makes up the lion's share of these losses. There is really practically no place to use it. And it is impossible to stop production: the production of associated products of great importance to the economy of this country, including propylene, benzene, pyrocondensate, etc., would suffer. What are the losses up to now? In the last half year, the Zima chemical plant accepted from Angarsk ten thousand tons of ethylene less than it ordered. The surplus had to be put to use as fuel. The loss amounted to more than a million rubles.

How can these losses be eliminated? In the opinion of specialists, underground ethylene storage needs to be put into operation quickly at the Zima plant. According to plans of the Ministry of the Chemical Industry, this facility is to go into operation in the second quarter of this year. But what is the real situation?

"Unfortunately," reported L. I. Osipenko, First Deputy Minister of the Chemical Industry, "it could not be managed in the time allotted. The reason is clear: we are unable to get the pipeline hardware, especially valves which are to be placed on the ethylene supply line, from the suppliers."

When will operations on the facility be completed?

"I do not know."

Thus, a cloud of uncertainty continues to blanket the problem of disproportion. Who will help solve it? And when?

12742  
CSO: 1841/346

BRIEF

DRILLING IN URENGOY FIELD--Tyumen Oblast (TASS)--A new stage has begun in the study of mineral resources of the Urengoy condensed-gas field in the polar tundra. An exploratory well has been drilled here with a planned depth of more than 5,000 meters. Prospectors for mineral resources have had a good picture of the field structure to a depth of 4,000 meters. The high pressure kept them from looking deeper. In order to overcome the pressure, it was necessary to develop special well construction procedures, to create special equipment and to train experimental personnel. Preparations for drilling an ultradeep eight-kilometer well have expanded here. [Text]  
[Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Aug 84 p 1] 12742

CSO: 1841/346

UDC: 665.753.4.001.41

MAXIMUM FILTERING TEMPERATURE OF DIESEL FUEL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 84  
pp 22-23

MITUSOVA, T. N., VERETENNIKOVA, T. N. and PRIBYTKOVA, N. M., All-Union  
Scientific Research Institute of Oil Refining

[Abstract] Data were accumulated using Soviet and foreign apparatus on  
turbidization, thickening and minimum filtering temperatures of Soviet  
diesel fuels. It is concluded that the minimum filtering temperature  
rather than the turbidization temperature should be included in the  
technical documentation supplied with fuels. Sources of fuels are tabulated.  
[277-6508]

UDC: 621.892:665.76

EFFECTIVENESS OF ANTIWEAR ADDITIVES IN OILS OF VARIOUS CHEMICAL COMPOSITIONS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 84 pp 23-24

ARSLANOV, M. G., BOL'SHAKOV, V. F., LASHKHI, V. L. and KOZHEKIN, A. V.

[Abstract] A study was made of the influence of the chemical composition  
of base oil on the effectiveness of synthetic oil additives intended to  
reduce friction. The most typical commercial antiwear additives were studied,  
including zinc dialkyldithiophosphate (DF-11), zinc diaryldithiophosphate  
(VNII NP-354) and barium diaryldithiophosphate (VNII NP-355), barium  
dialkyldithiophosphate (INKhP-21) and bis(alkylbenzylthio)ethane (ABES),  
as well as a promising additive, an oil-soluble compound of molybdenum  
(MSM). Temperature-viscosity, antiwear and antifricition properties were  
determined. MSM was found to be superior in anti-wear effect, followed  
by BS-11, VNII NP-354, INKhP-21, VNII NP-355 and ABES. The products in  
decreasing order of antifricition effect were MSM, DF-11, ABES, VNII NP-354,  
INKhP-21 and VNII NP-355. References 5 (Russian).  
[277-6508]

UDC: 665.61(470.4)

ULYANOVSK OBLAST PETROLEUM

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 84  
pp 28-30

LAZAREVA, I. S. and AKSENOVA, L. V., Department of Physics, All-Union  
Scientific Research Institute of Oil Refining

[Abstract] A number of petroleum-bearing areas have been found in Ulyanovsk Oblast in recent years. They have typical Volga-Urals oil and gas province geological cross sections. The oil deposits are in carbonaceous deposits of the Turmeyskiy and Bashkir stages and Verey level, or Terrigenous deposits of the Bobrikovskiy level. Tables are presented showing the physical and chemical properties of oil in the deposits, as well as the gasoline fractions and the fraction above 200°C. Calculation methods were used to determine that the petroleum of Ulyanovsk Oblast is favorable for production of bitumens.

[277-6508]

UDC: 665.765-404.035.6:532.133

SEPARATION OF OIL COMPONENTS WITH GOOD VISCOSITY-TEMPERATURE PROPERTIES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 84  
pp 30-32

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Research Institute of Oil Refining

[Abstract] The purpose of this article was to determine certain peculiarities of the viscosity-temperature properties of oils and demonstrate the possibility in principle of producing oils with unique viscosity-temperature characteristics and relatively low evaporation rates. The work was performed using the method of thermal diffusion separation, allowing hydrocarbons to be separated according to the type and form of their molecules. It is based on formation of a concentration gradient when a temperature gradient is present. Thermal diffusion separation allows the production of oils with low viscosity at -40°C, high viscosity index, low solidification point and relatively low evaporation rates. Figure 1; references 3: 2 Russian, 1 Western.

[277-6508]

DETERMINATION OF HEAT OF COMBUSTION OF JET FUELS BY CALCULATION METHOD

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 5, May 84  
pp 35-36

GORENKOV, A. F., LIFANOVA, T. A., KLYUYKO, I. G. and KUPREYEV, A. I.

[Abstract] Calculated values of heat of combustion of jet fuels produced according to All-Union State Standard 11065-75 sometimes differ significantly from experimental values, primarily because the empirical calculation equation was determined on the basis of results of testing of straight-run fuels with relatively low content of naphthenic and aromatic hydrocarbons. Use of the calculation method is further hindered by the fact that it requires experimental determination of the aniline point, which takes 70 minutes. This characteristic also is not satisfactory for determining the hydrocarbon composition of jet fuels and cannot be widely used for heat of combustion of a jet fuel are noted. An empirical equation is presented for calculation of the heat of combustion, based on the content of aromatic hydrocarbons, mean boiling point of the fuel and density of the fuel at 20°C. Calculation by this equation yields results more accurate than by using the old equation. [277-6508]

UDC 666.765-404.038.003(47+57)

MODERN TRENDS IN DEVELOPMENT OF LUBRICATING OIL ADDITIVE PRODUCTION IN USSR

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 16 Mar 81) pp 3-6

GORDASH, Yu. T. and BURLAKA, G. G., All-Union Scientific Research Institute for "PK neftekhimii" [Expansion uncertain: Increasing Petrochemical Quality?]

[Abstract] Improvements in domestic product efficiency has been accompanied by intensive development of production infrastructure and a growing need for durable, high-quality motor oil additives. In recent years the increase in use of lubricating oils in the USSR has dropped behind the growth in industrial petroleum production. Additive production has followed a similar trend, despite the increase in automobiles in the Soviet Union during the 9th and 10th five-year plans. The present article discusses Soviet efforts to develop detergent and dispersing agents that are more effective than alkyl-phenol sulfonate, alkylsalicylate and succinimide additives. A feature of the present state of additive development is quality improvement that permits creation of principally new lubricating oils, thus allowing reduction or elimination of imports of individual additives. While various technical and economic parameters have shown improvement, tasks remain such as increased production of highly alkylated additives, expanded product mix, improved supply of raw materials and development of new industrial oils

using the latest technology. Figures 3.  
[295-12131]

UDC 665.765-404.038.2

#### ELECTRON-MICROSCOPE STUDY OF HIGHLY ALKALINE SULFONATE ADDITIVES

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 18 Feb 81) pp 11-12

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Neftekhimii" [expansion uncertain: Increasing Petrochemical Quality]

[Abstract] High-alkaline sulfonate additives are colloidal dispersions of a carbonate and calcium hydroxide, stabilized in a hydrocarbon medium by alkylarylsulfonates of the same metal. The present article reports on study of the influence of production methods on the size of the particles formed. Additives were made with methanol or acetic acid promoters and various basic calcium compounds (methylate or hydroxide). The low fat content of these sulfonates significantly surpassed the quality of typical industrial additives with oily solutions. Size and stability parameters indicated that varying production methods had little effect on technical qualities, despite variations in physicochemical parameters. References 5 (Russian).  
[295-12131]

UDC 665.765-404.038

#### STUDY OF CONTROLLED ADDITIVE FEED ON MOTORLESS LABORATORY STANDS

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 24 Apr 81) pp 12-14

GORBENKO, S. I., KIRILLOVA, L. I., KHALYAVKA, Ye. P., KHAMIDOV, Sh. Kh.,  
MARCHENKO, A. I. and AL'TSHULER, M. A., All-Union Scientific Research  
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chemical Quality?]

[Abstract] A basic factor in useful life of motor oils for internal combustion engines is consumption of oil additives; recent research has shown the role of kinetic reactions and the possibility of chemical modeling of alkali reserves in motor oil on laboratory stands. The present article reports on additive wear and possible controlled additive feed in laboratory experiments, thus permitting lower and less wasteful initial additive amounts. Friction tests on ball bearing steel friction. Results indicated that equipment must be developed for more effective feed of additives before the value of controlled additive feed procedures can be successfully assessed. Figures 4; references 9 (Russian).  
[295-12131]

## CORRELATION ANALYSIS OF LABORATORY METHODS FOR EVALUATING ADDITIVE QUALITY IN MOTOR OILS

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 30 Jan 81) pp 20-22

KONOVICH, L. G., STAVTSEV, A. F. and CHERNYSHEV, I. A., All-Union Scientific Research Institute for "PK Neftekhimii" [expansion uncertain: Increasing Petrochemical Quality?]

[Abstract] Synthesis of motor oil additives require dependable laboratory methods for evaluating use properties. A key problem is deposits on hot engine parts, which is related to oil aging and formation of insoluble products. The present article reports on study of additive quality using laboratory methods to evaluate stability of induction-period precipitate formation, thermal-oxidation stability, dispersion, and precipitation and oil thickening at 200°C. Results showed a low correlation between additive parameters and lacquer formation on hot engine parts at 270°C using a Kyuregyan device. Correlation analysis of quality parameters of additive solutions of various concentration showed that correlation coefficients were distributed in a uniform manner for various additive concentrations. Further study of the quality of individual additives should be made using one-cylinder engines. References 4 (Russian).  
[295-12131]

UDC 665.61.033.25:665.652.8

## PRODUCING LUBRICATING COOLING-LIQUIDS USING NS-480 SODIUM SULFONATE

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 16 Mar 81) pp 29-32

KACHMAR, B. V., MATSELYUKH, V. S., MIKITENKO, V. S., KATRUSHENKOVA, M. S. and YATSKIY, O. K., All-Union Scientific Research Institute for "PK Neftekhimii" [expansion uncertain: Increasing Petrochemical Quality?]

[Abstract] Many lubricating-cooling technological substances containing sodium sulfonate use imported chemicals. The present article reports on development of a domestic Soviet sodium sulfonate "Ukrinol-1" and variant "Ukrinol-1M". The key properties of emulsion and anticorrosion characteristics were assessed. Results indicated that the variant "Ukrinol-1M" surpassed the earlier Soviet additive NS-480, which in turn contributed to the development of the new sodium sulfonate. The domestic sulfonates were judged to be suitable for replacing the imported "Sinacto-406".  
[295-12131]

EFFECT OF SULFUR ON ACTIVITY OF ALUMINUM-RHENIUM CATALYSTS IN STEAM  
CONVERSION OF ISOBUTANE

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 18 Feb 83) pp 179-184

ROZHDESTVENSKIY, V. P., RYASHENTSEVA, M. A., POLYANSKIY, A. B. and  
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University imeni N. G. Chernyshevskiy; Institute of Organic Chemistry  
imeni N. D. Zelinskiy, USSR Academy of Sciences

[Abstract] Experimental results were reported of the study of aluminum-rhenium catalysts in atmospheric pressure steam conversion of isobutane in presence of carbon sulfide. The reaction conditions consisted of 3% Re/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst, temperature of 700°C, 4 and 30 mg/m<sup>3</sup> of sulfur content and a passage rate of 1500 hr<sup>-1</sup>. Without the sulfur, the conversion rate was 95.7%; addition of 4 and 30 mg/m<sup>3</sup> of sulfur reduced the conversion rate to 89.9 and 89.4% respectively. After 2, 3 and 4 hours, the process carried out over the 3% Re/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst in presence of sulfur (30 mg/m<sup>3</sup>) gave a total vol-% content of hydrogen and carbon oxides in the range of 80.8, 67.1 and 51.8 respectively; the sum of C<sub>1</sub>-C<sub>4</sub> hydrocarbons increased at this time from 18.0 to 30.4 to 45.0, corresponding to a rate of 4.5; 2.2; and 1.2 respectively. The ratio of saturated to unsaturated hydrocarbons dropped in this system from 5 to 3.8 to 2.9. Selectivity of aluminum-rhenium catalysts changed with time towards formation of methane, ethylene, propylene and n-butane. Figures 3; references 12: 10 Russian (1 by Western author), 2 Western.  
[272-7813]

UDC 66.092.89

INVESTIGATION OF CARBON DEPOSITS FORMING ON Al-Co-Mo CATALYSTS DURING  
HYDROCRACKING AND HYDROPURIFICATION BY DERIVATOGRAPHY METHOD

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 25 May 82) pp 209-213

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[Abstract] In the title catalysis, the nature of starting hydrocarbons, the temperature and the duration of the process were investigated as they affected the quality and quantity of the product formed. The starting materials consisted of n-heptane, cyclohexane, benzene, styrene and cumene. An increase in the temperature and in the duration of the process led to greater carbon deposits. The material studied could be arranged in the

following order of increasing coke formation: benzene<cyclohexane<cumene<n-heptane<styrene, showing that the structure characteristics also could affect the deposition of carbon. During thermal decomposition of carbon deposits they lost 13.5-6.6% of their mass. Hydrogen and methane were found among the gaseous products of this reaction. The structure of carbon deposits resembled the structure of natural coal. Soot- and graphite-like fragments were not seen in the experimental carbon deposits. Figures 2; references 10 (Russian).  
[272-7813]

UDC 547.217.1:[66.095.252+66.094.18]

#### AROMATIZATION OF n-HEPTANE OVER PLATINUM CATALYSTS

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 11 Feb 84) pp 196-200

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[Abstract] In recent years a renewed interest was observed in the dehydrocyclization reactions of n-paraffinic hydrocarbons. New catalysts with higher activity and selectivity were sought. In the present paper the effect of thermal treatment on the activity and selectivity of platinum-containing zeolites in dehydrocyclization of n-heptane was studied. The catalysts treated in air were found to be the most reactive; they were followed by material treated in argon, followed by hydrogen reduction treatment. An assumption was expressed that the inert gas removed the oxygen absorbed by the zeolite, preventing the occurrence of local thermal effects during reduction of metal, thus favoring the formation of finely dispersed Pt crystals in the zeolite. Figure 1; references 9: 5 Russian, 4 Western.  
[272-7813]

## SELECTIVE HYDROGENATION OF ACETYLENE HYDROCARBONS TO OLEFINS IN PRESENCE OF COMPLEX PALLADIUM CATALYSTS WITH NITROGEN CONTAINING LIGANDS

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 22 Mar 83) pp 188-192

CHERKASHIN, G. M., SHUYKINA, L. P., KOVALEVA, L. S., PARENAGO, O. P. and FROLOV, V. M., Institute of Petrochemical Synthesis imeni A. V. Topchiyev, USSR Academy of Sciences

[Abstract] Experimental results were reported from the study of the hydrogenation of alkynes in presence of complex palladium catalysts containing a primary amine in their composition. It was shown that these complex catalysts are very active and selective in conversion of the acetylenes to olefins. At 20°C and 0.1 MPa hydrogen pressure, the activity of these catalysts equalled at least 4500 moles of the substrate per 1 g-at Pd·hr; selectivity was 98-99% with a 95% conversion of the starting material. Olefins with an  $\alpha$ -double bond were more active than the alkynes in hydrogenation reaction. In the course of the reduction,  $\alpha$ -olefins isomerized into olefins with internal double bonds which did not add hydrogen. The type of palladium salt used had insignificant effect on the activity of these complex palladium catalysts. Figures 2; references 6: 4 Russian, 2 Western (1 by Russian authors).  
[272-7813]

EFFECT OF Rh-COMPLEX CATALYST COMPOSITION ON SYNTHETIC PRODUCTS OF CO AND H<sub>2</sub>

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 22 Jun 83) pp 228-232

LAPIDUS, A. L., SAVEL'YEV, M. M., KONDRAT'YEV, L. T. and YASTREBOVA, Ye. V., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences

[Abstract] Synthesis of aliphatic hydrocarbons from CO and H<sub>2</sub> has a very practical meaning. In the present study the effect of the catalytic system composition on the products obtained from CO and H<sub>2</sub> was studied using the catalytic system Rh<sub>4</sub>(CO)<sub>12</sub>-AlBr<sub>3</sub>-Al, which was shown to be highly active in syntheses of alkenes from CO and H<sub>2</sub> at 150°C and atmospheric pressure. It was shown that at 50°C in tetrahydrofuran aluminum hydrides reduced the carbonyl ligand of the Rh<sub>4</sub>(CO)<sub>12</sub> forming methane, ethane and ethylene. In presence of H<sub>2</sub>, AlBr<sub>3</sub> and Al, the (C<sub>4</sub>-C<sub>6</sub>) n-alkanes convert at 150°C into C<sub>2</sub>-C<sub>4</sub> alkanes, principally into iso-C<sub>4</sub>H<sub>10</sub>. Selectivity of this synthesis in respect to the formation of C<sub>1</sub>-C<sub>4</sub> paraffins could be controlled by varying the composition of the catalytic system or the reaction conditions. Repeated

use of the catalyst at atmospheric pressure led to a rapid loss of its activity, however. Figure 1; references 6: 3 Russian, 3 Western.  
[272-7813]

UDC 546.262.3-31:542.941.7:541.128.34:541.44

STRUCTURE AND PROPERTIES OF CATALYSTS DURING HYDROGENATION OF CO BASED ON INTERMETALLIDES AND HYDRIDES CONTAINING Ni AND Co

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 20 Jun 83) pp 233-239

LUNIN, V. V., KRYUKOV, O. V., KOZHINSKIY, S. O., BRUK, I. A.,  
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imeni M. V. Lomonosov; Institute of Organic Chemistry imeni N. D. Zelinskiy,  
USSR Academy of Sciences

[Abstract] Syntheses based on reactions of CO with H<sub>2</sub> capture increasing interest in recent years. A new class of catalysts was used for conversion of CO (or CO<sub>2</sub>) to methane based on thermooxidative segregation of inter-metallic compounds and their hydrides: ZrNiH<sub>2.8</sub> and ZrCoH<sub>2.6</sub>. These catalysts were shown to be more active than Ni/ZrO<sub>2</sub> or Co/ZrO<sub>2</sub> obtained by coprecipitation. The active components in these catalysts are the crystallites of the transition metal forming in the surface layer as a result of segregation occurring under the influence of preliminary thermooxidative treatment of the catalysts. In principle, it was shown to be possible to regulate selectivity of the catalysts by introduction of selectively segregating components. Figures 5; references 12: 7 Russian, 5 Western.  
[272-7813]

UDC 547.313.3:542.971.3:542.943

HETEROGENIC-CATALYTIC EPOXIDATION OF PROPYLENE WITH ETHYLBENZENE HYDROPEROXIDE

Moscow NEFTEKHIMIYA in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 4 Mar 83) pp 243-245

KOTOV, St. V. and BOYEVA, R. S., Higher Chemical Technologic Institute  
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[Abstract] Propylene oxide is an important starting material in petrochemical industry. The goal of this study was to evaluate the ability of using molybdenum containing catalyst on a polymer base in the epoxidation of propylene with ethylbenzene hydroperoxide. The effect of selected reaction conditions on the conversion of ethylbenzene hydroperoxide was

studied along with selectivity in respect to propylene oxide. On the basis of weakly acidic cation exchange resin Bofatite CA-20, a polymer catalyst containing molybdenum was synthesized for the epoxidation of propylene. It was shown that the maximum yield of propylene oxide in above reaction was obtained at 95°C. References 10: 8 Russian, 2 Western.  
[272-7813]

UDC 665.37

CHANGES IN PHYSICAL-CHEMICAL PROPERTIES DURING STORAGE OF INDUSTRIAL PENTAERYTHRITE ESTER

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 4 Nov 82) pp 1171-1174

IL'INA, T. V., GROMOVA, V. V. and SHABALINA, L. A.

[Abstract] The widely used synthetic oil B-3V consists of a mixture of pentaerythrite ester of C<sub>5</sub>-C<sub>9</sub> fatty acids ("ester-2") and two additives: coptax and p-hydroxydiphenylamine. Stability of the oil depends on its purity. The greatest amount of admixtures is introduced into this oil through the "ester-2". To determine the actual impurities, the starting materials for "ester-2" were studied: technical pentaerythrite and two batches of synthetic fatty acids C<sub>5</sub>-C<sub>9</sub> from a petroleum processing plant. The results obtained showed that the C<sub>5</sub>-C<sub>9</sub> fractions of synthetic fatty acids contained about 25% of additives with functional oxygen groups and 5% isobutyric and caproic acids. During the period of 1976-1980, the production batches of "ester-2" showed insignificant changes. On storage, light fractions evaporated; the fraction of unsaturated compounds and the hydroxylic components were diminished, while the quantities of acidic components increased. Figure 1; reference 1 (Russian).  
[303-7813]

UDC 613.63:621.9.079

TOXICOLOGICAL EVALUATION OF PETROLEUM LUBRICANTS USED AS BASE FOR LUBRICATING-COOLING TECHNOLOGICAL SUBSTANCES

Kiev NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian Issue 23, 1982  
(manuscript received 10 Feb 81) pp 54-57

CHEREDNICHENKO, G. I., PORUTSKIY, G. V., SABIROVA, G. V., VERKHOVSKIY, L. G., MALINOVSKIY, G. T, and MARTYNYUK, A. D., All-Union Scientific Research Institute for "PK Neftekhimii" [expansion uncertain: Increasing Petrochemical Quality?]

[Abstract] Most lubricating-cooling technological substances (LCTS) utilize oils with various physico-chemical properties and chemical compositions as their hydrocarbon base, which accounts for 90-96% of composition. The present article reports on the toxicity of industrial, regenerated and experimental oils, as well as for viscosity and content of various petroleum fractions. The specific properties of the various oils tested are summarized. No clinically toxic signs were observed in test mice, rabbits or guinea pigs using various application methods (on the skin, subcutaneously or by ingestion). Thus the oils tested were judged to be of little or no toxic danger. References 4: 2 Russian, 2 Western.  
[295-12131]

## STRUCTURE-PROPERTIES RELATIONSHIP OF GRAFTED CELLULOSE COPOLYMERS CONTAINING ANTIMICROBIAL COMPOUNDS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 23 Nov 82) pp 1264-1269

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imeni Lenin Komsomol; All-Union Scientific Center of Surgery

[Abstract] Relationship between structures of grafted cellulose copolymers containing antimicrobial agents bound by an ester link and their properties was investigated. Cellulose modified with grafted copolymer of vinyl acetate and maleic anhydride (MA) or with copolymer of vinyl pyrrolidone and MA was reacted with formyl halides, pentachlorophenol and 2,4,5-trichlorophenol (copolymers I and II). In addition the following esters were grafted on cellulose: pentachlorophenyl esters of acrylic acid and methacrylic acid and trichlorophenyl ester of methacrylic acid (copolymers III-V). The rate of hydrolysis of these copolymers was studied in detail showing that copolymers I and II had about three-orders-of-magnitude higher rate of hydrolysis than copolymers III-V. Evaluation of antimicrobial activity indicated that it depended on the structure of the cellulose copolymer, quantity of bound antimicrobial agent and its biological activity. Figures 4; references 10 (Russian).

[307-7813]

## CHEMICAL CONSTRUCTION AND INTRAMOLECULAR STRUCTURE OF WATER SOLUBLE COPOLYMERS OF VINYL ALCOHOL AND VINYL ACETATE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 3 Dec 82) pp 1276-1282

ANUFRIYEVA, Ye' V., GROMOVA, R. A., KRAKOVYAK, M. G., KUZNETSOVA, V. A.,  
LUSHCHIK, V. B., NEKRASOVA, T. N., SOROKIN, A. Ya. and SHEVELEVA, T. V.,  
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[Abstract] Copolymers of vinyl alcohol and vinyl acetate (VA-VAc) are used for medicinal purposes. Structural analysis of VaVAc polymers was carried out looking for characteristics responsible for biological activity. Special attention was given to VA-VAc copolymers obtained by saponification of PVAc in ethanol (VA-VAc)E and methanol (VA-VAc)Me, since the first shows no negative biological activity and the latter does. Polarized luminescence was used to determine the distribution of co-monomer units and the intramolecular structure. Thus it was shown to be possible to use the luminescence method in studying the physical-chemical relationship between the synthetic methods for VA-VAc copolymers, their structure and their biological activity. Figures 3; references 9: 7 Russian, 2 Western (2 by Russian authors).

[307-7813]

## POLYMERS AND POLYMERIZATION

### PRACTICAL RESULTS OF POLYMER RESEARCH

Minsk SOVETSKAYA BELORUSSIYA in Russian 14 Jul 84 p 2

[Article by V. Bibikov: "Science at Work. By Order of Industry"]

[Text] We had occasion recently to observe a generally routine experiment at Institute of Physical and Organic Chemistry, BSSR Academy of Sciences. A laboratory technician poured a clear, viscous liquid into a metal beaker and added some kind of powder. She placed the beaker in a reactor: a unit resembling a narrow cabinet. The reactor turned around its axis unexpectedly easily (it turned out to have rollers instead of legs), and its "face" became visible, in the form of a large manometer. The manometer indicates the pressure of the air which passes through the liquid in the beaker. Then the technician took hold of knobs and tumblers of the reactor electronic control unit. With these controls one can regulate the supply of air to the beaker, the agitation and heating of its contents, etc.

When she turned the last tumbler, the room was filled with a low, even hum. I wondered whether the experiment was intended to last a long time.

"Such experiments can last from one to ten hours," answered the technician.

Only at first glance does it seem easy to "guess" chemical reactions. Even if they are accompanied by external effects, such as an explosion, the layman cannot hope to understand their nature. Therefore, I turned for aid to Candidate of Chemical Sciences B. G. Bal'kov, the group supervisor, who was standing next to me.

"Even we specialists can't see anything with the 'naked eye'", he answered. "We use various instruments, especially the chromatograph, for studying research results. The chromatograph determines the chemical composition of the reaction product. With respect to this experiment in particular, its purpose is to trace the influence of a substance which we are studying on the production of dimethyl terephthalate."

The last phrase needs "interpretation." And here is what we found out. To begin a long way back, lavsan, which is widely known today, at one time was almost a symbol of the possibilities of the wonders of chemistry. Its range of use extends from additions to fabrics, of which suits and shirts

are made, to parts for space equipment. Therefore, a great deal of lavesan was needed. The Mogilev "Khimvolokno" production association produces lavesan on a large scale. However, any technology becomes outmoded in time. The yield of the end product was far from the calculated level, the unit cost was high, and there was a great deal of waste. If one could improve these indices, even by a fraction of a percent, the improvement multiplied by the scale of production would have a significant effect.

Scientists of the Institute of Physical and Organic Chemistry BSSR Academy of Sciences accordingly "targeted" the "Khimvolokno" Association. They concentrated their attention primarily on key points of the technology: production of dimethyl terephthalate, the source material for producing lavesan, and the production of synthetic fibers from the latter.

The laboratory of N. I. Mitskevich, academician of the BSSR Academy of Sciences, resolved to improve the efficiency of the first stage of production. The problem is not a simple one. The technology and equipment for producing dimethyl terephthalate were purchased abroad and are protected by patents. Consequently, new scientific and technical solutions were needed. And the Belorussian scientists found them.

"To produce dimethyl terephthalate, one must effect a chain of complex chemical reactions," continues B. G. Bal'kov. "The essence of these reactions lies in purposeful oxidation of the source substance, paraxylene, with air oxygen. This requires the appropriate catalyst, temperature, air pressure, etc. Accordingly we are trying to select the parameters which will conform best to the specific conditions of the Mogilev "Khimvolokno" Production Association. We base this work on the Soviet school of oxidation of organic substances, for which academicians Semenov and Emanuel laid the foundations. Its achievements have been recognized throughout the world."

The catalyst is an extremely important "tool" for conducting a chemical reaction. It is capable of accelerating the reaction sharply and directing it in the course required. However, finding a suitable catalyst is no simple matter. It took hundreds of experiments like the one described above before the Belorussian scientists settled on a mixture of acetates of cobalt and manganese. This innovation made it possible to increase the yield of dimethyl terephthalate by a factor of 3-4, while waste dropped, and the specific consumption of paraxylene was reduced. The best selection of conditions for the chemical reactions increases plant productivity by 10%. No additional equipment is required. The resulting saving at the plant has been calculated as approximately a million rubles per year.

It would be fine to use the catalyst just once to produce dimethyl terephthalate and then burn it up. And the environment would be polluted, and new catalyst would be expensive. The laboratory has suggested the following: treating ash containing the expensive material with an acetic acid solution or even with reaction water formed in one stage of production. This can extract a significant portion of the acetates of cobalt and manganese from the waste. The special solution completely "draws out" these valuable materials remaining in the ash.

According to calculations, developments making it possible to use the catalyst repeatedly save more than a million rubles more per year. Money, however, is not the only consideration. Cobalt which goes into the catalyst is rarely encountered in nature. To recover it for use would be to expand the resources of a non-renewable raw material.

Chemists today encounter great difficulties in neutralizing production waste. At the same time, waste can serve as source material for producing useful products. Scientists, headed by N. I. Mitskevich, academician of the BSSR Academy of Sciences, have suggested measures such as making use of methylbenzoate, which had been considered a waste product. It can be used to produce a feed preservative for livestock breeding. It is considerably less expansive than the benzoic acid used at present, which, in addition, is scarce. This innovation has been tested successfully in practical use. Waste of the Mogilev "Khimvolokno" Association are sufficient for producing about a thousand tons of the preservative compound per year. However, the compositions of the wastes must be stabilized, and separate collection of the waste must be organized. These difficulties are quite manageable, especially since the scientists are prepared to give production specialists the help they need.

The laboratory headed by Candidate of Chemical Sciences I. F. Osipenko specializes in developing new substances to improve the quality of polymer threads and fibers. There are plenty of problems. For example, according to the present technology, a thread is twisted together from 25 extremely fine fibers on special machines. In this process, it "runs" many kilometers through various openings and over rollers. If the thread is left dry, it will "fray", i.e., many of the fibers will break and start to stick out in all directions. The strength of the thread, naturally, will drop sharply. In order to prevent this, the thread is treated with a special composition: a size material. For the time being, it is purchased abroad. However, I. F. Osipenko's laboratory has produced a similar compound...from waste. Research has demonstrated the high qualities of the new compound, and commercial testing is next. The institute is producing the first experimental batch of the new compound this year together with the Mogilev artificial fiber plant.

"It is easy to see that the developments we are carrying on are aimed at solving specific production problems," says BSSR Academy of Sciences corresponding member V. S. Soldatov, Director of the Institute of Physical and Organic Chemistry. "In this regard, cooperation with the 'Khimvolokno' Association is no exception. The first republic-wide seminar for directors of chemical and petrochemical enterprises was held recently under the aegis of the institute. This meeting made it possible for scientists and production specialists to get to know each other's problems better and to establish new contacts. Two new laboratories have been created based on the results of the seminar and are working in fields of interest to industry. Naturally, as befits an academic institution, we are striving to conduct research on a high theoretical level."

Cooperation of the institute with the "Integral" and Belorussian Optic-Mechanical Production Associations is under intensive development. The economic effect from the use of scientific developments at enterprises of various industries amounts to millions of rubles. The integration of chemical science and industry is continuing.

12742

CSO; 1841/346

PHOTOLYTIC CHAIN OXIDATION OF POLYSTYRENE BY SUNLIGHT

Kiev TEORETICHESKAYA I EKSPERIMENTAL'NAYA KHIMIYA in Russian Vol 20, No 3, May-Jun 84 (manuscript received 17 Jan 83, after completion 19 Dec 83) pp 372-375

KUZINA, S. I. and MIKHAYLOV, A. I., Branch of the Institute of Chemical Physics, USSR Academy of Sciences, Moscow Oblast

[Abstract] Ultraviolet light of 253.7 nm wavelength in the presence of oxygen at 300 K initiates a photolytic decomposition of polystyrene by a peroxide free-radical mechanism resulting in chain reaction of approximately  $10^3$  links. Small sheets of commercial polystyrene 2 mm thick were illuminated in vacuum, in air, and in oxygen by sunlight and by ultraviolet light of 253.7 nm wavelength. The degree of photooxidation was measured by oxygen absorption, and free radicals were measured with a radiospectrometer. Carbon dioxide and water oxidation products were collected in a cryogenic trap. Only insignificant amounts of aromatic decomposition products were noted. Reaction kinetics clearly indicate that photolysis by sunlight proceeds by a chain reaction of the same type as initiated by ultraviolet light of 253.7 nm wavelength. Approximately 90% of the absorbed oxygen is accounted for in the decomposition products and results in significant weight loss with the samples. Photooxidation slows noticeably when the wavelength of the illumination reaches 365 nm, although measurable decomposition continues up to wavelengths of 440 nm. Figures 3; references 5: 1 Russian, 4 Western.  
[321-12672]

## SULFONATION OF CYCLOHEXANECARBOXYLIC ACID IN PROCESS OF OBTAINING CAPROLACTAM FROM TOLUENE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 3, May-Jun 84  
(manuscript received 19 Jan 84) pp 36-40

YUSUPOV, P. P., SHURAYEV, V. N., SHLENKOVA, Ye. K. and KATSOBASHVILI, V. Ya.,  
Chirchik Production Association Elektrokhimprom

[Abstract] The production of caprolactam is based on the nitrosation of cyclohexanecarboxylic acid (CHCA) in oleum. The major side reaction produces up to 12 mass percent of  $\alpha$ -sulfocyclohexanecarboxylic acid; CHCA:H<sub>2</sub>SO<sub>4</sub> and C<sub>6</sub>H<sub>11</sub>COOSO<sub>3</sub>H are also formed. Reactions were studied by carefully mixing reactants at room temperature and then heating to reaction temperature (30-90 C) for specified time periods (2-75 min). The production of  $\alpha$ -sulfo-CHCA depends on the temperature, the oleum concentration, and the initial concentration of CHCA:H<sub>2</sub>SO<sub>4</sub>. Overall, it is apparent that the reaction of CHCA with oleum is a complex process involving several parallel reactions. Reaction kinetics provided straight-line plots on semi-log graphs and showed an inverse relation between the initial CHCA:H<sub>2</sub>SO<sub>4</sub> concentration and the  $\alpha$ -sulfo-CHCA production. Figures 6; references 7: 1 Russian, 6 Western.  
[309-12672]

UDC 541.127:677.028.686:547.495.9

## KINETICS OF INTERACTION OF DICYANODIAMIDE WITH EPOXIDES IN PRESENCE OF COPPER OR ZINC ACETYLACETONATES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84 (manuscript received 9 Jul 82)  
pp 438-441

VOROB'YEV, O. L., ORLOV, B. N., KARKOZOV, V. G. and NIKOLAYEV, A. F.,  
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Institute imeni Lensev

[Abstract] The interaction kinetics of dicyanodiamide with ED-8 epoxide oligomer and phenylglycidyl esters was studied in the presence of zinc and copper acetylacetonates. Changes in the gel-fraction content and epoxide group levels, measured by acetone extraction and back titration respectively, were used to monitor the course of the reaction. IR spectroscopy and gas chromatography were used to determine ester conversion. Both metal acetylacetonates demonstrated pronounced acceleration of hardening, which had a linear character until moderate levels of conversion. On increasing the reaction temperature from 110° to 125° the rate increased 1.5 times, which indicated that the reaction occurs in the diffusion region and is

limited by the solubility of dicyanodiamide in phenylglycidyl ester or the epoxide. The zinc acetylacetonate was less active than the copper, and lowered the temperature at which a sharp rate increase occurs from 150-160° to 125-135°. Figures 4; references 7: 6 Russian, 1 Western.  
[276-12126]

UDC 541.64:542.952:547

SURFACE ACTIVE PROPERTIES OF POLYELECTROLYTES BASED ON COPOLYMERS OF VINYL BENZYL BROMIDE AND ACRYLIC ACID

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 27, No 4, Apr 84  
(manuscript received 22 Jun 82) pp 453-456

SALIDZHANOVA, N. S., RAKHMATULLAYEV, Kh., DZHALILOV, A. T. and MURTAZAYEVA, G. A., Department of Plastics Processing Technology, Tashkent Polytechnic Institute imeni A. Beruni

[Abstract] A study was conducted on copolymers of vinylbenzylbromide with acrylic or methacrylic acid, aminated with trimethylamine or pyridine. The electrical conductivity isotherms of the four polymers were found to be nonlinear, due to increased free counterions and total macroion charge at low concentration. The strongly concave character of the isotherms indicates ionic association of the polymers in aqueous solution. Parabolic electrocapillary curves obtained with a mercury electrode indicate a sharp drop in surface tension in the presence of the polymers and a shift in maximum to more positive potentials. Polymers aminated with trimethylamine exhibited greater conductivity and surface activity than those aminated with pyridine, due to differences in basicity and polarity. Polymers aminated with trimethylamine had differential capacitance of  $2.8 \times 10^{-3}$  microF/cm<sup>2</sup>; those aminated with pyridine,  $2.8 \times 10^{-5}$ . Cement-bentonite mixtures containing 0.02% of the polymer had a plasticizing effect three times higher than controls. Figures 3; references 6 (Russian).  
[276-12126]

SUSPENSION COPOLYMERIZATION OF STYRENE WITH ACRYLONITRILE, INITIATED BY PEROXIDE OF FATTY ACID FRACTION

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 11-13

IVANCHEV, S. S. OSTROVSKAYA, A. I., KAZANSKAYA, V. F., KORNEVA, T. D., KONOVALENKO, V. V., IL'CHENKO, V. N., RUVINSKAYA, A. B., KRAVCHENKO, B. V. and NAZAROVA, N. A.

[Abstract] Styrene-acrylonitrile copolymers, used in motor vehicles, electronics, and in shock-resistant systems (ABS-plastics), are produced by suspension copolymerization using lauryl peroxide as initiator. In the present work it was found that a copolymer having satisfactory properties may be produced using the peroxide of domestically produced C<sub>7</sub>-C<sub>9</sub> synthetic fatty acid fraction. The stability of the peroxide, however, depends on the storage time and conditions. References 5: 4 Russian, 1 Western. [318-12765]

EFFECT OF ISOMERISM OF DIGLYCIDYL PHTHALATES ON PROPERTIES OF EPOXIDE POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 16-18

SHOLOGON, I. M., YURECHKO, N. A. and LIPSKAYA, V. A.

[Abstract] Owing to their low viscosity, mixed glycidyl esters of o-phthalic, tetrahydro- and hexahydrophthalic acids are used more and more as active diluents for high viscosity epoxide oligomers. In the present work the deformation, relaxation and other physical properties of epoxide polymers produced from other isomers, i.e., diglycidyl, diglycidyliso- and diglycidyl-terephthalates were studied. These esters gave polymers that are heat resistant and have high adhesion, tensile strength and deformation properties, and may therefore be used as binders, adhesives, press materials and press powders for producing objects that can be used at high temperatures and under high mechanical loads. Figures 2; references 10: 6 Russian, 4 Western. [318-12765]

## PROPERTIES OF PHENOLFORMALDEHYDE FOAM PLASTIC, FOAMED UNDER DIRECT CURRENT ELECTRICAL FIELD

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 19-20

SHANTARIN, V. D. and SHEVCHENKO, V. I.

[Abstract] A study was made of foam polymer formation under an induced direct current field. Phenolformaldehyde resin grade FRP-1 was placed in a 100 mm cubic container whose upper and lower covers served as electrodes. Temperature was maintained at  $21 \pm 1^\circ\text{C}$ , and electrical potentials of 0 to 1000 volts/meter were applied. After 24 hours the resulting foam polymer was cut into smaller pieces and tested for compression strength and bulk density. Samples exposed to the electrical treatment had 30% greater compression strength and 60% greater bulk density at the surface than samples not subjected to electrical treatment. Figures 2; references 3 (Russian). [318-12765]

## RADIATIONAL ELECTROCONDUCTIVITY OF SOME POLYMER-BASED COMPOSITES

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 28-30

SICHKAR', V. P., ALEKSANINA, O. S., SAYENKO, V. S., TYUTNEV, A. P. and VAYSBERG, S. E. (deceased)

[Abstract] A study was made of the effects of adding plasticizers dioctyl phthalate, tricresyl phosphate or dioctylsebacinate and aluminum oxide as filler on the supplemental electroconductivity (induced by ionizing radiation) of polystyrene, epoxy resin ED-5, polymethylmethacrylate and polyvinyl acetate composites. It was established that the radiational electrical conductivities of the above polymers can be altered by addition of plasticizers. If the additive has low activity with respect to the initial polymer and is distributed in the material as particles greater than the size of the macromolecule, then there is no effect on the conductivity of the resulting composite material. Figures 2; references 3 (Russian). [318-12765]

## THERMOPHYSICAL PROPERTIES OF ORGANIC FIBERS AT 5-400 K TEMPERATURE INTERVAL

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 30-32

TANAYEVA, S. A., DOMOROD, L. S. and YEVSEYEVA, L. Ye.

[Abstract] Organic fibers having mechanical properties superior to those of other reinforced plastics have recently found applications in cryogenics. A study was made of the heat conductivity, temperature conductivity and specific heat at 5-400 K of chaotically reinforced organic fibers made from epoxy resin EDT-10 filled with Vinivlon N; unidirectional glass-reinforced EDT-10 resin filled with glass-alumoboron silicate fibers and organic fiber Vinivlon N. Data were obtained for materials prepared by conventional impregnation of the fibers followed by hardening, and for oriented pre-reinforced organic fibers obtained by welding pre-stressed organic fibers. It was established that the degree of anisotropy of the pre-reinforced fibers has a significant effect on the properties of the composite material. The properties of such a material depend on the technique of preparation, i.e., impregnation with binder or welding the fibers without binder. Superior properties were obtained by pre-reinforcement. Figures 2; references 12: 10 Russian, 2 Western.  
[318-12765]

## SYNTHESIS OF METHACRYLIC ACID ESTERS AND AMIDES CONTAINING RESIDUAL ANTIMICROBIAL COMPOUNDS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 28 Sep 82) pp 1121-1126

GORCHAKOVA, V. A., BUDZAN, B. I., ANDRONOVA, N. A., KOLOKOLOV, B. N. and VIRNIK, A. D., Moscow Textile Institute imeni A. N. Kosygin; Lvov Polytechnic Institute imeni Lenin Komsomol; Scientific Research Institute of Organic Semi-finished Articles and Dyes

[Abstract] Reaction of methacrylic acid chloride (MAC) with 2,4,5-trichlorophenol (TCP), pentachlorophenol (PCP), 4-aminobenzosulfamide-streptocide (ST) and 4-aminomethylbenzosulfamide-maphenide (MP) in presence of an acceptor of HCl (diethylformamide or dimethylamine) yielded four new monomers: TCPMAC, PCPMAC, STMAC and MPMAC. The structures of these monomers were supported by data from elemental analysis and PMR, UV and IR spectral determinations. From these monomers, grafted copolymers with cellulose were obtained possessing antibacterial properties. Figure 1; references 6 (Russian).  
[303-7813]

## COPOLYMERIZATION KINETICS OF TETRAFLUOROETHYLENE WITH PERFLUOROALKYL VINYL ETHERS WITH VARIOUS STRUCTURES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
(manuscript received 28 Aug 82) pp 1126-1128

KOCHKINA, L. G., YEROKHOVA, V. A. and LOGINOVA, N. N., Okhtinsk Scientific Research Association "Plastpolimer"

[Abstract] Copolymerization of tetrafluoroethylene (TFE) with perfluoromethylvinyl ether (PFMVE), perfluoropropylvinyl ether (PFPPVE) and perfluoropropoxypropylvinyl ether (PFPPVE) was investigated. The copolymerization was carried out in aqueous medium with water soluble initiator as well as in trifluorotrchloroethane (FCE) in presence of fluorinated peroxide. It was shown that fluorinated vinyl ethers showed weaker activity in comparison to TFE, i.e., they behaved analogously to nonfluorinated analogues. Comparison of the energies of activation and total copolymerization rate constants showed that copolymerization occurred faster in FCE than in water. The overall reaction rate constant increased in the following order PFMVE-PFPPVE-PFPPVE. References 7: 6 Russian (3 by Western authors), 1 Western.  
[303-7813]

UDC 541.64:539.211

## POLYMERIZATION OF EPOXIDE RESIN ON SURFACE OF MODIFIED CARBON FIBER

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 29 Jul 82) pp 1139-1145

DUBKOVA, V. I., YERMOLENKO, I. N. and LYUBLINER, I. P., Institute of General and Inorganic Chemistry, BSSR Academy of Sciences

[Abstract] Polymerization of epoxide resin (ED-20) on the surface of modified carbon fiber (CF) was investigated. The modified CF were prepared by digestion of cellulose hydrate and cotton-paper fibers and fabrics in lead acetate followed by carbonization at 773 and 1173 K. The content of lead in the carbon materials was 10.9-36%; PbO predominated in material carbonized at lower temperature and metallic Pb in the specimens carbonized at higher temperature. Deposition of the epoxide resin on the surface of modified CF followed by thermal treatment gave an insoluble product which could not be removed from the surface. The resin distributed itself uniformly on the surface of the fiber, creating a coating which separated the fibers from each other. The amount of the resin solidifying on the CF surface depended on the content of metal in the CF, on the method of its introduction and on the structure of carbon residue. Figures 3; references 12: 11 Russian (4 by Western authors), 1 Western.  
[307-7813]

## POLYMERIZATION AND COPOLYMERIZATION OF 1,4-TETRAMETHYLENEDIISOCYANATE WITH 1,6-HEXAMETHYLENEDIISOCYANATE IN PRESENCE OF TRIS-(DIETHYLAMIDO)PHOSPHITE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 22 Aug 82) pp 1153-1158

BAKHIMOV, M. I., DAVLETBAYEV, I. G., PROKOP'YEV, V. P. and KUZNETSOV, Ye. V.,  
Kazan Chemical-Technologic Institute imeni S. M. Kirov

[Abstract] Cyclopolymerization of aliphatic diisocyanates was studied on the examples of 1,4-tetramethylenediisocyanate (TMDI) and 1,6-hexamethylenediisocyanate (HMDI). Oligoisocyanates forming in this polymerization contain urethinedione and isocyanurate fragments; they have the ability of forming increased number of crosslinkings, leading to higher thermal stability and better physical-chemical properties. The catalyst used--tris(diethylamido)phosphite--is easily available and less toxic than tri-n-butylphosphine usually employed in cyclopolymerization. Copolymerization of TMDI and HMDI occurred at a slower rate than polymerization of TMDI alone and the rate was increasingly slower as more HMDI was added. Thermal data and heat resistance of these homo- and copolymers are reported. Figures 5; references 12: 11 Russian (1 by Western author), 1 Western.

[307-7813]

## THERMAL CHARACTERISTICS OF IRRADIATED POLYETHYLENE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 30 Aug 82) pp 1159-1164

BRISKMAN, B. A. and ROZMAN, S. I., Scientific Research Physical-Chemical  
Institute imeni L. Ya. Karpov

[Abstract] Effect of radiation on thermal characteristics of polyethylene (PE) was investigated in many studies. Unfortunately, results of these studies could not be used for generalized observations due to the lack of uniformity. It was hoped to be able to explain radiation effects on thermal properties of partially crystallized polymers from the position of a dual phase model. Therefore, a systematic investigation was carried out of the effect of irradiation with accelerated electrons on heat conductivity, density and thermal coefficient of linear expansion of PE in an attempt to explain the specificity of action of the irradiation process, temperature of irradiation and the magnitude of the adsorbed dose. Radiation effects were found to be a function of the type of irradiation and the temperature of exposure of the subject. The radiation yield of crosslinkages increased with increased LPE of the radiation. Dose magnitude studies showed no effect in the range examined (13-170 Gr/s). Figures 5; references 15: 8 Russian, 7 Western.

[307-7813]

## EFFECT OF STEREOISOMERISM OF REGULARLY ALTERNATING ISOPRENE-PROPYLENE COPOLYMERS ON ITS THERMODYNAMIC PROPERTIES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 10 Sep 82) pp 1165-1166

SMIRNOVA, N. N., LEBEDEV, B. V., KIPARISOVA, Ye. G., KROPACHEVA, Ye. N. and MYAGKOVA, L. A., Scientific-Research Institute of Chemistry, Gorkiy State University imeni N. I. Lobachevskiy; All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] Data are reported on the effect of stereoisomerism on thermodynamic properties of regularly alternating cis- and trans-isoprenepropylene copolymer (IPC) along with thermodynamic criteria for its synthesis by copolymerization of isoprene with propylene in presence of the catalytic systems:  $TiCl_4-CH_3CoC_6H_5-Al(iso-C_4H_9)_3$  and  $[(CH_3)_3SiO] \cdot VOCl_2-Al(iso-C_4H_9)_3$  at 243 K. Two samples were obtained (IPS-I and IPS-II) which then were subjected to precision vacuum adiabatic and isothermal calorimetry. Entropy and enthalpy of heating was higher in case of the trans-isomer than for the cis-isomer, while the combustion enthalpy was reversed. Glass transition temperatures of these isomers differed by 29 K and their upper temperatures of the synthesis--by 190 K. Analysis of the thermodynamic data showed that the ratio of cis- to trans-components depended on kinetic factors (effect of catalytic system) and on thermodynamic parameters. With temperature increase, the yield of cis-fragments increased until at the temperatures exceeding 480 K only the cis-isomer was obtained. Figure 1; references 11: 7 Russian (1 by Western authors), 4 Western.  
[307-7813]

UDC 541.64:546.811

## POLYMERIZATION OF 10-VINYLPHENOTHIAZINE IN PRESENCE OF TIN CHLORIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 22 Sep 82) pp 1178-1182

SVYATKINA, L. I., GAYNTSEVA, L. L., KUROV, G. N. and SKVORTSOVA, G. G., Irkutsk Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences

[Abstract] Cationic polymerization of 10-vinylphenothiazine (VP) taking place in presence of  $SnCl_2 \cdot 2H_2O$  and  $SnCl_4 \cdot 5H_2O$  was studied. It was shown that poly-VP formed in adequate yields in polar, nonpolar, neutral and medium basic solvents. Protolytic solvents and strong bases inhibited the process. The growth of the VP chain in presence of tin chlorides appeared to be taking place through the free macrocation. in polar media and in presence of excess catalyst VP polymerization was accompanied by solvolysis of the intermediate cation radical of VP and destruction of poly-VP by partial elimination of the phenothiazine substituent from the polymer chain. Figures 4; references 17: 12 Russian, 5 Western.  
[307-7813]

UDC 678.4.0002:678'675.001

MODIFICATION OF BUTADIENENITRILE RUBBER USING HYDRAZINE DERIVATIVES IN ORDER TO INCREASE ITS THERMAL STABILITY

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84 (manuscript received 1 Jul 82) pp 465-469

DERBISHER, V. Ye., KABLOV, V. F., KOROTEYEVA, A. M. and OGREL', R. A.,  
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[Abstract] In order to improve rubber thermal stability, the effect of modifying butadienenitrile rubber SKN-40 by adding dicarboxylic acids, or their anhydrides, and dihydrazides to the resin mixture was investigated. These additives form polycondensates at vulcanization temperatures. Oxalic, adipic and malonic acids and dihydrazides and phthalic anhydride were used. The additives increased rubber thermal stability, so that the coefficient of thermal aging increased from 0.3 to as much as 0.7. Deformation resistance was similar to that of standard rubbers and changed only slightly with additive level. Relative elongation before rupture was greater than 400%, increasing at high monomer levels. The best rubbers were produced with phthalic anhydride or adipic acid plus the dihydrazide of adipic acid. Smaller additives may cyclize at the early stages of polycondensation, leading to less favorable results. The increased thermal stability was only observed with acid and dihydrazide together. Thermal analysis indicated that polycondensation begins at 423°K and cyclization at 573°K. While intensive rubber oxidation begins at 410°K and is exothermic, this is almost completely compensated for by the endothermic polycondensation. This process should slow rubber aging. Figures 3; references 9 (Russian).  
[276-12126]

## FORMATION OF FLUOROLONE COVERINGS ON RUBBER

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84  
(manuscript received 24 May 82) pp 494-495

OGREL', A. M., KHAYMOVICH, A. M. and KABLOV, V. F., Department of Elastomer  
Processing Chemistry and Technology, Volgograd Polytechnic Institute

[Abstract] In order to study the formation and adhesion of a polytetra-  
fluoroethylene fluorolone layer on rubber, SKN-40 rubber samples were dipped  
into an aqueous suspension of F-4D fluorolone and press vulcanized. Ad-  
hesion of the covering to a rubber base which was vulcanized before dipping  
was very small, as indicated by grid incision and small load testing. The  
covering appeared as a cracked film with no penetration into the rubber base.  
When the covering was applied before vulcanization adhesion was somewhat  
greater. Microscopic examination indicated that the fluorolone layer formed  
in three stages during vulcanization. In the first stage the structure is  
porous, in the second stage it is banded and in the third stage rubber flow  
leads to covering penetration. This resulted in a regular transverse band  
structure. While the results of all three stages could be seen on the same  
samples, the transverse bands were more prevalent at the edges. The porous  
structure was found closer to the center. Figures 1; references 3 (Russian).  
[276-12126]

UDC (678.743.41+678.742.2-139)002.612

IMPROVING PERFORMANCE OF RUBBER BASED ON COMBINING RUBBERS OF DIFFERING  
POLARITY BY USING NONPOLAR RUBBER WITH CHEMICAL MODIFICATION OF SIDE CHAINS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84 (manuscript received 31 Jan 83)  
pp 496-498

OGREL', A. M., SAFONOV, A. V., ALEKSEYEVA, L. N. and FRENKEL', R. Sh.,  
Department of Elastomer Processing Chemistry and Technology, Volgograd  
Polytechnical Institute; All-Union Scientific Research and Construction  
Technology Institute of the Rubber Industry

[Abstract] Rubber mixtures based on fluoro- and ethylene-propylene serial  
and grafted rubbers were studied. The grafted rubber was SKEPT, which con-  
tains 25% acrylonitrile. The mixture also contained zinc oxide, carbon and  
peroxyon and was vulcanized at 160° for 40 minutes. The combination of  
fluoro-rubber and grafted rubber gave better performance properties, which  
respect to viscosity, specific elongation, residual elongation on rupture,  
plasticity, hardness, elasticity, abrasability and friability temperature,  
than the mixture with the serial rubber. The decreased swelling in benzene

and isooctane-toluene observed, as well as the improved cold resistance, may be due to the presence of nitrile groups. Swelling in acetone and acid resistance were unaltered. Figures 2; references 6 (Russian).  
[276-12126]

UDC 541(64 + 183.12)

CONDITIONS OF FORMATION AND PROPERTIES OF POLYMER MIXTURES OF POLYELECTROLYTE COMPLEXES AND ACRYLATE LATEXES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 6, Jun 84  
(manuscript received 25 Nov 82) pp 1270-1275

SHALBAYEVA, G. B., NIKOLAYEVA, T. V., MIL'CHENKO, Ye. N., KALYUZHNAJA, R. I.  
and ZEZIN, A. B., Moscow State University imeni M. V. Lomonosov

[Abstract] Synthesis and properties of heterogenic mixtures of elastomers and polyelectrolyte complexes are described. An interesting property of these materials is the electrostatic interaction between particles from different phases. These materials are shown to be heterogenic mixtures in which the polymer components are incompatible. At relatively low level of the polycomplex in the study mixture, phase inversions took place. At a certain percentage of the content of polyacrylic acid (PAA) these mixtures became brittle: PAA-polyethyleneimine (PEI)--acrylic latex (L-I)  $\geq 30\%$ ; PAA--poly-N,N-dimethylaminoethylmetacrylate (DAM--L-I)--L-I  $\geq 40\%$  and PAA--PEI--L-II or PAA--PEI--L-III  $\geq 50\%$ . To obtain a continuous phase, large quantity of polyelectrolyte complex containing DAM must be introduced. Figures 5; references 14: 12 Russian (2 by Western authors), 2 Western.  
[307-7813]

WATER TREATMENT

UDC 678.5:541.183.12:628.543:547.415.1

CLEANSING EFFLUENTS OF ETHYLENEDIAMINE BY ION EXCHANGE

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 84 pp 45-46

KUZNETSOVA, Ye. M., KABOSHINA, T. A., CHUPRIK, N. N., KROL', I. Ts. and PROKHOROVA, V. A.

[Abstract] During production of one type of polymer, effluents are formed which are contaminated with ethylenediamine (EDA) in amounts of 600-2800 mg/l, and with hydrofluoric acid salts of EDA in amounts of 100-110 mg/l. In the present work a study was made of the feasibility of using ion exchange with KU-2 and KU2X8 in  $H^+$  for to treat such effluents. It was found that ion exchange can be used successfully if the effluent is first treated by reverse osmosis. References 5 (Russian).  
[318-12765]

UDC 621.359.7

ELECTROCHEMICAL DESALINATION OF WATER UNDER CONDITIONS OF PERIODIC TREATMENT OF DESALINATION CHAMBERS WITH HYDROGEN PEROXIDE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 5, May 84  
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[Abstract] The process of demineralization of solutions by electrodialysis through granular ion exchange resins has been known for a long time. The reason why this method has not found wider applicability thus far is that the ion exchange resins are subject to "poisoning", thus lowering the effective performance of the column. There are many methods of preventing the aging process of ion exchange columns. In the present study it was shown that a treatment of the desalination chamber with 0.3%  $H_2O_2$  solution once a week prevented it from being "poisoned". Because it was suspected that the aging process alone could not be responsible for the poisoning of ion exchange resins, further experimentation showed that indeed there are two factors contributing to this: destruction products of the housing and bacterial products growing on the exchange resins. Figures 2; references 9: 8 Russian, 1 Western.  
[303-7813]

SPONTANEOUS DECOMPOSITION OF HYDROGEN PEROXIDE SOLUTIONS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 4, Apr 84  
(manuscript received 7 Jun 82) pp 387-391

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[Abstract] Using permanganate titrations and manometric or volumetric measurement of oxygen evolution, the kinetics of hydrogen peroxide decomposition in aqueous solutions were studied at pH 1-12 and 25-90°C. Dissolved oxygen was determined polarographically. Oxygen evolution was maximal at pH 11 and was not altered by coating the vessel walls with paraffin. The reaction exhibited the induction period and self-quenching typical of a chain reaction. The reaction order was close to 1.5 in acid medium and close to 2 in base. Measurements of oxygen concentration in the solution indicated that its level is determined by solubility and the ratio of the rate of production to the rate of removal. Bubbling air through the reaction mixture accelerated the reaction, giving a reaction order of 2.4. Figures 4; references 13: 7 Russian, 6 Western.  
[276-12126]

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