67268

SOV/20-129-4-36/68

Investigation of the Temperature-dependent Transformations in Synthetic Polymers With Rigid Chains

transformed, it was plastified according to two methods: a) by the addition of a polymer with elastic chains (copolymer of caprolactam with hexamethylenediamine and adipic acid), b) by swelling in cresol. Figure 1 shows the influence exerted by temperature on polyurea plastified by copolymer. With the addition of 75% copolymer, two processes may be observed: First, transition to the viscous state occurs, after which vitrification follows at a certain temperature. The behavior of polyurea swelled in cresol is shown in figure 3. Also in this case the viscous state occurs with an increase in temperature. On the basis of these results the authors point out the following two possibilities: 1) Hardening of polymers with elastic chains by the admixture of polymers with rigid chains, and 2) reduction of temperature by plastification in order to make working with polymers with rigid chains possible. There are 3 figures and 5 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

Card 2/3

5.3931
~~5(4)~~

67926
SOV/20-129-5-36/64

AUTHORS: Iovleva, M. M., Kozlov, P. V., Kargin, V. A., Academician

TITLE: The Solubility of Grafted Copolymers on the Basis of Polystyrene and Acrylic Acid

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 5, pp 1093-1095 (USSR)

ABSTRACT: Since grafted polymers often feature the thermodynamic properties of their initial components (Refs 1-3) the authors investigated whether in this case actual components in the sense of Gibb's phase rule are concerned. They determined the number of the phases and the degrees of freedoms in a system consisting of the copolymer of polystyrene with 5 or 22% acrylic acid [+], benzyl alcohol [+], and methyl alcohol. Methyl alcohol was added to the solutions of the copolymer of different concentrations in benzyl alcohol, and the beginning of turbidity was determined by means of a photoelectric colorimeter. Two phases were observed: Solution of methyl alcohol in benzyl alcohol and solution of the copolymer in benzyl alcohol. The phase diagram (Fig 1) shows that the critical concentrations at which turbidity occurs, are on a straight line and that the copolymer

Card 1/2

KARGIN, V.A.

PHASE I BOOK EXPLOITATION SOV/4985

International symposium on macromolecular chemistry. Moscow, 1960.

Mezhdunarodnyy simpozium po makromolekulyarnoy khimii, SSSR, Moskva, 14-18 iyunya 1960 g; doklady i avtoreferaty. Sektsiya II. (International Symposium on Macromolecular Chemistry Held in Moscow, June 14-18; Papers and Summaries) Section II. [Moscow, Izd-vo AN SSSR, 1960] 559 p. 5,500 copies printed.

Sponsoring Agency: The International Union of Pure and Applied Chemistry, Commission on Macromolecular Chemistry

Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemists interested in polymerization reactions and the synthesis of high-molecular compounds.

COVERAGE: This is Section II of a multivolume work containing papers on macromolecular chemistry. The papers in this volume treat mainly the kinetics of various polymerization reactions initiated by different catalysts or induced by radiation. Among the research techniques discussed are electron paramagnetic resonance spectroscopy and light-scattering interpolation. There are summaries in English, French and Russian. No personalities are mentioned. References follow each article.

19

AVAILABLE: Library of Congress

Vinyl Compounds

31

45

PHASE I BOOK EXPLOITATION SOV/4842

Kargin, Valentin Alekseyevich, and Grigoriy L'vovich Slonimskiy

Kratkiye ocherki po fiziko-khimii polimerov (Brief Papers on the Physicochemistry of Polymers) [Moscow] Izd-vo Mosk. univ., 1960. 173 p. 2,000 copies printed.

Ed.: S.Ya. Mirlina; Tech. Ed.: M.S. Yermakov.

PURPOSE: This book is intended for persons desiring to familiarize themselves with the basic scientific concepts of the physics and chemistry of polymers.

COVERAGE: The book presents in a series of short review articles data on the structure, mechanical properties, and thermodynamic properties of polymers and their solutions. The authors note changes in the old ideas concerning the relationship between the structure and properties of polymers since the discovery of the globular and block structure of polymers. New ideas in the field are discussed in cases where they have already been generally accepted. The authors thank S.Ya. Mirlina. There are 14 references, all Soviet.

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A161/A130

25527

15 8330

AUTHORS: Perov, B. V., Candidate of Technical Sciences; Kargin, V. A., Academician; Gudimov, M. M., Candidate of Chemical Sciences

TITLE: Production of oriented polymethyl metacrylate and manufacture of articles from it

PERIODICAL: Vestnik mashinostroyeniya, no. 1, 1960, 70-75

TEXT: The information presents the results of investigations and experiments which have been undertaken in view of lack of process and equipment data in special literature, including foreign sources. Methods studied in the subject experiments were: 1) double blister settling method; 2) two-dimensional stretching of sheets; 3) calendering; 4) pressing. Two-dimensional multi-axial stretching and pressing proved technically best and cheapest. Several machines have been developed. Their work principle is stretching of a sheet in 12 radial directions. Sheets up to 2 m in diameter and 15 mm thickness can be obtained, which a stretching degree $\varepsilon = 50 \div 60\%$. The major machine element is the pulling unit consisting of a bevel gear couple, one of the gears moving on thread on a screw, i.e., the gear works as a nut, and moves the screw with a grip

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Production of oriented polymethyl ...

attached to it. The machine has 12 such units: one of them is connected to a worm gear reducer and drives the entire system. The stretching effort is determined by calculation, for producing tension stress of 10 kg/cm². The same principle is used in machines for producing square sheets. Pre-stretching was determined with the formula

$$\varepsilon_{pr} = \left(\sqrt{\frac{h_{init}}{h_{fin}}} - 1\right) 100\% \qquad (1)$$

where h_{init} and h_{fin} is the initial and the final sheet thickness in mm. The formula has been derived by simple mathematical transformations of an equation expressing the constancy of volume before and after stretching. The empirically determined relation between the linear stretching L (measured with a nonius on one of the grips) and the stretching degree (found with Formula 1) is:

$$L = \frac{D\varepsilon_{pr}}{200}$$

where D is the blank diameter. The orientation method by compression has been developed as well, for producing sheets, for instance, of 750 x 750 mm size and 25 mm thickness. In both methods the temperature of material must exceed its

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A161/A130

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Production of oriented polymethyl ...

softening point by 15-10°C. Heating to a higher temperature spoils the properties, and a lower temperature cannot be used because of an abrupt load increase on the machine drive and micro-cracks on the material. The strength of polymethyl acrylate increased with increasing stretching degree to 50-70% considerably, and after this limit the growth of mechanical properties was only slow, except for impact resistance (α_k) increasing evenly to the stretching degree $\varepsilon = 120 \div 130\%$. The static strength of parts from oriented material proved double comparing with parts from nonoriented; oriented glass did not split from sharp nail hammered into it (nonoriented split after penetration of the nail to 1/3 of depth). Oriented glass withstood bending tests in all temperatures except of below -60°C. Other advantages of oriented glass are: surface crack resistance dozens of times higher than of nonoriented; lower thermal expansion. Parts from oriented glass are produced with bending and fixing in frames and subsequent heat treatment to fix the shape. Cylindrical parts are formed in the same way. Orientation of heat-resistant organic glass decreases its inherent brittleness. N. D. Sobolev is mentioned having participated in the work. There are 9 figures and 1 table.

Card 3/3

S/030/60/000/05/15/056
B015/B008

AUTHORS: Kargin, V. A., Krentsel', B. A., Rokhlin, M. I., Smirnov, V. S.

TITLE: International Symposium on Macromolecular Chemistry and the Exposition of Synthetic Materials in the German Federal Republic

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 5, pp. 68-74

TEXT: The Symposium was convened by the Commission of High-molecular Compounds of the International Association for Pure and Applied Chemistry and was held at Wiesbaden (German Federal Republic) from October 12 to 17, 1959. It was attended by some 1200 scientists from 22 countries. The Soviet delegation consisted of 29 representatives of the USSR. Problems of the physics of the polymers, high-molecular compounds in solutions, the elementary acts as well as the kinetics of polyreactions, the chemistry of organic and inorganic high-molecular compounds, the natural high-molecular compounds and models were discussed. G. P. Mikhaylov

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S/030/60/000/05/15/056
B015/B008

International Symposium on Macromolecular Chemistry and the Exposition of Synthetic Materials in the German Federal Republic

reported on the investigation results of the molecular relaxation in polymers by means of the dielectric method. V. A. Kargin stated that the globules are to be considered as primary elementary structures in the orientation and crystallization of polymers. S. S. Medvedev showed that the development of cationic chains is directly linked with the formation of complexes between the catalyst and monomer. G. Mark (USA) mentioned in his report papers by Soviet scientists, especially the investigations by K. A. Andrianov in the field of the synthesis of organosilicon polymers. The authors describe next the International Exposition of Synthetic Materials which was held at Duesseldorf from October 17 to 25, 1959, and at which 21 countries (over 670 firms) were represented. The authors state that about one half of the exhibits consisted of machines and the other half of finished products. Among synthetic materials, polyvinyl chloride, polyethylene and reinforced plastics are especially mentioned, the authors referring to the papers by V. A. Kargin and N. A. Plate. It is underlined finally that the work of the experts in the field of new processing methods is to be regarded as being as important as the creation of new polymers. There is 1 Soviet reference.

Card 2/2

87642

S/191/60/000/012/001/016
B020/B066

11.2210 also 2209,

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin, V.A.

TITLE: Impact-resistant Polyvinyl Chloride

PERIODICAL: Plasticheskiye massy, 1960, No. 12, pp. 2 - 3

TEXT: Heat resistance and impact of PVC are comparatively low which considerably confines its range of applicability in spite of its other good properties. It is possible to increase the impact strength of PVC by synthesizing vinyl chloride polymers grafted with various rubbers, by means of a chain transfer reaction. The mechanical properties of Viniplasts obtained by this method are, however, no better than those of Viniplast made of PVC. The present paper investigates the physical and thermomechanical properties of Viniplast obtained from compositions consisting of PVC coplasticized with a polar synthetic rubber (PSR). Owing to interaction of functional groups of PVC with the rubber, interlaced structures of grafted copolymers are formed. PVC was mixed with stabilizers (litharge, calcium stearate) which were hot-rolled along with the adequate amount of PSR. Plates were cut from thin foils of the rolled

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Impact-resistant Polyvinyl Chloride

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material, and a stack of them was hot-pressed. In the test of Viniplast containing 10% PSR of different types, its physical and mechanical properties ranged within the following limits: specific impact strength from 57.2 to 84.8 kg·cm/cm^2 (8.6 for initial PVC); maximum tensile strength from 397 to 530 kg·cm^2 (550 for PVC); vitrification point between 76 and 80°C (75°C for PVC). The addition of 10% PSR to the Viniplast, thus, increases the specific impact strength up to the 6 to 10 fold, whereas the tensile strength is somewhat reduced, and the vitrification point is maintained. The dependence of the specific impact strength, tensile strength and relative elongation on the rubber content in Viniplast was investigated (Figs.1-3). The optimum ratio of PVC:PSR for obtaining Viniplast with high specific impact strength is 90:10 (Fig.1). The introduction of 2.5% rubber increases the impact strength of Viniplast to the threefold. At a rubber content of 15 - 50%, Viniplast samples were not destroyed in the impact test owing to their high elasticity. With increasing rubber content, tensile strength and relative elongation of the material (Figs.2,3) decrease, and the surface of Viniplast becomes uneven and rough, beginning from a rubber addition of 25 - 30%. The temperature dependence of the specific impact strength

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Impact-resistant Polyvinyl Chloride

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of impact-resistant Viniplast was studied in a range of from -60° to +60°C, and it was found that a Viniplast with 5 and 10% PSR exceeds a Viniplast from PVC even at a temperature below 0°C. The specific properties of impact-resistant Viniplast become particularly manifest at room temperature. The absolute value of the specific impact strength could only be determined at temperatures below zero. Table 1 gives comparative data of this factor obtained on compositions with 90% PVC and 10% PSR, and on PVC samples. The principal physical and thermomechanical properties of impact-resistant Viniplast, as well as of PVC-Viniplast, are presented in Table 2. There are 4 figures, 2 tables, and 1 Soviet reference.

X

Card 3/3

USMANOV, Kh.U.; KARGIN, V.A.; AYKHODZHAYEV, B.I.; INOYATOV, N.Sh.

Upgrading of cotton cord by means of ozonization. Vysokom. soed. 2 no.1:88-91 Ja '60. (MIRA 13:5)

1. Institut khimii polimerov AN UzSSR.
(Ozone) (Cotton)

KARGIN, V.A.; KABANOV, V.A.; METEL'SKAYA, T.K.

Polymerization on a potassium - carbon black catalyst. Vysokom. soed. 2 no.1:162-165 Ja '60. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova. Khimicheskiy fakul'tet.

(Polymerization) (Potassium) (Carbon black)

KARGIN, V.A.; PLATE, N.A.; SHIBAYEV, V.P.

Plasticization of polyvinyl alcohol - styrene and polyacrylic acid-styrene graft copolymers. Vysokom.soed. 2 no.1:166-173 Ja '60. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet. Khimicheskiy fakul'tet.
(Styrene) (Vinyl alcohol) (Acrylic acid)

81611

S/190/60/002/02/10/011
B004/B061

5.3831

AUTHORS: Kargin, V. A., Kabanov, V. A., Zubov, V. P.

TITLE: Synthesis of Isotactic Polymethylmethacrylate by Polymerization of the Frozen Monomer

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 2, pp. 303 - 305

TEXT: This is a continuation of the work of the authors in Refs. 1 and 2. It was established there that methylmethacrylate (MMA) can be polymerized in the solid state if it is condensed in vacuo with magnesium vapor on a surface cooled by liquid nitrogen. The polymerization sets in between -100 and -110°C, proceeds rapidly and even explosively if heat dissipation is insufficient. The polymethylmethacrylate obtained in this way is a homogeneous polymer containing no free magnesium but 0.5 wt% of bound Mg. It forms transparent solutions in toluene and dichloroethane. Fig. 1 shows the thermomechanical curve of such a polymer. Its softening temperature of +50°C is considerably lower than that of

Card 1/2

Synthesis of Isotactic Polymethylmethacrylate by Polymerization of the Frozen Monomer

81611

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B004/B061

polymethylmethacrylate synthesized in the normal manner. The polymer crystallizes after swelling in heptanone-2. Its X-ray picture is shown in Fig. 2. Its properties agree with those of isotactic polymethylmethacrylate obtained by polymerization of MMA with lithium alkylene in a nonpolar medium (Refs. 3 and 4). The authors conclude from this that the order of the monomer existing in the solid phase favors the development of the isotactic microstructure of the polymer chains. They mention a paper by A. A. Korotkov et al. (Ref. 4). There are 2 figures and 5 references: 3 Soviet and 2 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet, khimicheskiy fakul'tet (Moscow State University, Department of Chemistry)

SUBMITTED: December 2, 1959

Card 2/2

KARGIN, V.A.; KABANOV, V.A.; PLATE, N.A.; PAVLICHENKO, N.P.

Plasticization of block copolymers of acrylic acid and styrene.
Vysokom. soed. 2 no. 3:433-440 Mr '60. (MIRA 13:11)

1. Moskovskiy gosudarstvennyy universitet, Khimicheskiy
fakul'tet.
(Acrylic acid) (Styrene) (Polymers)

KARGIN, V.A., akademik

Structure of cellulose and the place it occupies among other polymers. Vysokom. soed. 2 no. 3:466-468 Mr '60.
(MIRA 13:11)

1. Moskovskiy gosudarstvennyy universitet, Khimicheskiy fakul'tet.
(Cellulose)

84512

15.8102 2209 only
15.8500 2109, 1372

S/190/60/002/004/013/020
B004/B056

AUTHORS: Kargin, V. A., Marchenko, I. Yu.

TITLE: The Problem of the Vitrification Temperature of Crystalline Polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 4, pp. 549-553

TEXT: The authors refer to a previous paper (Ref. 1), in which they showed that the vitrification temperature is an important characteristic feature for determining the working temperature of a polymer. In the present paper, they describe thermomechanical investigations carried out on polypropylene. The latter was produced by means of various systems of catalysts (titanium chloride-aluminum alkyl catalysts, $CrO_3/Al_2O_3.SiO_2$) at the laboratory for polymerization of the authors' institute. From the reaction product, the atactic, amorphous fraction I was obtained by means of ether, and the crystalline fraction II by means of n-heptane. The insoluble fraction III was an isotactic polymer. The molecular weight

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The Problem of the Vitrification
Temperature of Crystalline Polymers

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B004/B056

was determined by measuring the viscosity in decalin at 120°C. The vitrification temperature was determined by means of a dynamometric scale at stresses of between 0.3 and 510 kg/cm^2. The deformation occurring after 10 sec was also measured. Figs. 1-3 show the deformation (in %) as a function of temperature. Fig. 1 shows that in fraction I, the range of highly elastic deformation is limited by the vitrification temperature (-10 - -15°C) and the flow temperature. The vitrification temperature does not depend on the molecular weight; the flow temperature increases with increasing molecular weight. The crystalline polypropylene undergoes no deformation within a wide temperature range, and becomes viscous at its melting point (Fig. 2). If however, it is rendered amorphous by heating above melting temperature and subsequent quick cooling, then a region of a highly elastic state appears in the diagram, which, like in the atactic polymer, begins at -10°C. At high temperatures, however, deformability again decreases on account of recrystallization. The vitrification temperature was determined on the crystalline polymer, at a stress of 510 kg/cm^2 (Fig. 3). Above -10°C, the diagram shows a low stage that corresponds to the highly elastic range of the amorphous polymer:

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84512

The Problem of the Vitrification Temperature of Crystalline Polymers

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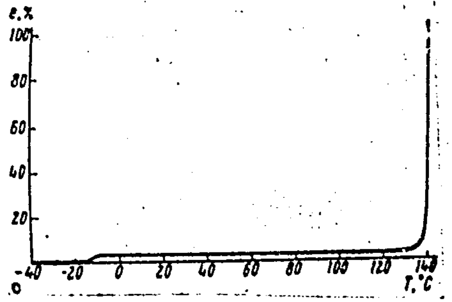
B004/B056



Legend to Fig. 3: Thermomechanical curve of crystalline polypropylene; stress, 510 kg/cm^2

Furthermore, the vitrification temperature was determined by uniaxial extension of films on a dynamometer (Figs. 4 and 5). Below the vitrification temperature, all crystalline polymers without orientation underwent breakage at low deformation. Polypropylene becomes brittle between -10 and -15°C. Above vitrification temperature, the structure

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The Problem of the Vitrification Temperature of Crystalline Polymers
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B004/B056

becomes orientated, the film becoming anisotropic. Its strength increases two or three times; so, repeated extension is possible only by means of higher stress above +15°C. Perpendicular to the orientation axis, the film still remains extensible at -65°C, and its strength rises to 1000 kg/cm^2. The vitrification temperature is thus lowered down to the lower temperature holding for other polymers with flexible chains. The range of working temperature is thus extended. The authors thank B. A. Krentsel' for his assistance in this work. There are 5 figures and 5 references: 5 Soviet and 1 German.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis AS USSR)

SUBMITTED: January 7, 1960

Card 4/4

83822

S/190/60/002/005/012/015
B004/B067

15.8105 also 2209

AUTHORS: Kargin, V. A., Kabanov, V. A., Zubov, V. P.

TITLE: Formation of Isotactic Polymethylmethacrylate on Photopolymerization in the System Methylmethacrylate - Zinc Chloride

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 5, pp. 765-769

TEXT: Proceeding from papers on the formation of stereoregular polymers (Refs. 1-4) the authors studied the influence exerted by inorganic salts capable of fixing a short-range order on the microstructure of a polymer chain. The experiments were made in a special set of ampoules (Fig. 1). Ampoule 1 contained methylmethacrylate, ampoule 2 $ZnCl_2$, and ampoule 3 benzoyl peroxide. The dehydration of the reagents by heating and evacuation is described. The monomer was then condensed in ampoule 2. A saturated solution of $ZnCl_2$ was produced in the monomer and polymerized in ampoule 3 under the action of ultraviolet light of a ПРК-2 (PRK-2)

Card 1/2

Formation of Isotactic Polymethylmethacrylate on Photopolymerization in the System Methylmethacrylate - Zinc Chloride

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B004/B067

mercury lamp at 20°C. The polymer obtained, which was purified by dissolution and reprecipitation, showed isotactic structure. It had a density of 1.22 g/cm³ and a vitrification temperature of about 65°C, whereas the syndiotactic polymer (Refs. 5, 6) had a density of 1.18 - 1.19 g/cm³ and a vitrification temperature of 115 - 135°C. The authors discuss the change in the probability of formation of d,l- or d,d- (l,l-) configurations during the polymerization (Figs. 2, 3), caused by the crystal field fixing the short-range order. Isotactic polymerization requires a screwlike structure which is stabilized by $ZnCl_2$ molecules through complex formation with the ester groups of the polymer radicals and with the monomer molecules (Fig. 4). There are 4 figures and 8 references: 4 Soviet and 4 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: February 2, 1960

Card 2/2

BERESTNEV, V.A.; GATOVSKAYA, T.V.; KARGIN, V.A.

Investigation of the structural changes in fibers by measurements of their specific surface areas and pore volumes. Vysokom.soed. 2 no.6:916-925 Je '60. (MIRA 13:6)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova i Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Fibers) (Sorption)

83706

15.8108 also 2209

S/190/60/002/006/011/012
B015/B064

AUTHORS: Makaruk, L., Kozlov, P. V., Kargin, V. A.

TITLE: Investigation in the Field of Polycarbonates. II. Electron Microscopic Examination of the Structure of Polycarbonates

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 6, pp. 931-936

TEXT: Electron microscopic examinations were made of the secondary structure of 2,2-bis-(4'-oxyphenyl)-propane polycarbonate. Basing on the data of the method of experimenting and the results obtained, the authors discuss the concept of flexible and rigid molecule chains and, among other things, they indicate that differentiation should be made between two types of links of polymer chains, i.e. the chemical and the kinetic chain link of polymer molecule chains. The examinations were made with a УЭМ-100 (UEM-100) electron microscope. High-molecular polycarbonate fractions were used (molecular weight 83000 and 230000) whose secondary structure was produced in three ways: 1) by evaporating the solvent from very dilute polycarbonate solutions (chlorobenzene, benzene), 2) by separation from

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83706

Investigation in the Field of Polycarbonates.
II. Electron Microscopic Examination of the
Structure of Polycarbonates

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B015/B064

dilute solutions (toluene, m-xylene, ethylbenzene and cyclohexanol) in the cooling of the solutions, and 3) by precipitating the polycarbonates with methanol from dilute solutions in methylene chloride. Figs. 1-12 show the structure. In the two first-mentioned ways of production, polycarbonates with a strongly asymmetrical, fibrous structure are obtained. This structure is due to a linkage of the primarily formed structure of the chain packets, and undergoes no morphological change no matter whether the chains of the packets are crystalline or amorphous. This is in agreement with the findings of the author in a previous paper (Ref. 1), and apparently explains the specific character of the mechanical properties of these polymers, especially/the high impact strength; the elasticity may be ascribed to the fibers of the polycarbonate. On precipitating with methanol, a spherical structure that is characteristic of colloidal systems occurs. This structure is unstable, and in the case of heating the fiber structure typical of polycarbonates is formed. There are 12 figures and 7 references: 4 Soviet and 3 German.

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83706

Investigation in the Field of Polycarbonates. II. Electron Microscopic Examination of the Structure of Polycarbonates

S/190/60/002/006/011/012
B015/B064

ASSOCIATION: Moskovskiy gosudarstvennyy universitet Khimicheskiy fakul'tet (Moscow State University, Department of Chemistry)

SUBMITTED: February 27, 1960

X

Card 3/3

IOVLEVA, M.M., KOZLOV, P.V.; KARGIN, V.A.

Thermodynamic study of the interaction between graft copolymers and the solvent. Vysokom.soed. 2 no.6:937-941 Je '60.

1. Moskovskiy gosudarstvennyy universitet.
(Polymers) (Styrene) (Acrylic acid)

87029

15.8500

S/190/60/002/007/013/017
B020/B052

AUTHORS: Kargin, V. A., Sogolova, T. I.

TITLE: The Effect of Fillers on the Melting Points of Crystalline Polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 7, pp. 1093-1098

TEXT: High-density polyethylene (with a melting point of 140°C) was investigated. Compounds were chosen as fillers as do not react with polyethylene, and whose melting points are considerably higher than that of polyethylene. These fillers were introduced into the melted polymer by calenders, and remained in the solid state. Hence it could be assumed that they affect the crystalline state of the polymer, without, however, impairing the structure of the chain molecules. Since the change in the crystalline state mainly affects the melting point, the effect of the filler addition on the melting point of polyethylene was investigated first. Therefore, the deformability of the crystalline polymers with different filler amounts in a wide range of temperatures, was investigated by

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The Effect of Fillers on the Melting Points of Crystalline Polymers

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dynamometric scales (Ref. 3). On the basis of the thermomechanical curves obtained (Fig. 1), the effect of the filler on the melting point of crystalline polyethylene was investigated. The addition of anthracene, anthraquinone, coke, quartz powder, KCl, aluminum naphthenate, asbestos powder, PbS et al. in different amounts do not affect the melting point of crystalline polyethylene. The mechanical properties of polyethylene (strength, elongation), however, change within a wide range (see Table). The independence of the melting point of crystalline polyethylene from the use of chemically inert, solid fillers, and at the same time the change of a series of mechanical properties prove that solid fillers only decompose the secondary structures in the polymer, the structure of the primary crystalline range remaining unaffected. The decomposition of the crystalline polymer structure by the addition of substances which chemically react with it, was investigated in the crystalline polyamide Γ-548 (G-548) (melting point of 160°) by compounds which are solid at room temperature and have different degrees of dissociation (tungstic, oxalic, and phosphoric acids). For a comparison, the weakly dissociated formic acid was also used. The thermodynamic curves of these mixtures are shown

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The Effect of Fillers on the Melting Points of Crystalline Polymers

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in Fig. 2. It was found that the melting point of the crystalline polyamide was reduced. Finally, metal oxides (CaO, ZnO, MgO, VO_3) were used as fillers for the crystalline polyamide. They slightly affect the melting point, but considerably increase the flowing point of the polymer. The addition of larger quantities of metal oxides as fillers causes the formation of materials which are highly elastic or solid above the melting point of the crystalline initial polymer. With very large amounts of metal oxides in crystalline polymers, they lose their fluidity altogether. There are 3 figures, 1 table, and 3 Soviet references.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: March 21, 1960

Card 3/3

86293

S/190/60/002/008/004/017
B004/B054

11.2210 also 2209

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin, V. A.

TITLE: Modification of Polyvinyl Chloride by Rubbers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 8, pp. 1188-1192

TEXT: The authors attempted to make graft copolymers from vinyl chloride and rubbers. In contrast to the unsuccessful copolymerization with the aid of latex reported on in Ref. 2, they used coarsely disperse rubber emulsions. Photogelatins, Sulfanole, or polyvinyl alcohol were used as emulsifiers. Copolymerization was conducted by two methods: 1) Swelling or dissolving of the rubber in vinyl chloride at 40-70°C, and subsequent polymerization in an autoclave after adding ammonium persulfate as initiator; 2) rolling of the rubber with ammonium-persulfate powder at room temperature, and subsequent copolymerization with vinyl chloride in an autoclave at 60-70°C. Viniplast was made from the reaction products by adding calcium stearate, lead monoxide, Neozone D, and transformer oil, kneading at 155-170°C, and pressing. The resulting products showed worse physical

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Modification of Polyvinyl Chloride by Rubbers S/190/60/002/008/004/017
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properties than pure polyvinyl chloride. On the other hand, a joint plastification of polyvinyl chloride (PVC) of the type ПФ-4 (PF-4) with НК (NK) natural rubber, СКБ(SKB) butadiene rubber, СКИ (SKI) isoprene rubber, СКН-26 (SKN-26) butadiene-nitrile rubber, and chloroprene rubber (nairit), led to the following results:

PVC combined with:	Content of rubber, %	toughness kg·cm/cm^2	tensile strength kg/cm^2	relative elongation, %
(without rubber)	0	8.6	550	82
natural rubber	10	9.7	354	4.4
butadiene rubber	10	6.7	350	5.8
isoprene rubber	10	3.7	357	9.7
nairit	10	16.5	437	81.5
butadiene-nitrile rubber	10	34.6	551	100

Rubbers with marked polarity (nairit, SKN-26) showed double to fourfold toughness. Hydrogen bonds are likely to form between the polar rubber and PVC. There are 2 figures, 2 tables, and 7 references: 1 Soviet, 4 US, 1 Belgian, and 1 French.

SUBMITTED: March 21, 1960

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S/190/60/002/008/016/017
B004/B054

AUTHORS: Kargin, V. A., Bakeyev, N. F., Li Li-shen, Ochapovskaya, T. S.

TITLE: Electron-microscopic Investigation of the Crystalline Structures of Polystyrene and Polypropylene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 8, pp. 1280-1282

TEXT: This paper is a preliminary report on the production and electron-microscopic investigation of monocrystals of isotactic polystyrene and polypropylene. It was found as a condition for the formation of monocrystals that crystallization takes place above the vitrification temperature. Therefore, 0.01 - 0.05% solutions of the polymers were heated to boiling in xylene, and cooled in a Dewar-vessel system for 2-3 weeks. In the case of polypropylene, trichloro ethylene heated to 87°C was also used as a solvent. As a second variant, the polystyrene solution heated to 110°C was applied to a hot collodion base, and crystallization took place by evaporation of the solvent. Monocrystals with a size of up to 100 μ were observed in the

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Electron-microscopic Investigation of the Crystalline Structures of Polystyrene and Polypropylene

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electron microscope. The polystyrene crystals showed a fibrous structure. The fibers were directed perpendicular to the longer diagonal of the rhomb, the c-axis was perpendicular to the base surface. Crystals of a laminated structure were formed in the case of polypropylene crystallized from xylene, rhombic crystals, however, from trichloro ethylene. A preliminary electron diffraction study showed that the molecular chain in these crystals had a similar folded conformation as had been found in other polymers. [Abstracter's note: The text refers to 8 figures, but two only are given]. There are 2 figures and 8 references: 2 Soviet, 2 US, 2 British, 1 German, and 1 Italian.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: May 4, 1960

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83481

15.9110 also 2109, 2209

S/190/60/002/009/013/019
B004/B060

AUTHORS: Selikhova, V. I., Markova, G. S., Kargin, V. A.

TITLE: X-Ray Investigation of Oriented Gutta-percha Films in the Range of Melting Temperatures

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 9, pp. 1398-1401

TEXT: The authors wanted to determine the temperature ranges for the three modifications (α, β, γ) of gutta-percha. The sample used was gutta-percha obtained from Euonymus, with a molecular weight of about 30,000. The films were prepared from a gutta-percha solution in CCl_4 at room temperature. Likewise at room temperature, the films were stretched by 400%. The X-ray structural analysis was made by a camera described in Ref. 7 for high temperatures, and by a УРС-70 (URS-70) universal apparatus for X-ray structural analyses at temperatures between room temperature and 80°C. Figs. 1-6 show the X-ray diffraction pictures obtained. Furthermore, the authors examined the fusion of films irradiated with Co^{60} in vacuum. The following results were obtained: The β-modification is stable up to 56°C.
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X-Ray Investigation of Oriented Gutta-percha Films in the Range of Melting Temperatures

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At higher temperatures, fusion sets in along with transition to the α-modification which melts at 64°C. The γ-modification is stable at still higher temperatures, and melts only at 76-78°C. The α- and β-modifications exhibit a better orientation of chains than the γ-modification. Radiation doses of $75 \cdot 10^6$ - $100 \cdot 10^6$ roentgens do not bear any influence on the crystal structure; there occurs, however, a change in the melting processes. At $75 \cdot 10^6$ r, the transition of the β- into the α-modification takes place unchangedly at 55°C. The α-modification melts at 63°C, but no more γ-modification forms on cooling. At $100 \cdot 10^6$ r, a complete transition of the β-modification into the α-modification does not even take place at 78°C. Evidently, this radiation dose gives rise to a cross-linking which renders the relaxation of chains and the transition to the α-modification impossible. There are 6 figures and 7 references: 2 Soviet, 3 US, and 2 British.

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ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: April 13, 1960

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88540

S 3831

S/190/60/002/010/013/026
B004/B054

AUTHORS: Kargin, V. A., Markova, G. S., and Kovaleva, V. P.

TITLE: A Study of the Structure and Properties of Copolymers of Ethylene With Propylene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 10, pp. 1531-1534

TEXT: The authors made comparative studies of regular polyethylene and polypropylene, and of copolymers containing 4, 8, 10, 20, 54, and 73.6% of propylene. The electron diffraction was taken by means of an ЭМ-4 (EM-4) electron diffraction camera of the ГОИ(GOI) system, and the ring diameter was measured by an ИЗА-2 (IZA-2) comparator. The electron diffraction pictures (edp) for polyethylene and polypropylene corresponded to published data (Ref. 1). In the copolymers with 4-54% of propylene, the edp corresponded to those of polyethylene. Only at a content of 73.6% of propylene, the polyethylene edp is superposed by polypropylene edp. The edp of the copolymers had the same structure as those of the individual components. Neither intermediate structures nor changes of the lattice parameters have been observed that might indicate a stress in the crystals.

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A Study of the Structure and Properties of Copolymers of Ethylene With Propylene

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The spectrum analysis showed that the intensity of the 1372 cm^{-1} absorption band of the CH_3 group increased almost proportionally with the propylene content. The dynamometric investigations showed that the copolymer becomes amorphous with increasing irregularity of the chains. Fig. 1 shows that the copolymer with 4% of propylene exhibits a curve, corresponding to regular polyethylene, for the elongation as a function of load, whereas the copolymer with 73.6% of propylene yielded a curve typical of amorphous polymers. With increasing irregularity of the chain, the recrystallization stress decreases (Fig. 2), the minimum lying at 73.6% of propylene. Further, the temperature of the transition from the vitreous into the crystalline state decreases. There are 2 figures and 3 Soviet references.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Institute of Physical Chemistry imeni L. Ya. Karpov)

SUBMITTED: May 17, 1960

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S/190/60/002/011/020/027
B004/B060

AUTHORS: Konstantinopol'skaya, M. B., Berestneva, Z. Ya., Kargin, V. A.

TITLE: Spiral Structures of Polyethylene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 11, pp. 1715 - 1716

TEXT: The authors used electron microscopic analyses to study the structural modifications taking place in polyethylene, when more concentrated solutions were used in comparison with previous experiments. A solution of 0.2% polyethylene in toluene was heated to 110°C and applied onto a colloxyline base. The pictures were taken by a УЭМБ-100 (UEMB-100) electron microscope. Unlike previously described processes (Refs. 1-4), wherein first packets, then planes, and finally crystals were formed, in the experiment concerned the authors first observed fibril structures passing over into planes giving rise in turn to spiral structures: Figs. 5-7. The appearance of these structures is explained by a reduced mobility of the individual molecular segments of

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Spiral Structures of Polyethylene

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the polymer due to higher concentration. There are 7 figures and 5 Soviet references.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: May 27, 1960

Card 2/3

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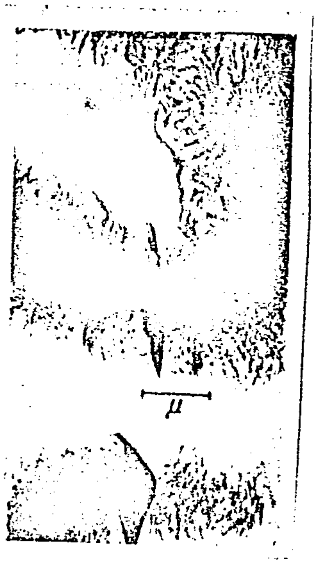

Fig.5

Fig.6

Fig.7

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B004/B060

AUTHORS: Zubov, V. P., Kabanov, V. A., Kargin, V. A., Shchetinin, A. A.

TITLE: Effect of Pressure on the Formation of the Microstructure of Polymer Chains in the Polymerization Process

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 11, pp. 1722 - 1727

TEXT: The ratio k_i/k_s of the reaction rates of the formation of isotactic and syndiotactic structures of a polymer can be influenced by stereospecific catalysts, and also, according to T. G. Fox (Ref.1), by the reaction temperature. The authors wanted to study the effect of pressure on the said ratio k_i/k_s. Proceeding from the theory of absolute reaction rates and taking into account a different compressibility of the initial components and the intermediate complex they obtained the equation: $\ln(k_i/k_s) = \delta V_o^{*} p/RT - \Delta a^{*} p^2/2RT + 2\Delta b p^3/3RT + \ln(k_{oi}/k_{os})$ (7).

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Effect of Pressure on the Formation of the Microstructure of Polymer Chains in the Polymerization Process

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Here, δV_0^* denotes the difference between the volumes of the syndiotactic and isotactic intermediate complexes at normal pressure, Δa^* is the difference between the coefficients of compressibility of the initial components, Δb the difference between the coefficients of compressibility of the intermediate complexes, k_{oi} and k_{os} the rate constants of iso- and syndiotactic addition at normal pressure. The validity of this equation was proved experimentally by way of producing polymethyl methacrylate in a pressure range of 2000-7500 atm. The vitrification temperature of the polymer dropped with pressure increase. Since the isotactic polymer has a vitrification temperature of 50-55°C, and the syndiotactic polymer has one in the range of 130-135°C, the drop of the vitrification temperature means an increase of the isotactic structure content, and thus, an increase of the value of k_i/k_s. It was found by the determination of density ϱ and by taking into account the relation $k_i/k_s = \varrho_i(\varrho - \varrho_s)/\varrho_s(\varrho_i - \varrho)$ that k_i/k_s increases from 0.33 at 1 atm to 0.54 at 7500 atm. The isotactic structure content increases

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Effect of Pressure on the Formation of the Microstructure of Polymer Chains in the Polymerization Process

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from 0.25 at 1 atm to 0.35 at 7500 atm. The difference $\Delta\chi$ of the compressibility coefficients of the iso- and syndiotactic structure was found, by way of experimental data, to have the value of $6.1 \cdot 10^{-6} - 1.8 \cdot 10^{-10}$ p. A pressure increase leads to a preferential formation of the intermediate complex with denser molecular package. P. P. Kobeko is mentioned. There are 2 figures, 1 table and 5 references: 2 Soviet, 2 US, and 1 German.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: June 16, 1960

Card 3/3

86327

15.8102 2209

S/190/60/002/012/014/019
B017/B078

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin, V.A.

TITLE: New Method of Obtaining Graft Copolymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 12, pp. 1839 - 1844

TEXT: A new method of obtaining graft copolymers by interaction between the polymers is suggested by the authors. This method permits to modify halogen-containing polymers with polymers having nitrogen-containing heterocycles. A case in point for such a reaction is the modification of PVC with methylvinylpyridine rubber under the formation of graft copolymers which are salts of quaternary polymer bases. Vinyl plastics obtained from such polymers have an impact strength ten times as high as that prepared solely from polyvinylchloride. Fig.1 illustrates the temperature dependence of some thermomechanical properties of some polyvinyl plastics. The two-stage formation of trimers is explained. Fig.2 illustrates the influence of the rubber content on the properties of polyvinyl plastics.

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New Method of Obtaining Graft Copolymers

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Fig.3 shows the vitrification temperature of polyvinyl plastics as a function of the admixtures. It is demonstrated that the thermal stability of polyvinyl plastics is not impaired by a methylvinylpyridine rubber content up to 25%. The method suggested here may be applied to vulcanize various halogen-containing polymers with methylvinylpyridine rubber. There are 3 figures and 13 references: 9 Soviet and 4 US.

SUBMITTED: May 24, 1960

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9,4300 (1164 ONLY)
5 4100 (2209, 1043, also 1136, 1151)

S/063/60/005/005/003/021
A051/A029

AUTHORS: Kargin, V.A., Academician, Topchiyev, A.V., Academician, Krentsel', B.A., Doctor of Chemical Sciences, Polak, L.S., Doctor of Physico-Mathematical Sciences, Davydov, B.E., Candidate of Chemical Sciences

TITLE: Semiconductor Properties of Polymer Materials

PERIODICAL: Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva im. D.I. Mendeleyeva, 1960, No. 5, Vol. 5, pp. 507-514

TEXT: The authors deal with the problems of developing new classes of polymers with certain predetermined electrophysical properties necessary for industry, particularly semiconductivity. These problems have been one of the main subjects of scientific research in the physics and chemistry of polymers. An analysis of published works on the conductivity of low-molecular organic compounds has shown that their semiconductivity properties are connected with the π-electrons of the conjugated bonds in aliphatic chains

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Semiconductor Properties of Polymer Materials

or rings. "Metal-likeness" is said to be the result of a collection of the π-electrons in a conjugated system, and from this stand-point the polymer macromolecules with conjugated double bonds are of particular interest in the production of materials having special electrophysical properties, including that of semiconductivity. A list of available data is presented on ordinary semiconductors comparing them to the structures and chemical features of polymers. Semiconductors are characterized by the electroconductivity values of 10^{-8}-10 $ohm^{-1} \cdot cm^{-1}$, increasing with an increase in temperature, and a concentration of the charge carriers of about 10^{10}-10^{21} electrons or electronic "holes" in a cm^3. It is pointed out that deviations from stoichiometry or any irregularity of the chain of the macromolecules' main valencies can have the same effect as admixtures in polymers on their semiconductivity properties. The distance between neighboring energy levels being about 10^{-22} ev, the sum total of these is regarded as a compact band about 1 ev wide and the energy value of the electron can be anywhere within this range. This band of energy states is called a zone. For all solid

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bodies, i.e., metals, semiconductors and dielectrics, the lower zone of electronic levels is the wide, so-called valency zone of the electrons fastened to certain atoms. A difference is noted between the listed three types of solid bodies when there is a shift to a higher energy level. Semiconductors having no additional levels in the forbidden zone are called semiconductors with self-conductivity. In the presence of an electrical field the free electrons and "holes" are the charge carriers. It is pointed out that real bodies always contain admixtures, creating admixture levels in the forbidden zone of the semiconductor located either closer to the upper or lower zone, in both cases causing the occurrence of additional admixture conductivity. The admixtures are called donor type in the first case and acceptor type in the second. It is assumed that any irregularity of the macromolecules usually creates acceptor admixtures. The mobility of the charge carriers is said to depend on the temperature and concentration of the admixtures and to decrease with an increase in the temperature and amount of admixture. Special interest is shown in the semiconductor type discovered by de Boer (Ref. 3), where part of the atoms of the lattice is replaced by atoms with almost the same size but a difference in valency. The method by which they are produced was developed for oxide semiconductors,

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and consists in adding metals to the sample having a valency differing by a unit of 1 from the valency of the main metal. It is thought possible to form new synthetic polymers having semiconductor properties by a similar method of introducing metals into the chain of the macromolecule. Ordinary polymers have a certain amount of electroconductivity (Ref. 4,5), which depends on the temperature, and is expressed by $\sigma \sim \exp - \frac{E}{kT}$, where E is a certain activation energy, T the absolute temperature, k Boltzmann's constant. From this relationship the authors have attempted to solve the problem of establishing the connection between the polymer's structure and its electrophysical or electroconductivity properties. In solving this problem they based their analysis on the known aspects of the electroconductivity of low-molecular (including organic) compounds. This was followed by the determination of the characteristic features of the polymer structure. The problem of electroconductivity in organic polymers was divided into two parts: 1) the movement of electrons in the macromolecule, 2) transfer of electrons (or holes) from molecule to molecule. In the first part, an isolated linear macromolecule with the same bonds is analyzed:

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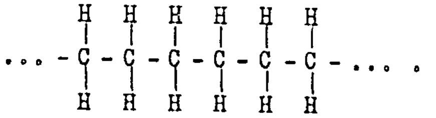

$\ldots - \mathrm{CH_2} - \mathrm{CH_2} - \mathrm{CH_2} - \ldots$

The exact path followed by the potential of the electrical field formed by the electrons and nuclei of this type of system is not known, but the field changes periodically in space, and its period is determined by the periodicity of the molecular chain structure. An electron is theoretically placed into this field and its movement is regarded through the Schroedinger equation for an electron in a periodic field, the solution of which in this case is said to be the wave functions according to Block (Ref. 6): $\Psi = \varphi_{\eta} e^{i-h-x}$, where $\varphi_{\eta}(x)$ is a function depending on the wave number η, and is periodic relative to x; the magnitude of the period is determined by the structure of the molecule: by the length of the interatomic bonds, etc. This solution causes a zonal structure (Ref. 4,5). In calculating these fields the authors state that the theory of disturbance of quantum mechanics is used analyzing two extreme cases: a) a strong bond, b) a weak bond. It is pointed out that a real macromolecule can have conductivity if there are electrons in it whith sufficient probability of shift under the effect of an external electrical field with its component along

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the molecular chain. The authors draw the conclusion that the probable necessary condition for the existence of electroconductivity in a macromolecule is the presence of multiple, particularly double bonds. It is considered advantageous to have a maximum number of multiple bonds, which can be accomplished in linear molecules and organic rings by alternating the single and double bonds (polyconjugation). The presence of a maximum number of multiple conjugated bonds in the macromolecule with a comparatively weak bond of the electrons to the atoms would facilitate the increase in electroconductivity. It is considered expedient to introduce atoms with a relatively weak bond of the electrons on the outer orbits, in order to decrease the width of the forbidden zone. The conductivity is further dependent on the migration of the double bonds and thus it is also expedient to increase the number of possible migrations of this kind, forming comple cyclic structures of conjugated bonds, (e.g., phthalocyanine and the metal compound type). In a molecule having quasi-free electrons the possibility of electronic and hole-type conductivity is present. The authors attempt to give a rough evaluation of the cases: Thus in the case of a double bond the π-electrons are less firmly attached to the corresponding atoms or group of atoms than

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the σ-electrons and more mobile, and thanks to the quantum tunnel effect can overcome the barrier U(r) and move to a neighboring bond with a probability p (relative to a unit of time)

$$\frac{1}{\tau} \sim p \approx \frac{V}{L} \exp\left\{-\frac{2}{\hbar}\int_{r_1}^{r_2}\sqrt{2m\left[U(r)-\varepsilon\right]}\,dr\right\}$$

(A), where τ is the life-span of the electron on a separate bond, $\hbar = \frac{h}{2\pi}$, L is the width of the potential depression, where the electrons are located, m is the electron mass, V is its velocity, ε is the kinetic energy. The complex function U(r) is replaced for simplicity by a rectangular potential barrier (Fig. 1), then L is determined by the length of the double bond C=C, U_o is determined by the dimensions of the atom C, $U_o - \varepsilon$ by the potential energy of the most weakly bonded electron. Then equation (A) becomes:

$$\tau \approx \frac{1}{V} \exp\left\{-\frac{2}{\hbar} L_o \sqrt{2m(U_o-\varepsilon)}\right\}.$$

At $L = T \cdot 10^{-8}$, $U_o - \varepsilon = 10$ ev $= 10^{-8}$ cm/sec, we obtain $\tau = 10^{-15}$ sec. Thus during the time of the electron being locat-

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ed on one bond about 10^{-15} it shifts over at a rate of $V_{shift} = \frac{0^{-8}}{0^{-15}} = 10^7$ cm/sec. The given formulas show that due to the strong dependence of τ on U_0 and $U_{max.} - \varepsilon$, the electrons of the internal orbits forming the polymer molecule, which have a greater bond energy, will be almost completely localized and will not be able to participate in the electroconductivity of the macromolecule. It is stressed that the problem of the transfer of the charge carriers (electrons and holes) from molecule to molecule is a difficult one. It is assumed that the mobility of the charge carriers can be mainly determined by the probability of the tunnel gap through the intramolecular barrier and that high temperatures are necessary so that the electrons can overcome these gaps between the macromolecules. The electroconductivity of the polymer semiconductor will depend only on the concentration of the charge carriers in the first approximation (at a given structure of the polymer). The importance of the intramolecular transfers is stressed on the example of the benzene molecule, which is an excellent conductor, but liquid benzene (a group of these molecules) is an excellent insulator. The actual potential barrier between the macromolecules depends on these conditions, i.e., on the distance between the macromolecules and their number in a unit volume. The chemical bonds between the molecules and their space orientation will also become relevant factors in future. The optimum conditions for the formation and movement of charge carriers in the macromolecule is partly determined by the formation of the polymer molecule with polyconjugated and aromatic rings in the chain, but the latter do not solve completely the problems of easing the intramolecular barrier for them. Further mention is made of the significant effect of orientation on the electroconductivity of the polymer. The orientation of the polymer molecule also causes severe anisotropy of its properties along and across the axis of orientation. As regards the electroconductivity, it is assumed that the orientation can lead to two results: an increase in the number of charge carriers passing in a unit of time through a certain transverse cross-section of the polymer semiconductor, and the occurrence of severe anisotropy of the conductivity. In a polymer with regularly-built chains the conductivity is present only in the chain molecules. It is suggested that the conducting elements can be simply arranged parallel to each other, and thus create a system with good conductivity along the orientation axis and a slight conductivity in the perpendicular direction. The most expedient conditions are a high degree of regularity and few transverse bonds, since the latter would form the most perfected orientation of the polymer thread. This type of polymer system should have the best conductivity along

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the orientation axis and the highest anisotropy of the conductivity. The authors discuss the paramagnetic properties of semiconductors, particularly occurring in their spectra of electronic paramagnetic resonance (EPR). Since the integral EPR spectrum is connected with the number of electrons present having non-paired spins in the investigated system, it is assumed that the π-cloud is characterized by a certain non-pairing. The number of particles with non-paired spins corresponding to the narrow signal in the EPR spectrum of the polymer is about 10^{18}-10^{19} in one cm^3. But these cannot be considered charge carriers in polymers with semiconductor properties for the following reason: the electroconductivity increases with the temperature and the concentration of these particles determined by the area of the narrow line mentioned in the EPR spectrum drops. It is assumed that the second wide signal might be connected with the electroconductivity. The EPR spectrum is considered a property of the modecule and not of the polymer on the whole. The signal in the EPR spectrum indicates the fulfillment of an important, although not the only, condition for the polymer (especially synthesized or processed), to possess semiconductor properties. The presence of a system of conjugated double bonds is considered important but not adequate for the formation of a polymer material, which would completely be conducting, particu-

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larly semiconducting. The authors claim that it is possible to produce polymers with a system of conjugated bonds in the main chain in two ways: 1) by transformation of the macromolecules in the chain of already known polymers, 2) by special construction (synthesis) of the macromolecules with a system of conjugated bonds. Some of the specific work done on the synthesizing of polymer molecules with a system of conjugated bonds is gone into, particularly that of the products of thermal transformation of polyacrylonitrile. It is thought that interesting prospects lie in the production of this polymer substance characterized by a complex of electrophysical properties, viz., semiconductivity. It is assumed that in the thermal transformation the polyacrylonitrile undergoes chemical changes leading to the formation of a polymer, the macromolecules of which consist of cyclic chains. The given reaction schemes show that in this type of polymer semiconductivity properties can be expected. This corresponds to the theory developed by Semenov (Ref. 7) in analyzing the EPR spectra of certain polymer molecules, especially that of polyaminoquinone. When elevating the temperature of processing the polyacrylonitrile, the narrow signal of the EPR mentioned above increases (Fig. 3) almostly linearly in the temperature range of 325-600°C. Similar data were previously obtained in the thermal processing of polyvinylchloride (Ref. 10). The authors feel partially justified in assuming that in order to produce

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satisfactory semiconductor properties, a strict regularity of the structure of the polymer chains is needed. It is also assumed that polyacrylonitrile forms such regular chains. Special interest is felt in orientation as a means for increasing the regularity of the structure of polymers amongst other possibilities. The authors specify that at the present time several new polymer materials, the macromolecules of which have a system of conjugated double bonds, have been produced both in the USSR and abroad. These polymers have interesting magnetic properties. In this connection the work of Berlin (Ref. 15) is noted in the synthesis of polyaminoquinones. In the interaction of chloranil with benzidine polymers were obtained of the given structure. The authors of this synthesis assume that in this case there are not only intermolecular hydrogen bonds, but also bonds of the intrachain type, which can lead to spatial structuralizing and impairment of the solubility. Reference is also made to polymer-chelate complexes of percyanoethylene with metals (Ref. 21) stating that these compounds have a high thermal stability, a high magnetic susceptibility, a low activation energy, (0.26) and σ about 10^{-2} $ohm^{-1} \cdot cm^{-1}$ at 20°C. Special attention is further paid to the products synthesized by the authors (Ref. 16) of semi-condensation of phthalic anhydride with n-phenylenediamine and hydroquinone. The latter are

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A051/A029

characterized by an electroconductivity of $7\cdot10^{-7}\text{ohm}^{-1}\cdot\text{cm}^{-1}$ with an activation energy of about 0.6 ev. Roginskiy (Ref. 18) mentioned the interesting possibilities of using the semiconducting properties of certain organic polymers as heterogenic catalysts. Semenev (Ref. 20) studied this matter further. In conclusion the authors point out that the future profound investigation of the properties of polymer materials with a system of conjugated bonds, especially those with obvious semiconducting properties, will lead to new possibilities of creating heterogeneous catalysts with a high selectivity. There are 2 figures, 1 table, 5 structural formulae, 1 diagram, 3 equations and 21 references: 14 are Soviet, 6 English, 1 Belgian.

~~Card 13/18~~

S/069/60/022/005/003/011
B015/B064

AUTHORS: Berestneva, Z. Ya., Konstantinopol'skaya, M. B., Kargin, V. A.

TITLE: The Crystallization Mechanism 19 of Colloidal Titanium Oxide 27

PERIODICAL: Kolloidnyy zhurnal, 1960, Vol. 22, No. 5, pp. 557-559

TEXT: In continuation of a previous paper (Ref. 1) the authors investigate the effect of surface tension at the interface between colloidal particles and intermicellar liquid on the crystallization of titanium dioxide. Since no direct method of examining the surface tensions of such systems is available, surface tension was changed by changing the composition of the intermicellar liquid, and the crystallization process was observed by a combination of electron microscopy and electron diffraction studies. The colloidal solutions were obtained by adding titanium tetrachloride to doubly distilled water at a temperature from -2^o to $+1^oC$, and the sol was concentrated with an ultracentrifuge. Practically all electrolytes could be removed from the intermicellar liquid by repeating this operation (between -2^o and $+21^oC$, five to ten times). It was found that the removal of the electrolytes from the intermicellar liquid slows

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The Crystallization Mechanism of Colloidal Titanium Oxide

S/069/60/022/005/003/011
B015/B064

down the rate of crystallization of colloidal titanium dioxide. After the removal of electrolytes, the usual electron microscopic images (Fig. 1) were obtained for the spherical colloidal titanium dioxide particles. If, instead of water, an organic solvent (benzene, toluene, or heptane) was used, electron microscopic images were obtained (Fig. 2) that differed only in that the particles did not aggregate. Thus, it may be assumed that the surface tension at the interface does not exert an essential influence upon the crystallization of the colloidal titanium dioxide. On the other hand, it was found that an addition of water to systems produced in organic solvents has a strong influence upon the rate of crystallization. There are 2 figures and 1 Soviet reference.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva (Scientific Research Institute of Physical Chemistry imeni L. Ya. Karpov, Moscow)

SUBMITTED: February 25, 1960

Card 2/2

S/030/60/000/009/002/016
B021/B056

AUTHORS: Kargin, V. A., Academician, Rokhlin, M. I.

TITLE: The Development of Science From Polymers (Results of the International Symposium on Macromolecular Chemistry in Moscow)

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, 30 No. 9, pp. 18 - 23

TEXT: The International Symposium on Macromolecules took place in Moscow from June 14 to June 18, 1960. It was organized and carried out by the Akademiya nauk SSSR (Academy of Sciences USSR) under participation of the Gosudarstvennyy komitet Soveta Ministrov SSSR po khimii (State Committee for Chemistry of the Council of Ministers USSR). Three reports were made in plenary sessions, and 173 lectures were delivered in three sections. The first plenary session was opened by V. A. Kargin. New data and hypotheses concerning the most important chemical processes predetermining the character of some types of polymerization were given by N. N. Semenov. M. M. Koton reported on methods of increasing the thermal resistivity of polymer products; K. A. Andrianov spoke about the stage of investigations

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The Development of Science From Polymers (Results of the International Symposium on Macromolecular Chemistry in Moscow)

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of the synthesis of inorganic polymers; A. V. Topchiyev on new experimental data concerning the use of oxidation catalysts for the polymerization of olefines; A. A. Berlin on new ways of synthesizing polymers; Z. A. Rogovin on methods of modifying the properties of cellulose and other polysaccharides. The authors find that Soviet scientists ought to pay more attention to the working out of problems of the destruction and stabilization of polymeric substances. The production of apparatus and their improvement must be intensified. For the purpose of organizing large international conferences, premises of particularly modern equipment are necessary. The Dia-projectors of the type ЛЭТИ-55 (LETI-55) and the projector of the type ПЛУ (PLU) are suggested as fundamental parts of the equipment. The erection of a modernly equipped conference building in Moscow is described as important. First of all, the conference rooms of the Presidium of the Academy of Sciences USSR, of the Institut organicheskoy khimii (Institute of Organic Chemistry), the hall of the Dom uchenykh (House of Scientists), and a number of halls of other institutions of the Academy must be modernly equipped for the purpose of organizing conferences. There is 1 Soviet reference.

Card 2/2

Kargin, V.A.

5.3832

68647

S/076/60/034/02/006/044
B010/B015

AUTHORS: Igonin, L. A., Gintsberg, E. G., Krasulina, N. A., Bass, S. I., Kargin, V. A.

TITLE: Investigation of Oxybenzylamines Obtained From Phenol and Its Mononuclear Derivatives

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol 34, Nr 2, pp 287-294 (USSR)

ABSTRACT: On the basis of publication data it may be assumed that oxybenzylamines form as intermediates in the hardening of Novolack phenol formaldehyde resins with hexamethylenetetramine. In oxybenzylamines, the phenol nuclei are connected by dimethylamine- or trimethylamine bridges. At high temperatures, these bridges are transformed into methylene- or azomethine bridges. In the present case, a series of oxybenzylamines, obtained from phenol and its mononuclear derivatives, were investigated thermomechanically as well as by spectral analysis. The absorption spectra were taken by the IKS-11 spectrograph, and are given for 2,2'-dioxy-3,5,3',5'-tetramethyldibenzylamine and the corresponding tribenzylamine (Fig 1). The absorption bands observed at 11.84μ in dibenzylamine and at 11.92μ in tribenzylamine are traced back to the dimethyleneamine- and trimethyleneamine bridges between the phenol nuclei. This

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assumption is confirmed by the absorption spectra (Fig 2) of the multinuclear oxybenzylamines. The latter were prepared by a method described earlier (Table 1, preparation conditions). All spectra of the oxybenzylamines obtained from phenol and its para-substituted derivatives show the 11.84μ band whereas with oxybenzylamine obtained from o-chlorophenol this band lies at 11.92μ. Thus, it can be seen that it is the reaction between hexamethylenetetramine and the mononuclear phenols in a diphenyl solution that leads to the formation of the polymeric oxybenzylamines (Table 2, suggested structural formulas of polymers). The polyoxybenzylamines obtained from phenol and its para-substituted derivatives are amorphous linear polymers reticulated by individual cross bindings. The polymers have very strong chains whose T_g value lies above their thermal stability. The o-substituted derivatives form strongly ramified and reticulated polymers. The polyoxybenzylamines obtained from phenol reticulate under the effect of heat, and pass over into a non-meltable and insoluble state whereas polybenzylamines obtained from o- and p-substituted derivatives of phenol are thermally instable, and decompose at a temperature above 160°C forming low-molecular products. There are 6 figures, 2 tables, and 6 references, 1 of

Card 2/3

which is Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut plasticheskikh mass (Scientific Research Institute of Plastics)

SUBMITTED: April 3, 1958

Card 3/3

5.3810

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SOV/20-130-2-32/69

AUTHORS: Kargin, V. A., Academician, Kozlov, P. V., Van Nay-chan

TITLE: The Temperature of the Vitrification of Cellulose

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 2, pp 356 - 358 (USSR)

ABSTRACT: The authors proceed from the opinion that the vitrification temperature T_v and the flow temperature T_f of cellulose are higher than its decay temperature. As was shown by references 1 and 2, T_v may be reduced in rigid polymers by plastifying additions. The authors applied this method to cellulose. They describe the purification of sulphite cellulose, which had an average molecular weight of 210 426, and the production of pulverized samples, to which triethyl phenylaminohydroxide was added in various quantities as plastifier. The samples were compressed into tablets at 100 atm and 160°, after which their deformation was dynamometrically measured with slowly rising temperature. From the salient points of the thermomechanical curves (Fig 1) the dependence of T_v on the plastifier content was determined (Fig 2) and by extrapolation for

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The Temperature of the Vitrification of Cellulose SOV/20-130-2-32/69

zero-concentration of the plastifier $T_v = 220^\circ$ was found. From the turning point of the curve there resulted the temperature T_2, at which the cellulose acquires rubber-like elasticity, at 370°. From the fact that T_v is about 40° above the temperature at which chemical decomposition of cellulose sets-in the physical properties of cellulose are explained. There are 2 figures and 5 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov) 4

SUBMITTED: October 9, 1959

Card 2/2

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S/020/60/134/005/014/023
B016/B054

15.8000 2209 only

AUTHORS: Kargin, B. A., Academician, Kabanov, V. A., Zubov, V. P., and Papisov, I. M.

TITLE: Polymerization of Acetone

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 5, pp. 1098-1099

TEXT: On the basis of an approximate estimation of the thermal effect of the polymerization of carbonyl compounds, for instance of acetaldehyde or acetone, the authors find that this polymerization is impossible in the homogeneous liquid phase. The picture is, however, considerably changed if the transition from a monomeric liquid to a system of arranged monomer molecules is effected in the initial state, i.e. if the entropy of the initial system is much reduced. One method of molecular arrangement is freezing. Here, the entropy of the system is reduced during crystallization by the quantity of the melting entropy. This reduction in entropy gives rise to a reduction of the negative polymerization entropy which, at sufficiently low temperatures, may even change its sign. In this case, a

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Polymerization of Acetone

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polymerization accompanied by a negative thermal effect would be possible. Guided by such considerations, the authors attempted the polymerization of acetone on the double bond $C=O$ by their method (Refs. 5-7). The experiments were carried out in an apparatus and by methods of Refs. 5,6. The initiator used was metallic magnesium whose vapors were slowly condensed in vacuo together with vapors of carefully dried acetone on a surface cooled with liquid nitrogen. The ratio acetone : magnesium was about 200 : 1. A vitrified molecular layer of an acetone-magnesium mixture was precipitated as a condensate on the cooled wall. With growing thickness of this layer, the temperature of the surface of this vitreous layer finally reaches a value at which a spontaneous process of coordinate? regrouping of monomer molecules is setting in. In the absence of initiation centers, this process would lead to a crystallization of the monomeric glass. An instantaneous polymerization sets in, however, due to the mobility of particles originating in the phase transition "disorder - order". The same phenomenon is observed in a gradual temperature increase of the wall used for the condensation. This leads to the formation of the acetone polymer, an elastic white substance which is soluble in its own monomer. Polyacetone is very unstable at room temperature, and decomposes into

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acetone, e.g. when ground between the fingers. The most stable polymer samples "exist" without oxygen and moisture for a maximum of 10-12 h. However, traces of vinyl acetate increased the stability of the polymer to a certain extent. Qualitative considerations on the formation mechanism of a polymer chain in an arranged system of monomer molecules have recently been made by N. N. Semenov (Ref. 8). It appears that stabilization of polyacetone could be achieved by blocking the active ends of growing polymer chains. This indicates that substances not polymerizing under the usual conditions, might polymerize if a preliminary regular arrangement of molecules of a monomer were achieved, e.g., by a solidification crystallization, as in the case described above. There are 8 references: 5 Soviet and 3 French.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: July 23, 1960

Card 3/3

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S/020/60/135/002/025/036
B004/B056

AUTHORS: Kargin, V. A., Academician, Kozlov, P. V., Asimova, R. M., and Anan'yeva, L. I.

TITLE: Two Types of Plasticization of Polymers With Rigid Chains

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 2, pp. 357-360

TEXT: It was the purpose of the present work to explain the two types of plasticization of polymers with rigid chains: A) The plasticizer is soluble to an unlimited extent in the polymer. B) The plasticizer is more or less incompatible with the polymer. The fact that in both cases plasticization occurs, must be attributed to the different action of the two plasticizer types. The plasticization of cellulose (molecular weight about 200,000) was investigated by means of the incompatible plasticizers guanidine thiocyanate and urea. The cellulose was saturated with the plasticizer dissolved in ethanol, dried after 2 to 3 days, and pressed into tablets at 130 - 140°C and 75 atm pressure. The thermomechanical curves of the tablets

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Two Types of Plasticization of Polymers With Rigid Chains

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were drawn. Whereas in plasticizing with triethylphenyl ammonium oxide (compatible with cellulose) a decrease of the vitrification temperature T_v occurred proportional to the plasticizer content of cellulose, incompatible plasticizers hardly changed T_v at all. In the latter case, no interaction can occur between the molecules of the plasticizer and the macromolecules of the polymer. The authors interpret this effect on the basis of the structure of amorphous polymers. They assume that the polymer has orientated secondary structures: orientated bundles of chains. In the case A, which they describe as "intrabundle plasticization", the interaction of the plasticizer with the active groups of the polymer is more intense than the interaction between the polymer molecules. The secondary structure of the polymer is therefore destroyed, and a solid solution of the plasticizer in the polymer is formed. In the case B, which is described as "interbundle plasticization", the plasticizer reacts only with the polymer molecules on the surface of the secondary structures. The secondary structure therefore remains conserved, and the polymer keeps its high mechanical strength. Its elasticity depends on the Hook elasticity of the secondary structure. Such a kind of plasticization is advantageous for

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Two Types of Plasticization of Polymers With Rigid Chains

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B004/B056

obtaining low-temperature resistant materials, which are supposed to have high elastic properties. There are 2 figures and 7 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: August 12, 1960

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Card 3/3

S/020/60/135/004/030/037
B004/B056

AUTHORS: Kargin, V. A., Academician, Mirlina, S. Ya., Kabanov, V. A., Mikheleva, G. A., and Vlasov, A. V.

TITLE: Structure and Properties of Isotactic Polyacrylic Acid and of Its Salts

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 4, pp. 893 - 895

TEXT: The problem the authors discuss is the study of spatially regular synthetic polyelectrolytes which may be used as model substances of biological polymers. An electron-microscopic examination of the secondary structures of isotactic polyacrylic acid (PAA) and of its salts has been made by means of a JEM-5Y apparatus. PAA was obtained by alkaline hydrolysis of isotactic polyisopropyl acrylate. Thermogravimetric study showed that PAA crystallizes as a hydrate, with two monomeric members sharing one water molecule. The salts were produced by potentiometric titration (glass electrodes, ЛП-5 (LP-5) tube potentiometer) with $Ba(OH)_2$, NaOH,

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Structure and Properties of Isotactic Polyacrylic Acid and of Its Salts

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and $(CH_3)_4NOH$. The following results are given: Isotactic PAA evaporated from 0.01 - 0.0001% aqueous solution upon a colloxylin film showed similar globuli as atactic PAA whose amorphous character was revealed by electron diffraction studies. Crystallization occurred after HCl addition to the dilute solution (0.00001 - 0.0001%). Crystal stacks, spiral bands, and single crystals were observed. Crystallization in the presence of HCl is explained by suppressed dissociation of the carboxyl groups. In acid media, PAA behaves like a spatially regular polymer. Barium salt produced from solutions with pH 4.2 - 10.7 exhibited globuli within the entire pH range. Intrinsic viscosity at pH = 5 was 0.07 for PABa, and 0.12 for PAA. Sodium salt obtained at pH 4.2 - 11.5 showed globuli in the case of low pH, which at pH = 6.75 unrolled as a consequence of increasing dissociation and intramolecular repulsion of the COO^- groups. Fibrils were forming. At pH = 7 dissociation was complete, single crystals formed, and intrinsic viscosity reached a maximum. At higher pH, the molecule chains entangled again, and globuli were observed. In the case of tetramethylammonium polyacrylate, fibrils were observed near the neutral point, which

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resembled the structures of biopolymers. Observation of a tetramethylammonium polyacrylate film in polarized light and dry air (40 - 60° C) showed that the film consisted of intergrown rhombic single crystals, 100μ in size, with a folded structure. Cooling down to 20° C initiated destruction of the crystals by air humidity. Birefringence vanished. Re-heating, however, re-established the old crystal structure. From these phenomena it is concluded that in the swelled film the mutual position of the structural elements remains unchanged. Hence, isotactic PAA showed the same structural types as atactic PAA. However, due to the regular succession of asymmetric atoms, isotactic PAA showed a greater variety in fibril forms approaching the regular structures of biopolymers. There are 4 figures and 2 references: 1 Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

Structure and Properties of Isotactic Polyacrylic Acid and of Its Salts

S/020/60/135/004/030/037
B004/B056

SUBMITTED: July 27, 1960

Card 4/4

KARGIN, V.A., akademik; KOZLOV, P.V., MIRLINA, S.Ya.; KAPRALOVA, Z.A.

Breakdown and formation of structure in natural proteins in the course of their transfer through nonporous membranes. Dokl. AN SSSR 135 no.6:1421-1424 D '60. (MIRA 13:12)

1. Moskovskiy gosudarstvennyy universitet im.M.V.Lomonosova.
(Proteins)

Name	:P	KARGIN, V. A.
Title	:	Academician, USSR Academy of Sciences. Head of Chair of High Molecular Compounds of the Chemical Faculty of the Moskva State University.
Remarks	:	Academician, V. KARGIN is the author of an article entitled "The Mechanics of Atomic Architecture."
Source	:	N: Izv. #232, 29 Sep. 1961, p. 4, c. 4, top.

33 10

KARGIN, V.A.

report to be submitted for the IUPAC 21st Conference and 18th Intl. Congress of Pure and Applied Chemistry, Montreal, Canada, 2-12 August 1961

GORODISKIY, A. V., Academy of Sciences UkSSR, Kiev - "The oscillographic investigation of the electrochemical kinetics in fused salts" (Section A.3,e.2 - Session I, 11 Aug 61, afternoon)

GURVICH, L. V., Academy of Sciences USSR, Moscow - "The calculation of thermodynamic functions of gases in a wide temperature range" (Section A.3,e,(1), Session II - 8 Aug 61, afternoon)

KARGIN, V. A., Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Vitrification phenomena in crystallin polymers" (Section B.4 - 7 Aug 61, afternoon)

KISELEV, A. V., Moscow State University imeni M. V. Lomonosov - "The influence of surface heterogeneity and adsorbate-adsorbate interaction on the adsorption properties of solid surfaces" (Joint Session, Sections A.2 and B.1 - 8 Aug 61, morning)

KONDRAT'YEV, V. N., Institute of Chemical Physics, Academy of Sciences USSR, Moscow - "The HO_2 radical" (Section A.1, Session I - 11 Aug 61, morning) (Also, Section A.1, Chairman, Session I - 8 Aug 61, morning)

KUZNETSOV, V. I., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "A novelty in the use of organic coprecipitants for concentration of small amounts of the elements" (To be presented in Russian) (Section C.2 - 11 Aug 61, morning)

LAVRUKHINA, A. K., RAKOVSKIY, E. E., and MOSKALEVA, L. P., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "New data on radiochemical investigations of the processes of fission and fragmentation induced by high energy protons" (Section A.4 - 3 Aug 61, afternoon)

LOVACHEV, L. A., Academy of Sciences USSR, Moscow - "Determination of rate constants of elementary processes from flame velocities as a function of temperature, pressure, and molecular transfer coefficients" (Section A.3,b,(2) - 7 Aug 61, afternoon)

MUNDIATH, S. (Probably MUNDYACH, S.) and GERASIMOV, Y. I., Moscow State University imeni M. V. Lomonosov - "Study of the thermodynamic properties of the system iron-platinum" (Section A.3,c,(3), Session II(A) - 11 Aug 61, morning)

PANCHENKOV, G. M., KOLCHIN, A. M., MALAKOV, V. F., and SHEPTI, Ya., Moscow State University imeni M. V. Lomonosov - "Emission of complex ions in solid-phase reactions" (Joint Session, Sections A.2 and B.1, 8 Aug 61, morning)

SEMENOV, N. N., Institute of Chemical Physics, Academy of Sciences USSR, Moscow - "Certain chemical reactions at reduced temperatures and related problems of energy transfer" (To be presented in Russian) (Plenary Lecture - Saturday, 12 Aug 61)

SHILOV, Ye. A., Academy of Sciences UkSSR, Kiev - "The active agents and the intermediary complexes in the heterolytic reactions of halogenation of the organic compounds" (Section A.1, Session II - 11 Aug 61, morning)

SMIRNOV, M. V., Electrochemistry Institute, Sverdlovsk - "The equilibrium between the titanium subgroup metals and the salt melts" (Section B.3 - 7 Aug 61, afternoon)

TAL'ROZE, V. L., Institute of Chemical Physics, Academy of Sciences USSR - "Reactions of ions and molecules in the gas phase" (Section A.1, Session I - 9 Aug 61, afternoon)

TERENIN, Aleksandr N., Leningrad State University imeni A. A. Zhdanov - (Section A.1, Chairman, Session I - 8 Aug 61, afternoon Session) (Also on program for Section A.1, Session I - 9 Aug 61, afternoon)

TERENIN, Aleksandr N., VILESOV, F. I., KURBATOV, B. L., and DOLGOVA, N. A., Leningrad State University imeni A. A. Zhdanov - "Mass-spectrometry and luminescence of radicals in the photodissociation and photoionization of molecules by vacuum ultra-violet radiation" (Section A.1, Session I - 9 Aug 61 - afternoon)

TUNITSKIY, N. N., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov - "On the dissociation of molecules on electron impact and the early states of radiation-chemical processes" (Section A.1, Session I - 8 Aug 61, afternoon)

VAYNSHTEYN, Emmanuil Ye., and KOROLEV, V. V., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Moscow - "The plasma generator and its use for spectral analysis of alloys and rocks" (Section C.1 - 8 Aug 61, morning)

VINOGRADOV, A. P., LAVRUKHINA, A. K., and REVINA, L. D., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "The study of nuclear reactions in iron meteorites under the action of high energy protons" (Section A.4 - 8 Aug 61, afternoon)

YAKOVLEV, Yu. V., and ALIMARIN, I. P., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "The determination of trace impurities in some materials for semiconductor techniques by radioactivation analysis" (To be presented in Russian) (Section C.1 - 8 Aug 61, afternoon)

YEROFEYEV, Boris V., Institute of Physical-Organic Chemistry, Minsk - "The effect of donor and acceptor admixtures on the decomposition rate of solids" (Section A.2 - 8 Aug 61, afternoon)

KARGIN, V.A.

To be submitted for the International Symposium on Macromolecular Chemistry, Montreal, Canada, 27 Jul -1 Aug 1961.

USSR

BIRSHTEYN, T. M., Institute of High Molecular Chemistry, Academy of Sciences USSR, Leningrad, jointly with KRIGBAUM, W. R., and KANEKO, M., Duke University, Durham, N.C. - "Elasticity of cube lattice chain networks" (Group 2)

DOGADKIN, Boris A., and DONTSOV, A. A., Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov - "Interaction of polyethylene with sulphur" (Groups 4-5)

KARGIN, Valentin A., Head, Laboratory of Colloidal Chemistry, Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "The formation of big crystal structures in polymers and their properties" (Group 2. Invited lecture)

KRENTSEL', B. A., TOPCHIYEV, A. V., and [illegible], L. A., Institute of Petroleum, Academy of Sciences USSR, Moscow - "Polymerization of some epoxy compounds" (Group 3-B)

MEDVEDEV, Sergey S., SPIRIN, Yu. (Yu. L.) A., AREST-YAKUBOVICH, A. A., POLYAKOV, D. K., and GANTMAKHER, A. R., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Polymerization catalyzed by lithium and lithium alkyl" (In German) (Group 3-B)

NAMETKIN, N. S., TOPCHIYEV, A. V., and POLAK, L. S., Institute of Petrochemical Synthesis, Academy of Sciences USSR, Moscow - "On the catalytic polymerization and radiochemistry of allylsilans" (Group 3-A)

PIOTROVSKIY, K. B., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev, Leningrad - "Temperature effect on polymer structure in diene polymerization by alkali metals" (Group 3-B)

PODDUBNYY, I. Ya., and YERENBURG, Ye. G., All-Union Scientific Research Institute of Synthetic Rubber, Leningrad - "Study of branching in regular isoprene polymers" (Group 1)

PODDUBNYY, I. Ya. MOSEVITSKIY, M. I. RABINERZON, M. A., and PERGONOV, A. P. All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev, Leningrad - "Nature of molecular-weight distribution and properties of styrene-butadiene rubbers depending on polymerization conditions" (Group 3-A)

PRAVEDNIKOV, A. N., TELESHOV, Ye. N., YING, She-k'ang, and MEDVEDEV, S. S., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Investigation of the mechanism of radiolysis of polymers containing quaternary atoms of carbon" (Group 4-5) [illegible] V. N.

TSVETKOV, Viktor N., Institute of High Molecular Compounds of the Academy of Sciences USSR, Leningrad - "Stereo-regularity and optical anisotropy of macromolecules" (Group not specified)

USMANOV, Khamdam U., and SUSHKEVICH, T. I., Academy of Sciences UzSSR, Tashkent, Uzbekistan - "The investigation of the cotton cellulose polydispersity according to the molecular weight" (Group not specified)

YENIKOLOPYAN, N. S., Institute of Chemical Physics of the Academy of Sciences USSR, Moscow - "On the kinetics of formaldehyde polymerization and polyformaldehyde degradation" (Group 3-B)

V. A
KARGIN, ~~A.~~V.

"Social Potential of Science"

report presented at the 10th Pugwash Conference, London, 2-7 Sep 61.

KARGIN, V. A.

"Observations on the Proper Organization of Education and its Significance in the Modern World"

report presented at the 10th Pugwash Conference, London, 2-7 Spe 61.

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26438
S/183/61/000/004/001/002
B101/B206

AUTHORS: Berestnev, V. A., Nagdaseva, I. P., Pogorelko, A. N.,
Kargin, V. A.

TITLE: Increase of thermostability of caprone fiber

PERIODICAL: Khimicheskiye volokna, no. 4, 1961, 26 - 28

TEXT: The authors discuss the increase of thermostability of caprone fiber by oxidation inhibitors. Since an addition of such substances to the initial polymer might impair its mechanical properties, the authors think it more convenient to apply such inhibitors on the finished fiber as a protective coat. In this case, the process may be combined with others such as impregnation or dyeing. The authors report on the treatment of caprone fiber with aqueous solutions of metal salts. Caprone cord of the type 14K (14K) was used for tests. It was immersed in the salt solution for 5 - 8 sec, and then dried for 5 min at 115 - 120°C. Cord fabric was immersed for the same time in the salt solution, and dried for 5 min at 132 - 136°C. In a combination with impregnation by latex emulsion, the metal salts were directly dissolved in the impregnation solution if

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B101/B206

Increase of thermostability...

the latter was acidic. If it was alkaline, the cord was first treated with the salt solution, then with the impregnation solution. After this treatment the cord fibers were heated for 100 hr at 150°C with 2 kg load, and tensile strength as well as breaking elongation were measured. Table 1 gives the results. Since a mixture of $CdCl_2$ and $CuCl_2$ showed the best effect, experiments followed with: (1) 0.035% $CuCl_2$ + 0.065% $CdCl_2$; (2) ditto plus impregnation solution of the type РШ-40 (RSh-40); (3) 0.1% $CuCl_2$ + 0.1% $CdCl_2$; (4) ditto plus RSh-40; (5) 0.03% $CuCl_2$ + $CdCl_2$ plus impregnation solution on resin-89 basis. Results: (a) The unheated fiber had a tensile strength of about 15.20 kg and an elongation of 27.3 - 32.9%; (b) the heated, untreated fiber had a tensile strength of 3.1 - 3.28 kg and an elongation of about 6.4%; (c) treatment with the solutions mentioned produced a tensile strength increase of the heated fiber to 11.46 - 14.49 kg, and an elongation increase to 15.8 - 18.34%. The authors point out that this surface treatment is only effective for thin fabrics exposed to oxygen, but not for heavy products such as tires. Treatment of the fibers with H_2S and microscopic investigation (conducted by Ye. S. Alekseyeva)

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Increase of thermostability... S/183/61/000/004/001/002
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showed that the fibers were covered only on the surface by metal sulfides. Therefore, this surface treatment of the fibers with metal chlorides protects the surface against oxidation, and does not change the other mechanical properties of the fiber. There are 2 figures, 2 tables, and 6 Soviet-bloc references.

ASSOCIATION: NIIShP (V. A. Berestnev, I. P. Nagdaseva, A. N. Pogorelko);
NIFKhI im. L. Ya. Karpova (NIFKhI imeni L. Ya. Karpov)
(V. A. Kargin)

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Card 3/4

LYTKINA, M.B.; BERESTNEV, V.A.; YEVSTRATOV, V.F.; KARGIN, V.A.

Physical and mechanical properties of viscose cord. Khim.volok. no.6:29-33 '61. (MIRA 14:12)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Rayon)

S/030/61/000/007/002/003
B105/B206

AUTHOR: Kargin, V. A., Academician, Deputy Chairman

TITLE: Discussion of the report by M. V. Keldysh

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 7, 1961, 59-60

TEXT: The author mentions the development in the field of chemistry and particularly of polymeric synthetics during the last three years, and refers to the following new problems: Science must find ways of continuously improving the properties of high-molecular substances and materials, which is necessary for the development of a large polymer industry. However, it is still more important to establish a theory for the processing of polymers and to find new, highly productive processing methods. Planning of research is described as being very incomplete, and the following examples are mentioned: The Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR (Institute of High-molecular Compounds AS USSR) in Leningrad develops the theory for problems of fiber research. The activity of this Institute can only be judged by the good or bad properties of the fibers developed. The Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical

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Chemistry AS USSR) in Moscow was made responsible for the state of science in the field of coatings. The only criterion for the achievements of this Institute is the question as to whether these coatings will be available or not. A new Institut polimerov (Institute of Polymers) was established in Uzbekistan. If this Institute is able to produce from cotton fibers which are not inferior to synthetic ones, it may be considered efficient; if not, its existence is not justified. If it were possible to conduct such planning, and institutes only dealt with two or three main problems, Soviet science would flourish. It is also considered regrettable that instead of real large-scale planning, only petty planning is being done, all activities being enumerated with indication of development stages, completion dates, and results. The manner of coordination is also criticized, and it is stated that proper coordination would have to split up research into one problem among two or three institutes. These activities would have to be discontinued in the remaining institutes and a special institute established, respectively. Unsuccessful studies conducted for many decades should be discontinued. However, this is almost impossible within the AS USSR on account of private interests turning up everywhere, which are difficult to eliminate. There are collaborators fulfilling and overfulfilling small

Discussion of the report by ...

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plans to general satisfaction, but nobody notices that their study is only of historical-chemical importance. Cases are known where institutes undertook to work in a proposed field and then tried to utilize funds received for continuing old research activities. The lack of a special organization for apparatus building, and of reserves of reagents is detrimental to the development of science.

ASSOCIATION: Nauchnyy sovet po vysokomolekulyarnym soyedineniyam Akademii nauk SSSR (Scientific Council of High-molecular Compounds of the Academy of Sciences USSR)

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B119/B216

AUTHORS: ~~Kargin, V. A.,~~ Kabanov, V. A., Mirlina, S. Ya., Vlasov, A. V.

TITLE: Isotactic polyacrylic acid and its salts

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 1, 1961, 134-138

TEXT: The present paper treats the synthesis of isotactic (stereoregular) polyacrylic acid (PAA) and its properties. This PAA, the authors hoped, would provide a suitable model corresponding to biological polyelectrolyte systems. PAA was synthesized by the following procedure: Isotactic polyisopropyl acrylate (PPA, Ref. 1), prepared by polymerization of isopropyl acrylate, was hydrolized. Hydrolyzation was carried out in various mediums: 1. PPA - H_2O - KOH, 2. PPA-H_2O-methanol - KOH, 3. PPA - methanol - KOH, 4. PPA - dioxane - KOH, 5. PPA - H_2O - dioxane - KOH, 6. PPA - pyridine - KOH, 7. PPA - H_2O - pyridine - KOH, 8. PPA - dimethyl formamide - KOH, 9. PPA - propyl alcohol - KOH, 10. PPA - H_2O - propyl alcohol - KOH, 11. PPA - propyl alcohol - toluene - KOH, 12. PPA - H_2O - propyl alcohol -

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- toluene - KOH, 13. PPA - H_2O - acetic acid - toluenesulfonic acid. The degree of hydrolysis was determined by potentiometric titration or by titration against phenolphthalein. PAA was precipitated by means of hydrochloric acid. Neutralization of PAA with the corresponding bases yielded the polyacrylates of Na^+, K^+, NH_4^+, $N(CH_3)_4^+$, which were studied under a polarization microscope. PAA was also examined thermogravimetrically and by infrared spectroscopy comparing the results obtained with those obtained on atactic PAA. The following conclusions were drawn: The systems 11 and 12 are most suitable for the hydrolysis of PPA. The diffraction pattern of isotactic PAA indicates a crystalline structure. The thermogravimetrical study showed that PAA crystallizes as hydrate, two monomeric units of PAA binding one molecule H_2O, corresponding to a water content of 11.11%. The K^+ and $N(CH_3)_4^+$ salts of the isotactic PAA crystallize in the form of well defined single crystals. The electron-microscopic and electrochemical study on isotactic PAA and its salts will be reported in the next publication of the authors. There are 5 figures, 1 table, and 4 references: 1 Soviet-bloc

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Isotactic polyacrylic acid and its salts... S/190/61/003/001/017/020
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and 2 non-Soviet-bloc.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: July 22, 1960

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S/190/61/003/001/018/020
B119/B216

AUTHORS: Kargin, V. A., Mirlina, S. Ya. Kabanov, V. A., Mikheleva, G. A.

TITLE: Study on the structure of isotactic polyacrylic acid and its salts

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 1, 1961, 139-143

TEXT: The study presented is of scientific interest, since polyelectrolytes represent systems in which insignificant influences produce considerable structural and chemical changes, comparable to those met in living nature. The experiments were carried out on isotactic polyacrylic acid, (PAA) (prepared according to Ref. 2) and its Ba^{2+}, Na^{+} and $N(CH_3)_4^{+}$ salts (obtained by potentiometric titration with the corresponding bases). The electron-microscopic studies were performed in a JEM-5Y electron microscope, and potentiometric titration in a ЛП-5 (LP-5) electronic potentiometer. The molecular weight (60,000) of the polymer was determined viscosimetrically (using 0.5 N NaCl as solvent). Preparations for electron-microscopy were prepared by evaporating drops of 0.01 - 0.00001% aqueous solutions of

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the substance on suitable carriers. The experimental results were compared with the results obtained on atactic PAA. Both isotactic PAA, and its salts, and atactic PAA were found to be of two basic structural types: globular (compact aggregates of molecules) and fibrilliform. Isotactic PAA and its Na^+ and $N(CH_3)_4^+$ salts (in contrast to atactic PAA and its salts) are able to assume highly regular fibrilliform structures (bands, helixes, single crystals) corresponding morphologically to biological polymers. Complete dissociation of the ionizing groups or an entirely undissociated state were found to be prerequisite for the formation of secondary crystalline structures, even at completely regular arrangement of the asymmetric atoms in the polyelectrolyte chain. Titration of 1% aqueous solution of isotactic PAA with NaOH yields a pK = 0.64 and with $N(CH_3)_4OH$, pK = 1.44 (provided the dissociation constant of the isolated carboxyl group $K_0 = 10^{-4.86}$; $pK = pKi - pK_0$). There are 8 figures and 4 references: 2 Soviet-bloc and 1 non-Soviet-bloc.

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Study on the structure of isotactic... S/190/61/003/001/018/020
B119/B216

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: July 27, 1960

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B130/B202

AUTHORS: Slovokhotova, N. A., Il'icheva, Z. F., Kargin, V. A.

TITLE: Effect of fast electrons on the structure of polystyrene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 2, 1961, 191-197

TEXT: By means of spectroscopic studies the authors attempted to explain the character of the structural changes in polystyrene on irradiation with fast electrons. The polystyrene films were irradiated in the vacuum (10^{-4} mm Hg) at room temperature in a 200 kv electron accelerator tube. The electron spectra and the infrared spectra were taken by means of an СФ-4 (SF-4) spectrometer and an Н-800 (N-800) spectrophotometer, respectively. The authors studied specimens of amorphous polystyrene (I) with a molecular weight of 600,000 and 1,300,000, and isotactic crystalline polystyrene (II). To remove the monomeric and low-molecular fractions, polystyrene was precipitated several times from a toluene solution by means of methyl alcohol. For the complete removal of the solvent the films were dried in high vacuum. The infrared spectrum of non-irradiated (II) essentially differs from that of non-irradiated (I). After the irradiation of (II) changes are observed in

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the spectrum which indicate an amorphization of the crystalline polystyrene. Instead of the doublet in the range 1050-1083 cm^{-1} a band appears at 1070 cm^{-1}, the maximum at 917 cm^{-1} is shifted to 906 cm^{-1}, the maximum at 562 cm^{-1} is shifted towards lower frequencies; besides, the intensity is reduced. Amorphization of isotactic polystyrene on irradiation distinctly appears at the point where the 917 cm^{-1} band is shifted. On irradiation of polystyrene with doses higher than 2500 Mrad the contour of the spectrum strongly changes at the highly intense 700 cm^{-1} band and at the weak 840 cm^{-1} band. This indicates that double bonds of the type $R_2C = CHR$ and cis-RCH = RHC are formed in the polymer. Hence, the process of cross-linking can be explained by the scheme of L. A. Wall and D. W. Brown (see below). According to this scheme the hydrogen released by the rupture of the CH bond of the main chain hydrogenates the neighboring ring of the phenyl molecule under formation of a cyclohexadiene ring with double bonds and cross-linking of the neighboring molecules. Conjugate systems with double bonds are formed in the main chain of polystyrene. Ye. I. Pokrovskiy and M. V. Vol'kenshteyn are mentioned. There are 5 figures, 1 table, and 12 references: 5 Soviet-bloc and 7 non-Soviet-bloc. The 3 references to English language publications read as follows: L. A. Wall, D. W. Brown,