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LITERATURE SURVEY ON THERMAL DEGRADATION, THERMAL OXIDATION, AND THERMAL ANALYSIS OF HIGH POLYMERS II

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PLASTEC NOTE 10

LITERATURE SURVEY ON THERMAL DEGRADATION, THERMAL OXIDATION, AND THERMAL ANALYSIS OF HIGH POLYMERS. II.

By

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ABSTRACT

A bibliography of references, many of them annotated, is presented. This bibliography is the result of a literature survey on thermal degradation, thermal oxidation and thermal analysis of high polymers. These references cover the period from about 1 October 1962 to 1 March 1965. 702 items are given. These are grouped under general and material headings. A subject index and an index of authors are provided. This bibliography brings PLASTEC NOTE 7, published June 1963, up-to-date.

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MATERIALS - Continued

INTRODUCTION

This bibliography brings the material reported in PLASTEC NOTE 7 up to about 1 March 1965. The coverage and arrangement follows essentially the same pattern as the earlier report.

For the convenience of the reader a rather extensive index is included.

PART 1 - BIBLIOGRAPHY

NOTE: Reports cited are not available at the Plastics Technical Evaluation Center

GENERAL

BOOKS AND GENERAL REVIEWS

Ref. No.

1 L. A. Wall, ENERGETICS OF POLYMER DECOMPOSITIONS. II., SPE Journal 16 (9), 1031 (1960)

2 A. E. Molzon, INDEXED REFERENCES PERTAINING TO DEGRADATION AND FRACTURE OF PLASTICS, U. S. Dept. Com., Office Tech. Serv. AD 268,266, 36 pp. (1961); C. A. 58, 6978 (1963)

3 R. Simha, DEGRADATION OF POLYMERS, Advan. Chem. Ser. No. 34, 157 (1962); C. A. 57, 13961 (1962)

4 L. Bonnot and G. Lefebre, HEAT-STABLE POLYMERS: A SURVEY, Rev. Inst. Franc. Petrole Ann. Combust, Liquides 17, 1508 (1962); C. A. 58, 10305 (1963)

5 L. A. Wall and J. H. Flynn, DEGRADATION OF POLYMERS, Rubber Chem. Technol. 35, 1157 (1962); C. A. 58, 10377 (1963)

6 J. J. Millane, DIFFERENTIAL THERMAL ANALYSIS, Plastics (London) 28 (314), 101 (1963); 29 (315), 81 (1964)

7 F. X. Lalau-Keraly, APPLICATION OF GAS-PHASE CHROMATOGRAPHY TO THE STUDY OF HIGH POLYMERS, Peintures, Pigments, Vernis 39, 4 (1963); C. A. 58, 11473 (1963)

8 Yun-Shih Ch'i, HIGH-TEMPERATURE PLASTICS, Hua Hsueh Tung Pao 1963, 90; C. A. 59, 815 (1963)

9 J. Stepanek and B. Dolezel, THERMAL AND LIGHT DESTRUCTION OF POLY(VINYL CHLORIDE), Chem. Listy 57 (8), 818 (1963); C. A. 59, 12943 (1963)

A review on the reaction conditions and mechanisms with 78 references.

10 W. L. Hawkins, THERMAL AND OXIDATIVE DEGRADATION OF POLYMERS. SPE Trans. 4 (3), 187 (1964)

11 P. J. Blatz and W. H. Andersen, FABRICATION OF PLASTICS FOR HIGH-TEMPERATURE APPLICATION, Combust. Propulsion, AGARD, Colloq., 5th, Brunswick, Ger. 1962, 317, discussion 400 (Pub. 1963); C. A. 61, 7181 (1964)

A review with 138 references.

BOOKS AND GENERAL REVIEWS - Continued

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12 M. B. Neiman, THE MECHANISM OF THERMOOXIDATIVE DESTRUCTION AND STABILIZATION OF POLYMERS, Usp. Khim. 33 (1), 28 (1964); C. A. 60, 9376 (1964)

THEORY AND MATHEMATICAL TREATMENT

Ref. No.

13 H. [illegible] Friedman, KINETICS OF THERMAL DEGRADATION OF CHAR-FORMING PLASTICS FROM THERMOGRAVIMETRY. APPLICATION TO A PHENOLIC PLASTIC, J. Polymer Sci. C6, 183

A technique was devised for obtaining rate laws and kinetic parameters which describe the thermal degradation of plastics from TGA data. The method is based on the intercomparison of experiments which were performed at different linear rates of heating. By this method it is possible to determine the activation energy of certain processes without knowing the form of the kinetic equation.

14 H. C. Anderson, THERMOGRAVIMETRY OF POLYMERS. PYROLYSIS KINETICS, J. Polymer Sci. C6, 175

Two TGA methods were developed to study kinetics of polymer degradation.

15 A. Amemiya, THEORY OF NON-RANDOM DEGRADATION OF LINEAR CHAIN MOLECULES, J. Phys. Soc. Japan 17, 1245 (1962); C. A. 57, 13961 (1962)

16 L. A. Dudina and N. S. Enikolopyan, MECHANISM OF INITIATION IN THE THERMAL DEGRADATION OF POLYMERS, Vysokomolekul. Soedin. 4, 869 (1962)

Proposes a method for determining the mechanism of active-center generation in the thermal degradation of polymers based on determining the dependence of the effective rate constant upon the initial DP. The validity of the method is confirmed by data on the thermal degradation of polyformaldehyde.

17 C. D. Doyle, ESTIMATING ISOTHERMAL LIFE FROM THERMOGRAVIMETRIC DATA, J. Applied Polymer Sci. 6, 639 (1962)

Equations are given for estimating equivalent isothermal life from TGA data and for estimating apparent activation energy for volatilization even though the nature of the kinetic process is unknown. Illustrative data for polytetrafluoroethylene are given.

18 V. K. Semenchenko and M. M. Martynyuk, THE THERMODYNAMICS OF POLYMERS. II. COMPARISON OF CONCLUSIONS DERIVED FROM THE MESOMORPHIC PHASE THERMODYNAMICS WITH EXPERIMENTAL DATA, Kolloidn. Zh. 24, 611 (1962); C. A. 58, 9240 (1963)

The minimum of the thermal stability corresponds to the melting point of crystalline polymers and to the glass point of amorphous polymers. High elasticity of polymers is observed in the region of their lower thermal stability.

THEORY AND MATHEMATICAL TREATMENT - Continued

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A theory is presented of the way in which the melting of a polymer is manifested in a differential temperature analysis thermogram. An analytical method based on this theory allows a precise determination of both the melting point and the crystalline weight fraction as a function of temperature. Experimental results for linear polyethylene and crystalline polypropylene confirm the theory.

20 S. Strella, DIFFERENTIAL THERMAL ANALYSIS OF POLYMERS. I. THE GLASS TRANSITION, J. Applied Polymer Sci. 7, 569 (1963)

A differential thermal analysis device (DTA) for measuring the glass and other polymer transitions is described. A theory on the manner in which a glass transition is manifested in a DTA thermogram, and on the manner for obtaining the real value from the thermogram is presented. Experimental results on polymethyl methacrylate and atactic polypropylene verify the various predictions of the theory.

21 A. I. Gubanov and A. D. Chevychelov, THEORETICAL ESTIMATES OF ENERGY OF CHAIN RUPTURE IN SOLID POLYMERS, Fiz. Tverd. Tela 5, 91 (1963); C. A. 58, 11525 (1963)

22 L. Reich and D. W. Levi, THERMAL STABILITY INDEXES FOR POLYMERIC MATERIALS BASED ON ENERGY CONSIDERATIONS, Makromol. Chem. 66, 102 (1963)

Analysis of literature TGA data (under nitrogen) led to correlation between overall energetics of decomposition and characteristics of the TGA curves.

23 M. Inokuti, WEIGHT-AVERAGE AND z-AVERAGE DEGREE OF POLYMERIZATION FOR POLYMERS UNDERGOING RANDOM SCISSION, J. Chem. Phys. 38, 1174 (1963)

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A method is derived by which the characteristic constants of the rate equation may be obtained directly from the TGA curve. Parameters determined for polytetrafluoroethylene, poly(methyl methacrylate) and polystyrene by this method are compared with literature values.

25 H. C. Anderson, ORDER OF POLYMER PYROLYSIS BY THERMOGRAVIMETRIC CYCLING EXPERIMENTS, J. Polymer Sci. B2, 115 (1964)

26 A. R. Haly and M. Dole, DIFFERENTIAL THERMAL ANALYSIS OF POLYMERS UNDERGOING A GLASS TRANSITION, J. Polymer Sci. B2, 285 (1964)

Ref. No.

27 S. Strella, COMMENTS ON HALY AND DOLE'S LETTER ON DTA, J. Polymer Sci. B2, 625 (1964)

28 L. Reich, A RAPID ESTIMATION OF ACTIVATION ENERGY FROM THERMOGRAVIMETRIC TRACES, J. Polymer Sci. B2, 621 (1964)

The report includes values of kinetic parameters for epoxide resins.

29 L. Reich and D. W. Levi, A GRAPHICAL ESTIMATION OF REACTION ORDER FROM THERMOGRAVIMETRIC TRACES, J. Polymer Sci. B2, 1109 (1964)

A procedure is described and applied to polytetrafluoroethylene.

30 L. Reich, H. T. Lee, and D. W. Levi, KINETIC PARAMETERS IN POLYMER DEGRADATION BY DYNAMIC THERMOGRAVIMETRIC ANALYSIS, J. Applied Polymer Sci. 9, 351 (1965)

Procedures are described and results for polytetrafluoroethylene degradation are used for comparison purposes.

MISCELLANEOUS

Ref. No.

31 F. H. Muller and H. Martin, CALORIMETRIC MEASUREMENT OF CRYSTALLIZATION AND MELTING OF POLYMERS, J. Polymer Sci. C6, 83

Crystallization and melting of polymers as a function of sample history is investigated by a DTA method.

32 J. K. Gillham and A. F. Lewis, STUDIES OF THE THERMAL BEHAVIOR OF POLYMERS BY TORSIONAL BRAID ANALYSIS, J. Polymer Sci. C6, 125

Studies of a thermoplastic polymer and a thermosetting resin are presented in which their thermal behavior is demonstrated with respect to first and second order transitions, cure, thermal crosslinking and degradation. The dynamic mechanical data are compared with the results obtained by differential thermal analysis, thermogravimetric analysis, and infrared spectroscopy.

33 K. Eiermann, THERMAL CONDUCTIVITY OF HIGH POLYMERS, J. Polymer Sci. C6, 157

The thermal conductivity of several high polymers was measured in the temperature range from -190 to 90°C.

34 A. E. Slobodzinski, MECHANICAL TESTING OF ADHESIVES IN A CREEP FURNACE AT TEMPERATURES RANGING FROM 200° TO 2400°F., U. S. Dept. Com., Office Tech. Serv., AD 282,700, 37 pp. (1962); C. A. 60, 5700 (1964)

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35 A. H. Landrock, EFFECTS OF THE SPACE ENVIRONMENT ON PLASTICS, U. S. At. Energy Comm. PLASTEC 12, 83 pp. (1962); C. A. 61, 14852 (1964)

36 R. K. Carlson, B. A. Forcht, J. A. Medford, A. R. McKinney, F. C. McQuiston, and R. O. Scott, CARBONIZED PLASTIC COMPOSITES FOR HYPERTHERMAL ENVIRONMENTS, NASA, Doc. N62-13477, 306 pp. (1962); C.A. 60,10873 (1964)

Prepared a new class of thermally protective materials which have good resistance to dimensional erosion in simulated reentry environments. The materials were prepared by controlled pyrolysis of reinforced plastics to form a porous carbonized matrix, which was subsequently impregnated with either an organic or inorganic ablative gas-forming filler.

37 B. Ya. Teitel'baum, THERMOMECHANICAL CURVES OF POLYMERS UNDER CONSTANT LOAD, Vysokomolekul. Soedin. 4, 654 (1962)

The method is based on continuous recording of the movement of a plunger pressed into the polymer by a constant load and on uniform elevation of temperature.

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Emphasizes the fact that the thermomechanical properties of polymers are extremely sensitive to the experimental conditions. Discusses the feasibility of studying the thermomechanical properties of powdered specimens.

39 W. Knappe, RECENT RESULTS IN THE FIELD OF THERMAL CONDUCTIVITY OF HIGH POLYMERS, Plaste Kautschuk 9, 189 (1962); C. A. 57, 16844 (1962)

40 N. E. Boyer, HOW TO MAKE PLASTICS RESISTANT TO FLAME, HEAT, AND SUN, Plastics Technol. 8, No. 11, 33 (1962); C. A. 58, 2543 (1963)

41 H. G. Bader, TESTING METHODS FOR THE FLAMMABILITY OF THERMOSET PLASTICS, ESPECIALLY FIBER-GLASS REINFORCED BUILDING MATERIALS, Kunststoffe-Plastics 9, 375 (1962); C. A. 58, 5838 (1963)

A review is given of the standard tests and testing methods currently in use in several countries.

42 S. L. Madorsky, RATES OF THERMAL DEGRADATION OF ORGANIC POLYMERS, SPE J. 18, 1482 (1962)

43 A. Yamamoto, DIFFERENTIAL THERMAL ANALYSIS OF SYNTHETIC POLYMERS, Bunseki Kagaku 11, 943 (1962); C. A. 57, 15328 (1962)

Improved instrumentation is described and sample runs are given for a number of polymers.

Ref. No.

44 S. Kohn and G. Taguet, TEST METHODS FOR THE STUDY OF FLASH PYROLYSIS OF HIGH POLYMERS, Rech. Aeron. 88, 27 (1962); C. A. 57, 11365 (1962)

Describes techniques permitting study of the high temperature degradation phenomena of ablation shields for re-entry bodies under conditions approaching those encountered in flight. A fast TGA technique is used. By DTA, the endo- or exothermic character of the pyrolysis reaction is established, and the temperature intervals in which they take place are determined. Gas evolution from the material is also measured.

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A material balance is given for the solid, liquid, and gaseous products formed from a range of vinyl polymers when carbonized to 900° under reduced pressure.

46 Masakazu Inoue, STUDIES ON CRYSTALLIZATION OF HIGH POLYMERS BY DIFFERENTIAL THERMAL ANALYSIS, J. Polymer Sci. A1, 2697 (1963)

DTA was applied for the investigation of melting and crystallization behavior of high polymers.

47 Bacon Ke, DIFFERENTIAL THERMAL ANALYSIS OF HIGH POLYMERS VII. SOME LOW-TEMPERATURE TRANSITIONS, J. Polymer Sci. B1, 167 (1963)

48 M. L. Dannis, TRANSITION MEASUREMENTS USING DIFFERENTIAL THERMAL ANALYSIS TECHNIQUES, J. Applied Polymer Sci. 7, 231 (1963)

Some data on cis-1,4-polybutadiene are reported.

49 J. K. Gillham and A. F. Lewis, DYNAMIC MECHANICAL PROPERTIES OF SUPPORTED POLYMERS. II. APPLICATION OF THE TORSIONAL BRAID TECHNIQUE TO THE STUDY OF THE CURING AND STABILITY OF RESINS, J. Applied Polymer Sci. 7, 2293 (1963)

Curing and thermal softening behavior, as well as pyrolytic and oxidative degradation, were monitored. A comparative study between three thermosetting resins (a phenolic, an unsaturated polyester and a phosphonitrilic chloride) is presented.

50 B. C. Cox and B. Ellis, INTRODUCTION OF POLYMER SAMPLES INTO A MICROREACTOR, J. Applied Polymer Sci. 7, S19 (1963)

Instrumentation is described for pyrolysis of polymers followed by gas chromatographic analysis.

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54 S. S. Leshchenko, V. L. Karpov, I. K. Karpovich, V. N. Katyshev, and Zh. K. Krumin, INDUCTION BALANCE FOR STUDY OF THE THERMAL DEGRADATION OF POLYMERS, Zavodsk. Lab. 29 (8), 1016 (1963); C. A. 59, 11679 (1963)

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A Pt wire coil was used for pyrolysis at 800° (20 sec.). The condensed reaction products were then put through the gas chromatograph at 100°.

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The flammability temperature, combustion speed in streaming oxygen, and the heat of combustion at room temperature and an oxygen pressure of 25 atm. were determined for a number of polymers.

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Describes new automatic recording instruments for the determination of mechanical stability of plastics at elevated temperatures by penetration tests and bending tests.

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59 Chwa-Kyung Sung, PYROLYSIS OF POLYMERS. II. IDENTIFICATION OF POLYMER PYROLYSIS PRODUCTS BY GAS CHROMATOGRAPHY, J. Korean Chem. Soc. 7 (2), 106 (1963); C. A. 61, 5762 (1964)

60 Hyuk Yu, SOME KINETIC ASPECTS OF OXIDATIVE DEGRADATION OF VINYL POLYMERS. Univ. Microfilms (Ann Arbor, Mich.), Order No. 63-579, 126 pp.; Dissertation Abstr. 24 (4), 1425 (1963); C. A. 60, 12130 (1964)

61 J. K. Sieron, PYROLYZED FIBERS FOR HIGH-TEMPERATURE REINFORCEMENT, Rubber World 148, 50 (1963); C. A. 60, 4317 (1964)

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Reinforcement with pyrolyzed fiber considerably enhanced mechanical properties at elevated temperature. Pyrolyzed fiber is produced by heating organic fibers, such as rayon, in an inert or reducing atmosphere at temperatures up to 5000°F.

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64 S. Leghissa and E. Bondi, APPARATUS FOR OXIDATIVE DEGRADATION OF POLYMERS, Materie Plastiche Elastomeri 29 (8), 1113 (1963); C.A. 61,16180 (1964)

65 A. P. Gray and K. Casey, THERMAL ANALYSIS AND THE INFLUENCE OF THERMAL HISTORY ON POLYMER FUSION CURVES, J. Polymer Sci. B2, 381 (1964)

DTA was applied to the melting behavior of polymers.

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Carbon was prepared by carbonization of polymers to 700° and subsequent heating to 2700 or 3000°.

67 N. Brenner and V. J. Bartolot, Jr., TRANSITION MEASUREMENTS OF POLYMERS, Plastics Technol. 10 (9), 56 (1964)

A new calorimeter is described for the study of polymer molecular structure, purity and thermal degradation.

68 C. B. Murphy, F. W. Van Luik, Jr., and A. C. Pitsas, A NEW METHOD FOR THE THERMAL ANALYSIS OF POLYMERIC MATERIALS, Plastics Design Process 1964 (July), 16; C. A. 61, 10789 (1964)

69 S. E. Smirnova-Zamkova, DETERMINING THE THERMAL STABILITY OF POLYMERIC MATERIALS, Ukr. Khim. Zh. 30 (1), 107 (1964); C. A. 60, 13317 (1964)

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72 B. Groten, APPLICATION OF PYROLYSIS GAS-CHROMATOGRAPHY TO POLYMER CHARACTERIZATION, Anal. Chem. 36 (7), 1206 (1964)

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MATERIALS

POLYSTYRENE AND RELATED POLYMERS

Polystyrene

Ref. No.

74 B. Wunderlich and D. M. Bodily, DYNAMIC DIFFERENTIAL THERMAL ANALAYSIS OF THE GLASS TRANSITION INTERVAL, J. Polymer Sci. C6, 137

Dynamic differential thermal analysis (DDTA) is described and its application to the study of the glass transition interval of polystyrene is discussed.

75 I. F. Bogdanov, M. L. Mishchenko and I. L. Farberov, THE COMPOSITION OF GASES FROM THE RAPID PYROLYSIS OF SEVERAL MACROMOLECULAR COMPOUNDS, Tr. Inst. Goryuch. Iskop., Adad. Nauk SSSR 18, 29 (1962); C. A. 58, 8053 (1963)

Gives preliminary results of the rapid pyrolysis of poly(methyl methacrylate) and polystyrene in air or nitrogen.

76 S. L. Madorsky, D. McIntyre, J. H. O'Mara and S. Straus, THERMAL DEGRADATION OF FRACTIONATED HIGH- AND LOW-MOLECULAR-WEIGHT POLYSTYRENES, J. Res. Natl Bur. Std. 66A, 307 (1962)

The kinetics of thermal degradation of polystyrene fractions with molecular weights ranging from 2400 to 5×10^6 were studied at 307.5°.

77 R. Giuffria, R. O. Carhart, and D. A. Davis, HIGH GLOSS OF EXTRUDED HIGH IMPACT POLYSTYRENE SHEET. A MICROSCOPICAL STUDY OF SHEET MORPHOLOGY, J. Applied Polymer Sci. 7, 1731 (1963)

The effects of temperature and oxidation and temperature alone on the copolymer particles have been investigated.

78 E. I. Kirillova, E. N. Matveeva, Yu. A. Glagoleva, G. P. Fratkina, and N. F. Usmanova, AGING OF POLYSTYRENE PLASTICS. THERMAL STABILITY OF POLYSTYRENE POLYMERS, Plasticheskie Massy 1963 (11), 3; C. A. 60, 5705 (1964)

Compared the thermal stability of the following polymers: polystyrene, styrene/acenaphthene copolymers, poly(monochlorostyrene), styrene/α-methylstyrene copolymers, poly(dichlorostyrene) and styrene/β-vinylnaphthalene copolymers.

79 A. K. Jahn and J. W. Vanderhoff, SELF-EXTINGUISHING POLYSTYRENE FOAMING-IN-PLACE BEADS, Am. Chem. Soc., Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 61 (1963); C. A. 62, 697 (1964)

Sufficient halogen can be incorporated into polystyrene by chain transfer to produce a self-extinguishing foaming-in-place composition.

80 Chwa-Kyung Sung, PYROLYSIS OF POLYMERS. I. THERMOGRAVIMETRIC ANALYSIS OF POLYMERS, J. Korean Chem. Soc. 7 (2), 96 (1963); C. A. 61, 5761 (1964)

Ref. No.

By TGA studies polymers were classified into types. Type I (e.g. polystyrene, (poly(methyl methacrylate), acetal resins) depolymerize mainly into monomers over a small temperature range. Type II (e.g. poly(vinyl chloride), polyamides, polyurethanes) decompose in two steps. Type III (e.g. poly(vinyl alcohol) and diene polymers) decompose over a much wider range of temperature due to various irregular chain scissions and side-chain splittings as well as depolymerization to monomer.

81 D. A. Aliev. S. G. Alieva, L. M. Lotkova, and R. V. Dubrovko, THE THERMAL DEPOLYMERIZATION OF STYRENE RESINS, Neftepererabotka i Neftekhim., Nauchn.-Tekhn. Sb. 1963 (7), 32; C. A. 60, 3161 (1964

82 J. C. Spitsbergen and H. C. Beachell, LIGHT-SCATTERING STUDY OF THE OXIDATIVE DEGRADATION OF POLYSTYRENE, J. Polymer Sci. A2, 1205 (1964)

Oxidations were conducted on films in an air oven at 200°C for various times. The oxidized films were dissolved and various parameters were obtained on the solutions. Fractionation of unoxidized and oxidized thermally polymerized polystyrene showed a narrowing of molecular weight distribution during oxidation. There was a marked decrease in Mw on oxidation. The results indicate that random chain scission of oxidized polymer occurs along with formation of carbonyl groups giving molecules of shorter chain length, most of which probably retain the initial linear random coil structure. In addition to chain scission, branching and crosslinking are indicated by distortion of Zimm plots by microgel.

83 H. Feuerberg and H. Weigel, IDENTIFICATION OF ORGANIC POLYMERS BY PYROLYSIS AND GAS CHROMATOGRAPHY, Z. Anal. Chem. 199 (2), 121 (1964); C. A. 60, 5641 (1964)

The polymers studied included polystyrene, silicone rubber, silicone oil, poly(methyl methacrylate), polyacrylonitrile, poly(butyl acrylate), poly(ethyl acrylate), benzyl cellulose, ethyl cellulose, methyl cellulose, cellulose acetate, cellulose acetate butyrate, cellulose, poly(vinyl propionate), poly(vinyl acetate), and poly(vinyl alcohol).

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85 F. M. Natanson, Yu. I. Khimchenko, N. E Kharitinich, and Z. R. Ul'berg, THERMOOXIDATIVE DEGRADATION OF METAL POLYMERS OF POLYSTYRENE, Plasticheskie Massy 1964 (10), 3; C. A. 62, 2829 (1965)

DTA was used to study the thermal degradation of polystyrene containing highly dispersed Mn and Bi. Small amounts of both metals added to the monomer before polymerization, increased the decomposition temperature.

Polystyrene - Continued

Ref. No.

86 M. L. Mishchenko, I. L. Farberov, and I. D. Bogdanov, PYROLYSIS OF LINEAR POLYMERS DURING THERMAL SHOCK, Gazifikatsiya i Piroliz Topliv, Akad. Nauk SSSR, Gos. Kom. po Toplivn. Prom. pri Gosplane SSSR, Inst. Goryuch, Iskop., Sb. Statei 1964, 12; C. A. 62, 5353 (1965)

Pyrolysis of polystyrene, polyethylene, and Na butadiene rubber was studied at 800 - 1200°.

Poly(methylstyrenes)

87 F. Danusso and G. Polizzotti, APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS TO ISOTACTIC POLYMERS OF SUBSTITUTED STYRENES, Makromol Chem 61, 157 (1963)

88 D. Braun and G. Heufer, THERMAL DECOMPOSITION OF POLY(α-METHYLSTYRENES) OF DIFFERENT TACTICITY, Makromol. Chem. 79, 98 (1964) (Ger)

POLYETHYLENE AND SOME OTHER POLYOLEFINS

Polyethylene

Ref. No.

89 H. W. Holden, A DIFFERENTIAL THERMAL ANALYSIS STUDY OF THE EFFECTS OF THERMAL HISTORY ON POLYETHYLENE, J. Polymer Sci. C6, 53

The melting and crystallization behavior of polyethylene samples has been investigated by differential thermal analysis (DTA), with special emphasis on the effects of thermal conditioning on the crystalline state of the sample.

90 F. H. Winslow, W. L. Hawkins, and W. Matreyek, EFFECT OF MORPHOLOGY ON POLYETHYLENE OXIDATION, Am. Chem. Soc. Div. Polymer Chem., Preprints 2, No. 1, 186 (1961); C. A. 57, 15332 (1962)

91 V. L. Karpox, Yu. M. Malinskii, L. V. Mitrofanova, S. T. Sinitsyn, E. E. Finkel, A. S. Fridman, and S. M. Chernetsov, INCREASING THE THERMAL STABILITY OF POLYETHYLENE-INSULATED LINES BY IONIZING RADIATION, Tr. Tashkentsk. Konf. po Mirnomu Ispol'z. At. Energii, Akad. Nauk Uz. SSR 1, 383 (1961); C. A. 61, 8476 (1964)

92 T. R. Crompton, THE EFFECT OF CARBON BLACK ON THERMAL ANTIOXIDANTS FOR POLYETHYLENE, J. Applied Polymer Sci. 6, 558 (1962)

93 T. H. Melitzer and R. N. Goldey, COMPARATIVE CHEMICAL MEANS OF ASSESSING POLYETHYLENE OXIDIZABILITY, SPE Trans. 2, No. 1, 11 (1962)

94 R. G. Nagler, THE POSSIBILITY OF STRAIN DEPENDENCE IN THE THERMAL DEGRADATION PROCESSES OF VINYL POLYMERS, NASA, Doc. N62-12746, 10 pp. (1962); C. A. 60, 9372 (1964)

Polyethylene - continued

Ref. No.

95 S. Ozawa and K. Murai, DEGRADATIONS OF ZIEGLER-PROCESS LOW-PRESSURE POLYETHYLENE AND ITS STABILIZERS. I. EFFECT OF ANTIOXIDANTS ON THERMAL DEGRADATION, Kobunshi Kagaku 19, 571 (1962); C. A. 61, 5852 (1964)

96 A. A. Berlin, S. F. Bulacheva and Yu. L. Morozo, THE CHEMISTRY AND TECHNOLOGY OF SYNTHETIC POLYMERS. MODIFICATION OF THE PROPERTIES OF POLYETHYLENE BY SURFACE OXIDATION, Plasticheskie Massy 1962, No. 10, 3; C. A. 58, 8093 (1963)

The oxidation of polyethylene films with $K_2Cr_2O_7/H_2SO_4$ was studied at various temperatures, the process being followed by determining the wetting angle.

97 T. H. Meltzer, POLYETHYLENE OXIDATION TEST BY A COMBUSTION METHOD, Poliplasti 10, No. 60, 22 (1962); C. A. 58, 12726 (1963)

98 V. L. Karpov, S. S. Leshchenko, L. V. Mitrofanova and E. E. Finkel, THE EFFECT OF VARIOUS ADDITIVES ON THE RADIATION CROSS-LINKING AND THERMAL STABILITY OF IRRADIATED POLYETHYLENE, Trudy 2-90 (Vtorogo) Vses. Soveshch. po Radiats. Khim., Akad. Nauk SSSR, Otd. Khim. Nauk, Moscow 1960, 547 (Pub. 1962); C. A. 58, 6977 (1963)

To diminish the cracking at 150-200°C of polyethylene crosslinked by ionizing radiation, the effect of various antioxidative stabilizers was studied. Thermomechanical curves and mechanical properties were determined.

99 M. A. Magrupox and N. A. Slovokhotova, THERMAL DESTRUCTION OF POLYETHYLENE, Dokl. Akad. Nauk SSSR 146, 826 (1962); C. A. 58, 2544 (1963)

Shows infrared spectra of high- and low-pressure polyethylene which had been subjected to thermal degradation at 300-415°C.

100 B. H. Clampitt, DIFFERENTIAL THERMAL ANALYSIS OF LINEAR POLYETHYLENE-HIGH PRESSURE POLYETHYLENE BLENDS, Anal. Chem. 35, 577 (1963)

101 F. H. Winslow, C. J. Aloisio, W. L. Hawkins, W. Matreyek, and S. Matsuoka, DEPENDENCE OF POLYOLEFIN OXIDATION ON MORPHOLOGY, Chem. Ind. (London) 1963, 533

102 W. L. Hawkins and H. Sautter, SYNERGISTIC ANTIOXIDANT COMBINATIONS. MECHANISM OF STABILIZATION WITH ORGANO-SULFUR COMPONENTS, J. Polymer Sci. A1, 3499 (1963)

103 W. L. Hawkins and M. A. Worthington, SYNERGISTIC ANTIOXIDANT COMBINATIONS. CARBON BLACK SUBSTITUTES, J. Polymer Sci. A1, 3489 (1963)

104 Bacon Ke, DIFFERENTIAL THERMAL ANALYSIS OF HIGH POLYMERS. VI. COMMENTS ON SOME MATERIAL AND EXPERIMENTAL FACTORS, J. Polymer Sci. A1, 1453 (1963)

Polyethylene - continued

Ref. No.

105 L. Dulog, E. Radlmann and W. Kern, AUTOXIDATION OF SATURATED MACROMOLECULAR HYDROCARBONS, Makromol. Chem. 60, 1 (1963)

Polyethylene, polypropylene and poly(butene-1) were oxidized in trichlorobenzene at 120-140°C for polypropylene and 150-176°C for the others. Oxidation was followed through volumetric measurement of oxygen consumption.

106 Chwa-Kyung Sung, Icksam Noh, Jung Yup Kim and Sung Vong Chang, PYROLYSIS OF POLYMERS. IV. PYROLYSIS OF POLYETHYLENE AND POLYPROPYLENES, J. Korean Chem. Soc. 7 (2) 122 (1963); C. A. 61, 5762 (1964)

107 S. Ozawa and R. Takahashi, DEGRADATION AND STABILIZERS OF ZIEGLER-PROCESS LOW-PRESSURE POLYETHYLENE. II. FACTORS OF THERMAL BRITTLENESS, Kobunshi Kagaku 20 (216), 251 (1963); C. A. 61, 9634 (1964)

Studied the mechanical properties of Ziegler-process polyethylene, heated in air at 100°.

108 H. G. Kilian and F. H. Mueller, DIFFERENTIAL THERMAL ANALYSIS OF DIFFERENT BRANCHED AND CHLORINATED POLYETHYLENES IN COMBINATION WITH X-RAY MEASUREMENTS, Kolloid-Z. 192 (1,2), 34 (1963)

109 W. J. Tabar, METHOD FOR DETERMINING THE FUNDAMENTAL AND PRACTICAL BEHAVIOR OF POLYMERS AT HIGH TEMPERATURES, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, G1; C. A. 60, 9417 (1964)

In order to determine the thermal stability of polyolefins under conditions similar to those encountered in commercial practive, a technique is described by which a polymer can be exposed to temperatures as high as 400° for short contact times in a continuous flow system. Data are given for polyethylene.

110 P. M. Kamath, W. Wild, and S. G. Howell, MECHANO-THERMAL DEGRADATION OF POLYETHYLENE EFFECT ON MOLECULAR-WEIGHT DISTRIBUTION, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, U1; C. A. 60, 9373 (1964)

Degradation of polyethylene by both thermal and mechanothermal means was studied by fractionation of degradation products and examination of their molecular weight distribution curves. Both thermal and mechanothermal degradations proceeded by identical mechanisms.

111 F. H. Winslow, C. J. Aloisio, W. L. Hawkins, W. Matreyek, and S. Matsuoka, EFFECT OF BRANCHING AND MOLECULAR WEIGHT ON THE MORPHOLOGY OF POLYETHYLENE. OXIDATIVE ANNEALING, Am. Chem. Soc., Div. Polymer Chem., Preprints 4 (1), 336 (1963); C. A. 62, 651 (1965)

112 F. H. Winslow, C. J. Aloisio, W. L. Hawkins, W. Matreyek and S. Matsuoka, OXIDATIVE CRYSTALLIZATION OF POLYTHENE, Chem. Ind. (London) 1963 (35) 1465

Ref. No.

A linear polyethylene and a polymethylene when heated in nitrogen for 300 hours at 100°, showed no change in density (0.933). When they were heated in oxygen, they showed a rapid increase to a density of 0.99, while the X-ray pattern showed a mere trace of amorphous structure.

113 T. Ogihara, OXIDATIVE DEGRADATION OF POLYETHYLENE IN NITROGEN DIOXIDE. Bull. Chem. Soc. Japan 36, No. 1, 58 (1963)

The progress of the NO_2 oxidation of polyethylene was followed by infrared spectral analysis.

114 T. Ogihara, S. Tsuchiya, and K. Kuratani, THERMAL DEGRADATION OF POLYETHYLENE IN NITROGEN DIOXIDE GAS, Tokyo Daigaku Koku Kenkyusho Shuho 3, 260 (1963); C. A. 59, 7718 (1963)

The degradation of polyethylene in NO_2 was studied by infrared absorption measurement of an oxidized specimen. The mechanism is discussed.

115 H. Kambe and S. Igarashi, THERMAL STABILITY OF HIGH POLYMERS. I. AN AUTOMATIC RECORDING THERMOBALANCE AND THERMOGRAVIMETRIC ANALYSIS OF POLYETHYLENE, Rept., Aeron. Res. Inst., Univ. Tokyo 28 (8), 145 (1963); C. A. 60, 1891 (1964)

116 H. Kambe and Y. Shibazaki, STUDIES ON THERMAL DEGRADATION PRODUCTS OF POLYMERS BY GAS CHROMATOGRAPHY. I. POLYETHYLENE, Kobunshi Kagaku 20 (222), 641 (1963); C. A. 60, 14627 (1964)

117 T. H. Meltzer. C. C. White, and J. J. Kelley, UNUSUAL EXPOSURE TO OXIDATION FOR POLYETHYLENE, SPE Journal 19 (6), 565 (1963)

Carbon black in polyethylene resins is a good antioxidant in a strong oxidation environment. Polyisobutylene decreases the resistance to oxidation.

118 A. L. Goldenberg, AN INFRARED SPECTROSCOPIC STUDY OF THE CHEMICAL CHANGES IN POLYETHYLENE DURING FLAME SPRAYING, SPE Trans. 3, 286 (1963)

119 E. N. Matveeva, S. S. Khin'kis, A. I. Tsvetkova, and V. A. Balandina, AGING OF POLYOLEFINS. THERMOOXIDATIVE DEGRADATION OF POLYOLEFINS, Plasticheskie Massy 1963, No. 1, 2; C. A. 58, 12698 (1963)

The degradation of high- and low-pressure polyethylene, polypropylene, and an ethylene/propylene copolymer at 120-170° in oxygen were studied.

120 V. D. Moiseev, QUANTITATIVE COMPOSITION OF VOLATILE PRODUCTS IN THE THERMAL DEGRADATION OF POLYMERS AND RADICAL ISOMERIZATION KINETICS, Plasticheskie Massy 1963 (12), 3; C. A. 60, 8153 (1964)

Ref. No.

A mechanism of thermal degradation of polyolefins is proposed to explain the formation of volatile products. It consists of chain bond rupture with formation of 2 chain-end radicals, isomerization of the radicals through shifting of H atoms, and bond rupture at the radical C atom. The low molecular weight products predicted by this mechanism for polyethylene and polypropylene degradation were confirmed experimentally.

121 A. V. Vannikov, V. D. Bityukov, and N. A. Bakh, SOME ELECTROPHYSICAL PROPERTIES OF PRODUCTS OF IRRADIATION AND THERMAL TREATMENT OF POLYETHYLENE, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 41; C. A. 62, 661 (1965)

122 J. Kapacauskiene and Yu. A. Shiyapnikov, OXIDATION OF HIGH-PRESSURE POLYETHYLENE, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya, Polimerov, Sb. Statei 1964, 218; C. A. 62, 1795 (1965)

Investigated the oxidation of high-pressure polyethylene in the temperature range 130-200°.

123 V. D. Moiseev and M. B. Neiman, ISOMERIZATION OF RADICALS AND PRODUCTS OF THERMAL DEGRADATION OF POLYMERS, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sv. Statei 1964, 114; C. A. 62, 658 (1965)

Low molecular weight products of thermal degradation of low-pressure polyethylene at 330-370° and of isotactic fractions of polypropylene at 370-400° were investigated. The mechanism is discussed.

124 N. A. Slovokhotova, M. A. Magrupov, and V. A. Kargin, THERMAL DEGRADATION OF POLYETHYLENE, Vysokomolekul. Soedin. 6 (11), 1974 (1964); C. A. 62, 4129 (1965)

125 Z. A. Markova, B. G. Ershov, and N. A. Bakh, STRUCTURAL CHANGES OF POLYETHYLENE ON IRRADIATION AND THERMAL TREATMENT, Vysokomolekul. Soedin. 6 (1), 131 (1964)

Used infrared spectroscopy to investigate structural changes in polyethylene irradiated in vacuum, then oxidized in air (2 hours at 265°) and pyrolyzed in vacuum (up to 820°). Reports an apparent three-dimensional structure forms from this treatment in which carbonyl and aromatic compounds with a high degree of conjugation of C:C and C:O bonds predominate.

126 B. Kaesche-Krischer, H. J. Heinrich, and J. Zehr, PYROLYSIS AND IGNITION OF PLASTICS IN DUST FORM, Staub 24 (3), 99 (1964); C. A. 61, 4548 (1964)

The spontaneous ignition during storage of dusts of plastic materials such as poly(vinyl alcohol), poly(vinyl chloride), polyethylene, and polypropylene, is discussed in terms of pyrolysis and oxidation processes.

Polyethylene - continued

Ref. No.

127 K. Ipoly, POLYETHYLENE AGING AND STABILIZATION, Magy. Kem. Lapja 19 (1), 15 (1964); C. A. 60, 14711 (1964)

128 N. T. Notley, THERMAL OXIDATION OF POLYOLEFINS, Trans. Faraday Soc. 60 (493), Pt. 1, 88 (1964)

Studied the sorption of oxygen on polyethylene and polypropylene.

129 H. P. Schreiber, PYROLYSIS CONDITIONS FOR CARBON BLACK RECOVERY FROM POLYETHYLENE COMPOUNDS, Mater. Res. Std. 4 (6), 288 (1964); C. A. 61, 9630 (1964)

130 A. Monini, POSSIBLE CAUSES OF ODOR IN POLYETHYLENE, Farmaco (Pavia) Ed. Prat. 19 (1), 52 (1964); C. A. 60, 10873 (1964)

The factors which cause odor development in manufactured polyethylene articles are connected mainly with thermal or thermooxidative degradation phenomena occurring in the hot working of the polymer.

131 G. V. Grebenshchikov and I. L. Farberov, THERMOGRAPHIC INVESTIGATION OF SOME POLYMERS AND POLYCONDENSATES, Gazifikatsiya i Piroliz Topliv, Akad. Nauk SSSR, Gos. Kom. po Toplivn. Prom. pri Gosplane SSSR, Inst. Goryuch. Iskop., Sb. Statei 1964, 31; C. A. 62, 1791 (1965)

132 G. Geiseler and H. Wergin, OXIDATIVE DEGRADATION OF POLYOLEFINS BY OXYGEN CONTAINING OZONE. I. KINETIC INVESTIGATIONS, J. Prakt. Chem. 25 (3-4), 135 (1964); C. A. 62, 4130 (1965)

Polyethylene, polypropylene and polyisobutylene were suspended in tetrachloroethane and subjected to an oxygen stream containing 3% (weight) ozone from -25 to 100°. The kinetics are reported.

133 K. Casey, C. T. Elston, and M. K. Phibbs, METHYL GROUP CLUSTERS IN FREE RADICAL POLYETHYLENE, J. Polymer Sci. B2, 1053 (1964)

Differential thermal analysis was used for melting point determination.

134 T. H. Meltzer, THE INFLUENCE OF OXIDATIVE DEGRADATION UPON THE DENSITY OF POLYETHYLENES, Tech. Papers, Reg. Tech. Conf., Soc. Plastics Engrs., Chicago Sect. 1964, 25; C. A. 61, 3258 (1964)

135 S. Igarashi, I. Mita, and H. Kambe, THERMOGRAVIMETRIC ANALYSIS OF THE EFFECT OF IONIZING RADIATION ON THERMAL STABILITY OF POLYETHYLENE, J. Applied Polymer Sci. 8, 1455 (1964)

The effect of radiation on thermal oxidative degradation of polyethylene was studied by TGA. It was found that the thermal stability of polyethylene irradiated in a vacuum and in air at room temperature decreases with increasing radiation dose.

Ref. No.

136 S. Igarashi, O. Yamamoto, and H. Kambe, DIFFERENTIAL THERMAL AND INFRARED ANALYSES OF OXIDIZED POLYETHYLENE, Kolloid Z. 199 (2), 97 (1964)

137 S. Igarashi and H. Kambe, THERMOANALYTICAL STUDIES OF THE THERMAL STABILITY OF HIGH POLYMERS. II. DIFFERENTIAL THERMAL ANALYSIS AND THERMOGRAVIMETRIC ANALYSIS OF SOME POLYETHYLENES, Bull. Chem. Soc. Japan 37 (2), 176 (1964)

DTA and TGA studies were carried out on high- and low-pressure polyethylene in air and in nitrogen.

138 H. Kambe, S. Igarashi, I. Imanishi, and O. Yamamoto, GAS-FLOW DIFFERENTIAL THERMAL ANALYSIS APPARATUS FOR STUDYING THERMAL DEGRADATION OF HIGH POLYMERS, Rept. Aeron. Res. Inst., Univ. Tokyo 29 (1), 1 (1964); C. A. 61, 12108 (1964)

DTA of polyethylene was carried out in oxygen and nitrogen. In oxygen, there were exothermic peaks at about 190° (assigned to oxidation) and at 300° (oxidative degradation). In nitrogen only the peak due to melting was observed.

139 G. M. Brauer, PYROLYTIC TECHNIQUES, J. Polymer Sci. C8, 3

Pyrolysis and gas chromatography was used to study the structure of polymers such as egg and bovine serum albumin, phenol-formaldehyde resins, polypropylene, polyethylene, polymethylene, polystyrene, SBR-polybutadiene vulcanizates, and poly(methyl methacrylate). TGA methods are also briefly discussed.

140 B. H. Clampitt, DIFFERENTIAL THERMAL ANALYSIS OF THE COCRYSTAL PEAK IN LINEAR-HIGH PRESSURE POLYETHYLENE BLENDS, J. Polymer Sci. A3, 671 (1965)

141 Bill B. Stafford, APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS TO POLYETHYLENE BLENDS, J. Applied Polymer Sci. 9, 729 (1965)

142 H. A. Lanceley, THE EFFECT OF OXIDATION ON SPHERULITE SIZE IN POLYETHYLENE FILMS, Polymer 6, 1, 15 (1965)

Well resolved and thus readily identifiable spherulites appear in crystallized polyethylene films only after the polymer has been heated to temperatures 100° to 200°C in excess of the crystal melting point. Infrared examination of samples of a low pressure polyethylene heated in air and in vacuo reveals that oxidation is also necessary before these morphological changes occur.

Polypropylene

Ref. No.

143 H. J. Donald, E. S. Humes and L. W. White, CRYSTALLIZATION OF POLYPROPYLENE MEASURED BY DIFFERENTIAL THERMAL ANALYSIS, J. Polymer Sci. C6, 93

Ref. No.

144 J. C. Woodbrey and Q. A. Trementozzi, CHARACTERIZATION OF STEREOCHEMICAL REGULATION IN POLYPROPYLENES, J. Polymer Sci. C8, 113

Included are a few DTA results.

145 C. A. Russell and J. V. Pascale, THE EARLY STAGES OF ISOTACTIC POLYPROPYLENE OXIDATION, Am. Chem. Soc., Div. Polymer Chem., Preprints 2, No. 2, 19 (1961); C. A. 58, 14131 (1963)

Used dielectric and infrared methods to study the initial stages of oxidation at 130°.

146 R. H. Hansen, C. A. Russell, T. DeBenedictis, W. M. Martin, and J. V. Pascale, INHIBITION OF THE COPPER-CATALYZED OXIDATION OF POLYPROPYLENE, Am. Chem. Soc., Div. Polymer Chem., Preprints 2, No. 1, 190 (1961); C. A. 57, 15351 (1962)

147 Yu. A. Shlyapnikov, V. B. Miller, and E. S. Torsueva, THE ACTION OF INHIBITORS DURING THE OXIDATION OF POLYPROPYLENE, Izv. Akad. Nauk SSSR, Otd. Khim. Nauk 1961, 1966; C. A. 58, 9286 (1963)

148 H. W. Wyckoff, X-RAY AND RELATED STUDIES OF QUENCHED, DRAWN, AND ANNEALED POLYPROPYLENE, J. Polymer Sci. 62, 83 (1962)

Some DTA studies of melting are included.

149 D. Ryshavy and L. Balaban, THE EFFECT OF POLYMERIZATION CATALYSTS ON THE RATE OF DEGRADATION OF ISOTACTIC POLYPROPYLENE, SPE Trans. 2, No. 1, 25 (1962)

150 V. V. Dudorov, A. L. Samvelyan, A. F. Lukovnikov and P. I. Levin, DECOMPOSITION OF HYDROPEROXIDE GROUPS IN OXIDIZED ATACTIC POLYPROPYLENE, Izv. Akad. Nauk Arm. SSR, Khim. Nauki 15, 311 (1962) (in Russian); C. A. 58, 9287 (1963)

151 N. A. Nechitailo, L. S. Polak, and P. I. Sanin, ACTION OF γ-RAYS ON POLYPROPYLENE IN THE PRESENCE OF IONOL AS STABILIZER, Plasticheskie Massy 1962, No. 7, 3; C. A. 57, 16863 (1962)

Some DTA studies of irradiated samples are reported.

152 M. P. Schard and C. A. Russell, OXYLUMINESCENCE OF POLYMERS, Am. Chem. Soc., Div. Polymer Chem., Preprints 3 (2), 239 (1962); C. A. 61, 3218 (1964)

The weak emission of light by polymers on heating in air or oxygen was studied for polypropylene, polyethylene and nylon.

153 Fumiyuki Hamada, THERMAL DEGRADATION OF POLYPROPYLENE, Kobunshi Kagaku 19, 402 (1962); C. A. 60, 1893 (1964)

Polypropylene was degraded thermally in vacuum and in air, and the changes in D. P. were studied.

Ref. No.

154 R. Rado, CONTROLLED DEGRADATION OF POLYPROPYLENE, Chem. Prumysl 12, 209 (1962); C. A. 58, 4687 (1963)

Studied regulation of molecular weight of polypropylene by thermal degradation with peroxides as initiators.

155 V. S. Pudov and M. B. Neiman, DECOMPOSITION KINETICS OF ISOTACTIC POLYPROPYLENE PEROXIDES STUDIED BY CHROMATOGRAPHY, Neftekhimiya 2, 918 (1962); C. A. 58, 9243 (1963)

156 Yu. A. Shlyapnikov, V. B. Miller, M. B. Neiman and E. S. Torsueva, CORRELATIONS IN THE EFFECT OF INHIBITORS IN OXIDATION REACTIONS. I. ALKYLPHENOLS, Vysokomolekul. Soedin. 4, 1228 (1962); C. A. 59, 2966 (1963)

Investigated the dependence of the induction period of polypropylene oxidation upon the concentration of phenolic inhibitors at temperatures of 170-210°.

157 E. G. Rozantsev, L. A. Krinitskaya and B. V. Rozynov, THERMOOXIDATIVE DESTRUCTION OF POLYPROPYLENE IN THE PRESENCE OF BORIC ACID ESTERS, Plasticheskie Massy 1963 (11), 46; C. A. 60, 4302 (1964)

158 Z. Manasek, D. Berek, M. Micko, M. Lazar, and J. Pavlinec, FORMATION AND DECOMPOSITION OF HYDROPEROXIDES OF ATACTIC POLYPROPYLENE, Rubber Chem. Technol. 36 (3), 532 (1963)

The kinetics of formation and decomposition of peroxides in the oxidation of atactic polypropylene in air from 20 to 120°C are described.

159 M. Giesen, AGING OF POLYOLEFINS AND RUBBER, Kautschuk Gummi 16, 481 (1963); C. A. 59, 15462 (1963)

Discusses possible oxidative reactions of polyethylene and polypropylene in relation to changes in the infrared spectra of aged films. Aging results under various test conditions are reported for a natural rubber vulcanizate.

160 G. I. Likhtenshtein and Ya. G. Urman, THEORY OF THE INHIBITION OF OXIDATION, Vysokomolekul. Soedin. 5 (7), 1016 (1963)

161 I. Benesh and G. Kaplan, THERMO-OXIDATIVE DEGRADATION OF POLYPROPYLENE IRRADIATED WITH γ-RAYS, Vysokomolekul. Soedin. 5 (10), 1580 (1963)

Films were irradiated by γ-rays and the induction period of oxygen absorption at 180°C was determined to check the stability. The induction period decreased as the radiation dose increased. The chief mechanism was the destruction of the inhibitor due to its reaction with products of irradiation oxidation of the polymer.

Polypropylene - continued

Ref. No.

162 A. F. Lukovinkov, B. P. Fedorov, A. G. Vasil'eva, E. A. Krasnyanskaya, P. I. Levin, and Ya. L. Gol'dfarb, BENZIMIDAZOLE DERIVATIVES AS INHIBITORS OF THE OXIDATION OF POLYPROPYLENE AND THE EFFECT OF p-HYDROXYDIPHENYLAMINE ON THESE DERIVATIVES, Vysokomolekul. Soedin. 5 (12), 1785 (1963)

163 A. Monaci, P. Lazzari, and E. Berarducci, THERMAL OXIDATIVE DEGRADATION OF POWDERED, NONSTABILIZED POLYPROPYLENE, Chim. Ind. (Milan) 45 (11), 1337 (1963); C. A. 60, 4270 (1964)

Weight loss, intrinsic viscosity, and number of carbonyl groups were determined as a function of heating temperature and time.

164 S. S. Stivala, L. Reich, and P. G. Kelleher, KINETICS OF THE THERMAL OXIDATION OF ISOTACTIC POLYPROPYLENE BY INFRARED SPECTROSCOPY, Makromol Chem. 59, 28 (1963)

165 W. L. Hawkins, RECENT ADVANCES IN THE STABILIZATION OF POLYOLEFINS AGAINST THERMAL OXIDATION, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, 01; C. A. 60, 12180 (1964)

166 G. C. Newland and J. W. Tamblyn, METAL-ORGANIC STABILIZERS AND ANTI-STABILIZERS FOR POLYOLEFIN PLASTICS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, N1; C. A. 60, 10876 (1964)

167 C. E. Tholstrup, NEW INHIBITORS OF COPPER-CATALYZED OXIDATION OF POLYPROPYLENE, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, P1; C. A. 60, 10877 (1964)

168 H. Schott and W. S. Kaghan, VISCOUS FLOW AND DEGRADATION OF MOLTEN POLYPROPYLENE, SPE Trans. 3 (2), 145 (1963)

169 V. S. Pudov, B. A. Gromov, E. G. Sklyarova, and M. B. Neiman, OXIDATION OF ISOTACTIC POLYPROPYLENE. I. KINETICS OF OXYGEN ADSORPTION, Neftekhimiya 3 (5), 743 (1963); C. A. 60, 6947 (1964)

Oxidation of isotactic polypropylene was studied by the kinetics of oxygen adsorption on thin films and concentration of peroxides in the polymers at 130° several oxygen pressures. The mechanism is discussed.

170 V. S. Pudov and M. B. Neiman, OXIDATION OF ISOTACTIC POLYPROPYLENE. II. MECHANISM OF FORMATION OF THE MAIN VOLATILE PRODUCTS, Neftekhimiya 3 (5), 750 (1963); C. A. 60, 6947 (1964)

Rates of formation of volatile oxidation products of isotactic polypropylene were determined at 120-140° and 200-600 mm. oxygen pressure.

171 Yu. A. Shlyapnikov, V. B. Miller, M. B. Neiman, and E. S. Torsueva, REGULARITIES OF THE ACTION OF INHIBITORS IN OXIDATION REACTIONS, Vysokomolekul. Soedin. 5 (10), 1507 (1963)

Polypropylene - continued

Ref. No.

172 N. A. Slovokhotova, M. A. Magrupov, and V. A. Kargin, THERMAL DEGRADATION OF POLYPROPYLENE, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 237; C. A. 62, 1757 (1965)

Studied the degradation of isotactic and atactic polypropylene under vacuum at 215-415°. The products of degradation were studied by cryoscopy and by infrared methods.

173 P. Drienovskii and O. Kysel, PYROLYSIS OF ATACTIC POLYPROPYLENE, Chem. Zvesti 18 (7), 512 (1964); C. A. 61, 10795 (1964)

174 P. Manaresi, R. Zannetti, and L. Boldi, DETERMINATION OF THE TRANSITION TEMPERATURES THROUGH MEASUREMENT OF DILATATION, DIFFERENTIAL THERMAL ANALYSIS, X-RAY DIFFRACTION AND β-RAY ABSORPTION ON SOME POLYMERS AND COPOLYMERS OF OLEFINS, Materie Plastiche Elastomeri 30 (4), 370 (1964); C. A. 61, 12102 (1964)

175 J. Benes, MECHANISM OF ACTION OF ANTIOXIDANTS DURING OXIDATION OF POLYPROPYLENE, Collection Czech. Chem. Commun. 29 (2), 163 (1964); C. A. 60, 12179 (1964)

176 K. Matsuzaki, H. Sobue, and Z. Osawa, ANALYSIS OF THERMAL DEGRADATION OF POLYPROPYLENE WITH A THERMAL BALANCE, J. Polymer Sci. B2, 845 (1964)

A TGA method was studied. The relationship between the oxygen absorption method and this TGA method was also studied.

177 T. Takahashi and K. Suzuki, EFFECT OF PIGMENTS ON DEGRADATION OF POLYMERS. I. THERMAL DEGRADATION OF POLYPROPYLENE, Kobunshi Kagaku 21 (232), 487 (1964); C. A. 61, 14847 (1964)

178 Yu. A. Shlyapnikov, V. B. Miller, M. B. Neiman, and E. S. Torsueva, THE LAWS OF ACTION OF INHIBITORS IN OXIDATIVE REACTIONS (OF POLYPROPYLENE). III. THE INHIBITOR 2,2'-THIOBIS-(4-METHYL-6-TERTBUTYLPHENOL), Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 106; C. A. 62, 689 (1965)

179 B. A. Gromov, V. B. Miller, M. B. Neiman, E. S. Torsueva, and Yu. A. Shlyaprikov, MECHANISM OF WEAK ANTIOXIDANT ACTION IN THE OXIDATION OF POLYPROPYLENE, Vysokomolekul. Soedin. 6 (10), 1895 (1964)

180 V. D. Moiseev, M. B. Neiman, and V. I. Suskina, THE DEPOLYMERIZATION, ISOMERIZATION, AND CHAIN-TRANSFER RATES OF THE THERMAL DEGRADATION OF POLYPROPYLENE, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 86; C. A. 62, 1758 (1965)

Describes results for weight loss, gas evolution and molecular weight variation on vacuum thermal degradation. The rates of depolymerization, isomerization, and chain transfer were calculated.

181 R. H. Hansen, C. A. Russell, T. DeBenedictis, W. M. Martin, and J. V. Pascale, INHIBITION OF THE COPPER-CATALYZED OXIDATION OF POLYPROPYLENE, J. Polymer Sci. A2, 587 (1964)

Ref. No.

Thermal oxidation and copper-catalyzed thermal oxidation of polypropylene were studied over a range of elevated temperatures. The apparent activation energy for both of these processes is 27 kcal./mole.

182 I. Kirshenbaum, Z. W. Wilchinsky, and B. Groten, HEAT AND ENTROPY OF FUSION OF POLYPROPYLENE, J. Applied Polymer Sci. 8, 2723 (1964)

DTA was used to determine the heat of fusion of isotactic polypropylene.

183 A. V. Tobolsky, P. M. Norling, N. H. Frick, and H. Yu, THE MECHANISM OF AUTOXIDATION OF THREE VINYL POLYMERS: POLYPROPYLENE, ETHYLENE-PROPYLENE RUBBER, AND POLY(ETHYL ACRYLATE), J. Am. Chem. Soc. 86 (19), 3925 (1964)

184 Jen Chiu, NEW DIFFERENTIAL THERMAL ANALYSIS FOR MEASURING ISOTHERMAL CRYSTALLIZATION RATES OF HIGH POLYMERS, Anal. Chem. 36 (11), 2058 (1964)

185 W. McG. Morgan, ANTIDEGRADANTS FOR POLYOLEFINS AND RUBBER, Rubber Plastics Age 45, 289 (1964)

186 H. C. Beachell and D. L. Beck, THERMAL OXIDATION OF DEUTERATED POLYPROPYLENES, J. Polymer Sci. A3, 457 (1965)

Infrared spectroscopy was used to follow the kinetics over the temperature range 100-130°. A deuterium isotope effect was found for the thermal oxidation of polypropylene.

187 D. Poller and A. M. Kotliar, EFFECTS OF DEGRADATION ON POLYPROPYLENE MELT RHEOLOGY, J. Applied Polymer Sci. 9, 501 (1965)

The rheological behavior of a molten polypropylene resin is governed primarily by its weight-average molecular weight and its molecular weight distribution. When the polymer is exposed to processing operations carried out at high temperatures, oxidative conditions, and high shear stresses, significant degradation often results, causing major changes in molecular weight and molecular weight distribution.

Polybutenes

Ref. No.

188 B. H. Clampitt and R. H. Hughes, DIFFERENTIAL THERMAL ANALYSIS OF POLYBUTENE-1, J. Polymer Sci. C6, 43

It is shown that the three polymorphic forms of polybutene-1 may be readily characterized by DTA.

189 H. W. Holden, THE LOW-MELTING CRYSTALLINE MODIFICATIONS OF ISOTACTIC POLYBUTENE-1, J. Polymer Sci. C6, 209

Ref. No.

The effect of annealing on the low-melting crystalline modification (III) of isotactic polybutene-1 was studied by DTA.

190 C. Geacintov, R. S. Schotland, and R. B. Miles, PHASE TRANSITION OF CRYSTALLINE POLYBUTENE-1 IN FORM III, J. Polymer Sci. B1, 587 (1963)

191 C. Geacintov, R. S. Schotland, and R. B. Miles, FORM III TO FORM II PHASE TRANSITION OF POLYBUTENE-1, J. Polymer Sci. C6, 197

The Form III to Form II transition of crystalline polybutene -1 at elevated temperature has been observed by DTA, dilatometry, x-ray diffraction, and photomicrography.

192 D. L. Beck, J. R. Knox, and J. A. Price, POLYMERS OF STRAIGHT CHAIN α-OLEFINS: MELTING AND GLASS TRANSITIONS, Am. Chem. Soc., Div. Petrol. Chem., Preprints 8 (2), B63 (1963)

Dilatometric and DTA methods were used in the study.

193 E. Beati, F. Severini and G. Clerici, PEROXIDATION OF POLYBUTENE, Makromol. Chem. 61, 104 (1963) (in English)

Autocatalytic peroxidation was carried out in air at 80-100°. Hydroperoxides, peroxides, active hydrogen, and alcohols were determined by chemical methods in the oxidized product, and the ketonic carbonyls were determined qualitatively by infrared analysis.

194 J. Boor, Jr. and J. C. Mitchell, KINETICS OF CRYSTALLIZATION AND A CRYSTAL-CRYSTAL TRANSITION IN POLY-1-BUTENE, J. Polymer Sci. A1, 59 (1963)

A DTA technique is included.

195 I. D. Rubin, RELATIVE STABILITIES OF POLYMORPHS OF POLYBUTENE-1 OBTAINED FROM THE MELT, J. Polymer Sci. B2, 747 (1964)

Some DTA results are reported.

196 J. Boor, Jr. and E. A. Youngman, POLYMORPHISM IN POLY-1-BUTENE: APPARENT DIRECT FORMATION OF MODIFICATION I, J. Polymer Sci. B2, 903 (1964)

Includes a discussion of DTA.

197 D. McIntyre, J. H. O'Mara, and S. Straus, THERMAL DEGRADATION OF FRACTIONATED HIGH- AND LOW-MOLECULAR-WEIGHT POLYISOBUTYLENE, J. Res. Natl. Bur. Std. A68 (2), 153 (1964)

Rates of thermal degradation and molecular weight changes during degradation were studied. Osmotic and viscometric methods were used.

198 B. A. Fomenko. V. P. Volodin, A. V. Sidorovich, and E. V. Kuvshinskii, THERMOMECHANICAL STUDY OF POLYISOBUTYLENE BY STRETCHING AND INDENTATION, Rubber Chem. Technol. 37 (2), Pt. 1, 365 (1964); C. A. 61, 12172 (1964)

Miscellaneous

Ref. No.

199 C. S. Hsia Chen, SOLID-STATE POLYMERIZATION OF ACENAPHTHYLENE INDUCED BY IONIZING RADIATION, J. Polymer Sci. 62, S38 (1962)

Some DTA results on polyacenaphthylene are reported.

200 A. A. Berlin, R. M. Aseeva, G. I. Kalyaev, and E. L. Frankevich, OXIDATION PRODUCTS OF HIGH-MOLECULAR-WEIGHT CONJUGATED POLYENES, Dokl. Akad. Nauk SSSR 144, 1042 (1962); C. A. 57, 15331 (1962)

201 R. B. Isaacson, I. Kirshenbaum, and W. C. Feist, PROPERTIES OF SEMI-CRYSTALLINE POLYOLEFINS: POLY-4-METHYL-1-PENTENE, J. Applied Polymer Sci. 8, 2789 (1964)

Some data on heat distortion properties are given.

202 A. E. Newkirk, A. S. Hay and R. S. McDonald, THERMAL DEGRADATION OF POLY(m-DIETHYNYLENE BENZENE), J. Polymer Sci. A2, 2217 (1964)

Degradation of the polymer was studied by TGA, x-ray diffraction, and infrared spectroscopic techniques. TGA experiments (in nitrogen) showed that the main weight losses occurred in two stages. The weight loss of the first stage, from room temperature to 200°C, is probably due to loss of solvent from the polymer, and some first stage decomposition. The second stage loss was from 300° to 800°C.

203 N. A. Nechitailo, P. I. Sanin, T. I. Bevza, and N. A. Pokatilo, STABILITY OF POLY(3-METHYL-1-BUTENE), Plasticheskie Massy 1964 (4), 3; C. A. 61, 8469 (1964)

DTA was used to study the stability of the title polymer heated in air and in argon.

POLYPHENYLS

Ref. No.

204 D. A. Frey, M. Hasegawa, and C. S. Marvel, PREPARATION AND AROMATIZATION OF POLY-1,3-CYCLOHEXADIENE. II, J. Polymer Sci. A1, 2057 (1963)

Further work on the polymerization of 1,3-cyclohexadiene by the action of Ziegler-type catalysis and by cationic initiation has been carried out and polymers with an inherent viscosity of 0.1-0.19 have been obtained consistently. Dehydrogenation of the poly-1,3-cyclohexadiene by halogenation followed by pyrolysis has given good conversion to a polyphenyl which has some units which are incompletely aromatized. This polymer has very good heat stability but is not a useful polymer for plastic purposes.

SOME HYDROCARBON POLYMERS FROM DIENES AND RELATED MATERIALS

Poly(acetylene)

205 PH. Teyssie and A. C. Korn-Girard, SYNTHESIS OF NEW MONOMERS AND POLYMERS. IV. SYNTHESIS AND PROPERTIES OF POLYDIPHENYLDIACETYLENES, J. Polymer Sci. A2, 2849 (1964)

Poly(acetylene) - continued

Ref. No.

The thermal stability of the polymers was investigated by TGA.

206 R. J. Fredericks, D. G. Lynch, and W. E. Daniels, THERMAL PROPERTIES OF POLY(ACETYLENE): ON THE ORIGIN OF CUPRENE IN REPPE'S CYCLOOCTATETRAENE SYNTHESIS, J. Polymer Sci. B2, 803 (1964)

TGA, under vacuum, showed that poly(acetylene) (after degassing) decomposed at an appreciable rate only at a temperature above 420°C.

Polybutadiene

207 M. V. Alfimov and V. G. Nikol'skii, RADIOTHERMOLUMINESCENT INVESTIGATION OF STRUCTURAL TRANSFORMATIONS IN BUTADIENE RUBBER AT FROM 130° TO 273°, Vysokomolekul. Soedin. 5 (9), 1388 (1963); C. A. 59, 15458 (1963)

208 A. T. Sturrock and D. V. Sarbach, ANTIOXIDANTS FOR CIS-POLYBUTADIENE COMPOUNDS, RUBBER AGE (N. Y.) 92, 723 (1963)

209 Kh. S. Bagdasar'yan, Z. A. Sinitsyna, and R. I. Milyutinskaya, KINETIC STUDIES OF THE ACTION OF ANTIOXIDANTS IN RUBBER OXIDATION. I. KINETICS OF NONINHIBITED RUBBER OXIDATION, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 265; C. A. 62, 714 (1965)

210 Kh. S. Bagdasar'yan and R. I. Milyutinskaya, KINETIC STUDY OF THE ACTION OF RUBBER OXIDATION INHIBITORS. III. KINETICS OF INHIBITED OXIDATION, Vysokomolekul. Soedin. 6 (6), 1098 (1964); C. A. 61, 9648 (1964)

211 S. Rasidescu, N. Horodniceanu, and E. Nitescu, OXIDATION OF STEROSPECIFIC ELASTOMERS. PROSPECTS OF AN INDUSTRIAL APPLICATION, Ind. Usoara (Bucharest) 11 ([illegible]), 304 (1964); C. A. 62, 2897 (1965)

Polyisoprene

212 A. Tkac and V. Kello, THE REACTION OF POLYISOPRENES IN OXIDATIVE RADICAL PROCESSES, Chem. Zvesti 17, 237 (1963); C. A. 59, 15455 (1963)

The thermooxidation of polyisoprene and factors involved in its stability are described.

Rubber

213 C. G. Collins, COMBINED RADIATION TEMPERATURE EFFECTS ON HOSE AND SEAL ELASTOMERS, U. S. At. Energy Comm. DC-60-12-95, 40 pp. (1960); C. A. 59, 10327 (1963)

214 A. Tkac and Z. Frait, THE STABILIZATION OF MACROMOLECULES GENERATING FREE RADICALS AT ELEVATED TEMPERATURES IN THE SOLID PHASE, Preprints Papers Intern. Symp. Free Radicals, 5th, Uppsala 1961, 71-1-27; C. A. 59, 2995 (1963)

Kinetic analyses and electron-spin-resonance studies were made on thin layers of natural rubber deposited on NaCl plates and heated to 110-200° under nitrogen or argon.

Ref. No.

215 E. M. Bevilacqua and E. S. English, EFFECT OF OXYGEN PRESSURE ON VULCANIZATE OXIDATION, Proc. Rubber Technol. Conf., 4th, London 1962 (49), 11 pp. (Preprint); C. A. 60, 12211 (1964)

216 J. Blenkin, APPLICATIONS OF GAS CHROMATOGRAPHY IN THE RUBBER INDUSTRY, Proc. Rubber Technol. Conf., 4th, London 1962 (47), 19 pp. (Preprint); C. A. 60, 14709 (1964)

217 H. Feuerberg and H. Weigel, ANALYSIS OF ELASTOMERS IN VULCANIZATES. II. GAS-CHROMATOGRAPHIC INVESTIGATIONS OF ELASTOMER PYROLYZATES, Kautschuk Gummi 15, WT276 (1962); C. A. 57, 16821 (1962)

218 T. Baba and S. Tokumaru, IDENTIFICATION OF RUBBER BY GAS CHROMATOGRAPHY, Nippon Gomu Kyokaishi 35, 162 (1962); C. A. 57, 16821 (1962)

219 B. Ya. Teitel'baum, M. F. Dianov, M. G. Beregovskaya, and T. A. Yagfarova, THERMOMECHANICAL CURVES OF RUBBERS, Kauchuk i Rezina 21, No. 8, 3 (1962); C. A. 58, 3579 (1963)

The percent deformation (penetration) versus temperature (-120° to 450°C) was determined for natural rubber, polyisoprene, piperylene rubber and polybutadiene.

220 A. S. Kuz'minskii, V. D. Zaitseva, and N. N. Lezhnev, SUPPRESSION OF THE CATALYTIC ACTIVITY OF METAL IONS OF VARIABLE VALENCE IN THE OXIDATION OF RUBBERS, Vysokomolekul. Soedin. 4, 1682 (1962)

221 I. T. Gridunov, S. F. Pryakhina, and N. I. Astrakhantseva, HEAT-RESISTANT RESINS FROM NEOPRENE AND CHLOROSULFONATED POLYETHYLENE, Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol. 5, 821 (1962); C. A. 58, 9288 (1963)

To increase heat resistance of neoprene, added chlorosulfonated polyethylene and active fillers, such as ZnO, MgO, chalk, etc. Various mixtures were vulcanized and tested between 20 and 100°C.

222 L. Zalukajevs and V. I. Pivnev, NEW METHOD FOR FOLLOWING THE OXIDATION OF RUBBER, Vestn. Soveta Nar. Khoz. (Voronezh) 1962 (6), 40; C. A. 60, 9455 (1964)

Followed variation in the mobility of macromolecules during oxidation of rubber by noting the variation of the NMR spectra.

223 A. S. Kuzminskii, L. I. Lyubchanskaya, and L. S. Feldshtein, INFLUENCE OF MECHANICAL STRESS ON AGING OF VULCANIZED RUBBERS, Proc. Rubber Technol. Conf., 4th, London 1962 (48), 10 pp. (Preprint); C. A. 60, 12211 (1964)

Studied stress relaxation in natural rubber at 100° in air and under vacuum.

Ref. No.

224 M. L. Bhaumik, D. Banerjee, and A. K. Sircar, THERMAL DETERMINATIONS IN HARD RUBBER REACTIONS WITH DIFFERENTIAL THERMAL ANALYSIS, Preprint Rubber Technol. Conf., 4th, London 1962, No. 9, 12 pp.; C. A. 60, 16079 (1964)

225 M. L. Bhaumik, D. Banerjee and A. K. Sircar, STUDIES IN HARD RUBBER REACTION. PART I. HEAT OF HARD RUBBER REACTION, J. Applied Polymer Sci. 6, 674 (1962)

A method for the determination of heat of hard-rubber reaction by the application of differential thermal analysis is reported.

226 A. Tkac, Z. Frait, and M. Ondris, THE MACROMOLECULAR-FREE RADICAL DEGRADATION LEVEL IN THE THERMAL DEGRADATION OF POLYDIENES AS REVEALED BY THE ELECTRON-SPIN-RESONANCE METHOD, Chem. Zvesti 17 (2), 81 (1963); C. A. 60, 1906 (1964)

The initiation and termination of macromolecular free radicals in natural rubber and in polyisoprene were studied in the solid state from -150 to 200°.

227 L. G. Angert, S. E. Khanin, and A. S. Kuz'minskii, THERMAL AGING AND PROTECTION OF CURED NATURAL RUBBER, Kauchuki Rezina 22 (10), 19 (1963); C. A. 60, 4318 (1964)

228 B. Ya. Teitel'baum, and E. F. Gubanov, THERMOMECHANICAL CHARACTERIZATION OF THE MOLECULAR WEIGHT OF LINEAR POLYMERS EXEMPLIFIED BY NATURAL RUBBER, Dokl. Akad. Nauk SSSR 149 (6), 1384 (1963); C. A. 59, 4145 (1963)

229 Z. N. Tarasova, I. I. Eitingon, L. G. Senatorskaya, G. I. Andronova, and B. A. Dogadkin, EFFECT OF THIO DERIVATIVES OF AMINES AND PHENOLS ON THERMOMECHANICAL BEHAVIOR AND FATIGUE OF VULCANIZATES, Vysokomolekul. Soedin. 5 (6), 892 (1963)

The destruction or rearrangement of the structure of vulcanizates during thermomechanical or thermooxidative treatment is probably due to a free-radical mechanism. The chain cleavage by thermal oxidation is accompanied by decomposition of hydroperoxide groups. Study effect of the title class of compounds in inhibiting such cleavage.

230 T. Kotani, S. Yamashita, and J. Furukawa, AGE RESISTORS. I. THE RELATION BETWEEN THERMAL DETERIORATION AND OXIDATION POTENTIAL, Nippon Gomu Kyokaishi 36, 441 (1963); C. A. 60, 742 (1964)

Oxidation potential was measured for some 30 compounds, including commercial antioxidants, diamine derivatives, aniline derivatives, etc. Investigated the relation between oxidation potential and oxidizability of the vulcanizates in which these compounds were compounded.

Ref. No.

231 Chwa-Kyung Sung, PYROLYSIS OF POLYMERS. III. IDENTIFICATION OF GASES FROM RUBBER PYROLYSIS BY GAS CHROMATOGRAPHY, J. Korean Chem. Soc. 7 (2), 115 (1963); C. A. 61, 5762 (1964)

232 C. Strugaru and I. Istrate, BUTYL RUBBER-BASED PRODUCTS RESISTANT TO HIGH TEMPERATURES, HUMIDITIES, AND DYNAMIC LOADS. BLADDERS FOR TIRE VULCANIZATION, Rev. Chim. (Bucharest) 14 (7), 391 (1963); C. A. 60, 743 (1964)

233 A. Fiorenza and G. Bonomi, IDENTIFICATION OF ELASTOMERS BY GAS CHROMATOGRAPHY, Rass. Chim. 15 (5), 197 (1963), C. A. 60, 9447 (1964)

234 J. Reid Shelton, ANTIOXIDANT MECHANISMS IN ELASTOMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, Ql; C. A. 60, 9451 (1964)

235 P. S. Sarfare, H. L. Bhatnagar, and A. B. Biswas, A STUDY ON THE THERMAL DEGRADATION OF RUBBER IN DILUTE SOLUTIONS, J. Applied Polymer Sci. 7, 2199 (1963)

The kinetics of low-temperature (60-100°C.) thermal degradation of deproteinized and deresinified petroleum ether soluble fraction of natural rubber in two chemically inert solvents, cyclohexane and transdecalin, were studied. The scission was found to be random and the average energy of activation is 25.8 kcal./mole. This low-energy requirement suggests the presence of weak links in the rubber molecule which get ruptured at low temperature.

236 W. Cooper and G. Vaughn, CRYSTALLIZATION OF GUTTA PERCHA AND SYNTHETIC TRANS-1,4-POLYISOPRENES, Polymer 4, 329 (1963)

The crystallization of gutta percha and synthetic trans-1,4-polyisoprenes was studied by DTA and by dilatometry.

237 P. Kralik, CHANGES OF MECHANICAL PROPERTIES OF NATURAL RUBBER DURING DEGRADATION, Chem. Zvesti 17 (7), 469 (1963); C. A. 60, 5719 (1964)

238 P. Kralik, REBOUND FOR STUDY OF THERMAL DEGRADATION OF NATURAL RUBBER, Chem. Zvesti 17 (7), 461 (1963); C. A. 60, 5717 (1964)

239 V. A. Popov, I. S. Druyan, and B. G. Varshal, INVESTIGATION BY THE THERMAL-ANALYSIS METHOD OF PROCESSES OCCURRING DURING HEATING OF POLYMERS, Plasticheskie Massy 1964 (6), 52; C. A. 61, 8501 (1964)

240 B. Ya. Teitel'baum and N. P. Anoshina, THERMOGRAPHIC STUDY OF THE LOW-TEMPERATURE CRYSTALLIZATION OF NATURAL RUBBER, Dokl. Akad. Nauk SSSR 156 (1), 145 (1964); C. A. 61, 5879 (1964)

241 A. Fabrikant and H. Kamenov, FLOTATION REAGENTS BY PYROLYSIS OF VULCANIZED RUBBER SCRAP. I. PYROLYZATE AND ITS PRODUCTS, Khim. i Ind. (Sofia) 36 (4), 136 (1964); C. A. 61, 14873 (1964)

Rubber - continued

Ref. No.

242 Z. A. Sinitsyna and Kh. S. Bagdasar'yan, KINETIC STUDY OF THE ACTION OF RUBBER OXIDATION INHIBITORS. II. COMPARATIVE STUDY OF INHIBITORS AND THEIR MIXTURES, Vysokomolekul. Soedin. Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 272; C. A. 61, 16280 (1964)

243 K. C. Tsou, S. J. Makower, R. N. Goldey, and B. D. Halpern, DEVELOPMENT OF REINFORCED HIGH-TEMPERATURE ELASTOMERS, 30 pp. (1964) NASA Accession No. N64-18894, Rept. No. AD 432322; C. A. 61, 16279 (1964)

Filler-rubber systems containing various chemical modifications of silica and fibrous talc as fillers were evaluated at 500°F after aging at 500°F.

244 S. Murakami, T. Fukumori, J. Tsurugi, and N. Murata, ANTIOXIDANTS. I. THE ABSORPTION OF OXYGEN BY RUBBER VULCANIZATES, Kogyo Kagaku Zasshi 67 (8), 1157 (1964); C. A. 62, 1824 (1965)

Measured oxygen absorption at 100° and 1 atm. on rubber samples containing various antioxidants.

245 L. Zalukajevs and V. I. Pivnev, APPLICATION OF NUCLEAR MAGNETIC RESONANCE (NMR) IN THE STUDY OF THE AGING OF RUBBERS, Vysokomolekul. Soedin. 6 (3), 538 (1964)

NMR intensity changes were used in a study of oxidation inhibitors and of the crosslinking of rubbers during aging under atmospheric oxygen at 130°.

246 L. Zalukajevs, V. I. Pivnev, V. S. Reznikov, O. G. Shestakova, Z. N. Korbanova, and A. S. Buryagina, NUCLEAR MAGNETIC RESONANCE (NMR) STUDY OF THE HEAT AGING OF NATURAL RUBBER TREADS, Kauchuk i Rezina 23 (3), 19 (1964); C. A. 61, 2034 (1964)

247 W. Cooper and R. K. Smith, MELTING TRANSITIONS IN DIENE POLYMERS, J. Polymer Sci. A1, 159 (1963)

The melting transitions of natural rubber, cis-polyisoprene, gutta-percha, balata and synthetic trans-polyisoprene, and cis-polybutadiene were examined by means of DTA.

Miscellaneous

248 J. K. Sieron, STABILIZERS FOR HIGH-TEMPERATURE RUBBERS, Rubber World 149 (1), 58 (1963); C. A. 60, 4317 (1964)

249 W. S. Anderson, THERMAL STABILITY OF DIOLEFIN CYCLOPOLYMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, T1; C. A. 60, 9374 (1964)

Studied degradation at 400-500° of cyclopolymers and cyclocopolymers of 1,5-hexadiene, 2- and 3-methyl-1,5-hexadiene, and 1,6-heptadiene. They volatilized more slowly than linear polyethylene and gave mostly high-boiling fragments.

Miscellaneous - continued

Ref. No.

250 J. Pellon, R. L. Kugel, R. Marcus, and R. Rabinowitz, FREE RADICAL POLYMERIZATION AND COPOLYMERIZATION OF BICYCLO-(2.2.1)-HEPTA-(2.5)-DIENE (NORBORNADIENE), J. Polymer Sci. A2, 4105 (1964)

The temperatures at which a 10% weight loss occurs when a sample is heated at 10°C/min. in air or nitrogen are reported for several copolymers of norbornadiene.

251 L. E. Trimble and A. Cosgarea, Jr., ACCELERATED AIR-AGING STUDIES WITH NITRILE RUBBER STOCKS, Rubber Age (N. Y.) 94 (6), 910 (1964); C. A. 808 (1964)

Accelerated air-aging was accomplished at $70-130^{\circ}$. After aging, mechanical properties were studied.

SOME HALOGEN SUBSTITUTED MATERIALS

Chlorinated Polypropylene

Ref. No.

252 B. A. Krentsel, G. E. Semenido and D. E. Il'ina, DECOMPOSITION OF CHLORINE-CONTAINING POLYMERS. I. THERMAL DECOMPOSITION OF CHLORINATED POLYPROPYLENE, Vysokomolekul. Soedin. 5, 558 (1963)

Thermal decomposition of chlorinated stereoblock polypropylene polymers containing 60% atactic fraction and 3 to 75% Cl was studied at different temperatures. At 100° to 238°C, the dehydrochlorination rate increased with increase of temperature. Above 250°C, HCl and other gases were evolved, indicating the rupture of C-C bonds in the polymer backbone.

253 B. A. Krentsel, G. E. Semenido, D. E. Il'ina and M. V. Shishkina, DECOMPOSITION OF CHLORINE-CONTAINING POLYMERS. II. MECHANISM OF DEHYDROCHLORINATION OF CHLORINATED POLYPROPYLENE, Vysokomolekul. Soedin. 5, 564 (1963)

Infrared spectra of the polymer were determined before and after thermal decomposition at 120° and 238°. The dehydrochlorination process is accompanied by cross-linking and is explained by an ionic mechanism.

Kel-F

254 T. G. Degteva and A. S. Kuz'minskii, OXIDATIVE DEGRADATION OF A FLUORINE-CONTAINING KEL-F TYPE ELASTOMER AT $250-360^{\circ}$, Vysokomolekul. Soedin. 5 (9), 1417 (1963)

Polychloroprene

255 N. U. Kocharyan, N. A. Nalbandyan, V. Ts. Arakelyan and G. S. Farshyan, DEGRADATION AND THERMAL AGING OF POLYCHLOROPRENE RUBBER, Dokl. Akad. Nauk Arm. SSR 36 (2), 83 (1963) (in Russian); C. A. 59, 7737 (1963)

Ref. No.

256 J. Dvorak and B. Matyska, THERMAL DEGRADATION OF POLYCHLOROPRENE, Collection Czech. Chem. Commun. 28, 2387 (1963); C. A. 59, 12997 (1963)

Polytetrafluoroethylene

257 D. L. Compton, W. Winovich, and R. M. Wakefield, MEASUREMENTS OF THE EFFECTIVE HEATS OF ABLATION OF TEFLON AND POLYETHYLENE AT CONVECTIVE HEATING RATES FROM 25 TO 420 B.T.U./FT./SEC., NASA Doc. N62-1[illegible]01, 31 pp. (1962); C. A. 60, 9423 (1964)

258 H. C. Anderson, THERMOGRAVIMETRIC RELATIONS FOR STUDYING THE PYROLYSIS OF POLYMERS, NASA Doc. N63-22491, 18 pp. (1963); C. A. 60, 10814 (1964)

Two TGA methods were developed to show whether rate of weight loss varies with extent of pyrolysis of a polymer. The methods were applied to polytetrafluoroethylene and to a copolymer of tetrafluoroethylene and hexafluoropropylene.

259 Yu. A. Dushin, THE EFFECTIVE HEAT OF DECOMPOSITION OF ADDITION POLYMERS, Plasticheskie Massy 1963 (6), 11; C. A. 59, 10250 (1963)

The effective heat of decomposition (H) is used to characterize the heat resistance of polymers in use at temperatures higher than their decomposition temperature. H is defined and a method for its calculation is given. Parameters for calculating H for polytetrafluoroethylene, poly(methyl methacrylate), polystyrene, polyisobutylene and polybutadiene are given.

260 S. N. Koikov, V. A. Fomin, and A. N. Tsikin, ELECTRICAL AGING OF POLY-(TETRAFLUOROETHYLENE), Izv. Vysshikh Uchebn. Zavedenii, Fiz. 1963 (2), 31; C. A. 59, 11679 (1963)

Electrical aging of polytetrafluoroethylene was studied experimentally in the range 20-250° by using a.c. and d.c. in air at normal pressure and in a vacuum of 10^{-5}-10^{-6}mm.

261 L. Reich, H. T. Lee, and D. W. Levi, NOTE ON THE THERMAL DEGRADATION OF TEFLON, J. Polymer Sci. B1, 535 (1963)

TGA and isothermal studies were made on polytetrafluoroethylene under vacuum. Kinetic results are reported.

262 M. I. Bro, E. R. Lovejoy, and G. R. McKay, REACTIONS OF IRRADIATED POLYTETRAFLUOROETHYLENE RESIN, J. Applied Polymer Sci. 7, 2121 (1963)

Some pyrolysis experiments are reported.

263 H. H. G. Jellinek and H. Kachi, THERMAL DEGRADATION OF POLY(TETRAFLUOROETHYLENE) IN A CLOSED SYSTEM, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, C1; C. A. 60, 10817 (1964)

Polytetrafluoroethylene - continued

Ref. No.

264 L. A. Wall and S. Straus, THERMAL DECOMPOSITION OF GAMMA-IRRADIATED FLUOROPOLYMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, H1; C. A. 60, 9375 (1964)

The rate of volatilization of poly(vinyl fluoride), poly(vinylidene fluoride) and polytrifluoroethylene is enhanced by prior irradiation. The volatilization rate of polytetrafluoroethylene is not changed by prior irradiation, but is greatly enhanced by simultaneous irradiation and pyrolysis.

265 G. Putti and G. Pizzigoni, DIFFERENTIAL THERMAL ANALYSIS (DTA) IN THE STUDY OF SPECIFIC TRANSFORMATIONS IN THE FIELD OF POLYMERS, Materie Plastiche Elastomeri 30 (8), 748 (1964); C. A. 62, 651 (1965)

266 J. C. Siegle, L. T. Muus, Tung-PO Line, and H. A. Larsen, THE MOLECULAR STRUCTURE OF PERFLUOROCARBON POLYMERS. II. PYROLYSIS OF POLYTETRAFLUOROETHYLENE, J. Polymer Sci. A2, 391 (1964)

Report that vacuum pyrolysis of polytetrafluoroethylene follows first-order kinetics with monomer the only important decomposition product in the temperature range 360-510°C. Kinetic parameters are reported.

267 E. C. Penski and I. J. Goldfarb, THE EFFECTS OF "CAGEING" ON THE THERMAL DEGRADATION OF POLYTETRAFLUOROETHYLENE, J. Polymer Sci. B2, 55 (1964)

In order to demonstrate that the "cage" effect is a contributing factor to the over-all kinetics, a mathematical model including it is discussed.

268 E. R. Lovejoy, M. I. Bro, and G. H. Bowers, CHEMISTRY OF RADIATION CROSSLINKING OF BRANCHED FLUOROCARBON RESINS, J. Applied Polymer Sci. 9, 401 (1965)

A number of fluoropolymers were subjected to ionizing radiation at elevated temperatures and the changes in melt viscosity were measured as an indication of the degree of crosslinking or degradation which occurred. Polytetrafluoroethylene, polychlorotrifluoroethylene, polyhexafluoropropylene, and a copolymer of hexafluoropropylene with perfluoroheptene-1 decrease in melt viscosity when irradiated at 200-250°C., while copolymers of tetrafluoroethylene with hexafluoropropylene, octafluorobutylene, or perfluoroheptene-1 increase in melt viscosity, indicating crosslinking.

269 Jen Chiu, THERMAL ANALYSIS OF HIGH POLYMERS: DIFFERENTIAL THERMAL ANALYSIS AND DYNAMIC ELECTROTHERMAL ANALYSIS, J. Polymer Sci. C8, 27

Instrumentation is described. Data are given for polytetrafluoroethylene and an aromatic polyimide.

Poly(chlorotrifluoroethylene)

Ref. No.

270 M. Peterka, THE STABILIZATION OF POLY(TRIFLUOROCHLOROETHYLENE) FOR COMPRESSION AND INJECTION MOLDING, Mater. Sb., Statei Vyzkum. Ustav Mater. Technol. 1961 (2), 95 (Pub. 1962); C. A. 59, 14165 (1963)

271 J. P. Sibilia and A. R. Paterson, APPLICATION OF INFRARED SPECTROMETRY TO THE STUDY OF SOME POLYMER PROBLEMS, J. Polymer Sci. C8, 41

The major products of thermal degradation (300°C) of polychlorotrifluoroethylene and copolymers with vinylidene fluoride were identified and were considerably different depending upon whether or not degradation occurred in nitrogen or oxygen.

272 Anon., PYROLYSIS OF POLY(TRIFLUOROETHYLENE), Kunststoffe-Plastics 10 (4), 398 (1963); C. A. 60, 9374 (1964)

273 S. Straus and L. A. Wall, PYROLYSIS OF POLY(TRIFLUOROETHYLENE): INFLUENCE OF GAMMA RADIATION AND ALKALI TREATMENT, SPE Trans. 4 (1), 61 (1964)

Poly(vinyl Chloride)

274 E. S. Khoroshaya, A. N. Lykova, G. I. Kovrigina, R. D. Gordonova, L. S. Shuvalova, Yu. M. Obudovskaya, Z. V. Sokolova and V. I. Bezrukova, DROP METHOD FOR DETERMINATION OF THE STABILITY OF POLY(VINYL CHLORIDE) RESINS, Nauchn.-Issled. Tr., Vses. Nauchn.-Issled. Inst. Plenochnykh Materialov i. Iskusstv. Kozhi 1960 (12), 107; C. A. 59, 5316 (1963)

In determining the stability of poly(vinyl chloride) at 150°, the HCl evolved was detected by decolorizing a solution of NaOH in the presence of phenolphthalein.

275 S. Sonnerskog, REACTIVITY OF POLY(VINYL CHLORDIE), Acta. Chem. Scand. 14 (2), 491 (1960) (in English); C. A. 60, 5660 (1964)

The thermal stability of poly(vinyl chlordie) (containing -OOH and/or -OO- groups) in hot pyridine (100°) was enhanced by the presence of carbon black, PhSH, and $(COOH)_2$, each of which reduces polymer peroxy groups.

276 H. Muecke, THERMAL AND OXIDATIVE HYDROGEN CHLORDIE EVOLUTION FROM POLY(VINYL CHLORDIE), Monatsber. Deut. Akad. Wiss. Berlin 3, No. 11/12, 668 (1961); C. A. 57, 15350 (1962)

HCl evolution from poly(vinyl chlordie) at 170° is due to a radical mechanism catalyzed by oxygen, in addition to the purely thermal effect. The influence of various additives was also studied.

277 V. M. Anikeenko, K. M. Kevroleva, R. M. Kessenikh and V. G. Sotnikov, THERMAL AGING OF POLY(VINYL CHLORIDE) PLASTICS, Izv. Vysshikh Uchebn. Zavedenii, Fiz. 1962, No. 3, 149; C. A. 57, 15352 (1962)

Studied effect of aging on the mechanical strength of poly(vinyl chloride) resins at 80, 100 and 120° for 1800 hours.

278 J. B. Gilbert and J. J. Kipling, THE CARBONIZATION OF POLYMERS. III. SOLID RESIDUES FROM SOME VINYL POLYMERS, FUEL 41, 493 (1962)

The solid residues formed by carbonization of poly(vinyl chloride), poly(vinyl acetate), poly(vinyl alcohol) and polyacrylonitrile were examined by chemical analysis and by infrared spectroscopy.

279 R. Nagatomi and Y. Saeki, THE MECHANISM OF SYNERGISTIC EFFECT OF POLYVINYL CHLORIDE STABILIZERS, J. Polymer Sci. 61, S60 (1962)

280 N. L. Perry, STABILIZATION OF RIGID POLY(VINYL CHLORIDE) FORMULATIONS FOR OUTDOOR EXPOSURE, SPE Tech. Papers 8, Session 22, Paper No. 3, 1 (1962); C. A. 57, 15351 (1962)

A system for stabilizing against heat and light consists of a Ba-Cd soap, a phosphite chelating agent, an epoxy plasticizer, and an ultraviolet absorber.

281 W. Jasching, DEGRADATION AND STABILIZATION OF POLY(VINYL CHLORIDE), Kunststoffe 52, 458 (1962); C. A. 57, 15349 (1962)

Processes occurring during poly(vinyl chloride) degradation under the influence of heat and light are described. Mechanisms of action of stabilizers are also discussed.

282 M. Tokarzewska and L. Tokarzewska, OXIDATION PRODUCTS OF HIGH MOLECULAR WEIGHT POLYENES, Plaste Kautschuk 9, 230 (1962); C. A. 58, 2514 (1963)

The dechlorination of poly(vinyl chloride) with sodium alcoholates gave polyenes which were oxidized with 30% nitric acid to give up to 50% oxalic acid besides gaseous products and insoluble polymer.

283 S. Otani and T. Ishikawa, CARBONATION AND GRAPHITIZATION OF ORGANIC COMPOUNDS. XII. ON THE RELATION BETWEEN THE MOLECULAR STRUCTURE OF POLY(VINYL CHLORIDE) AND ITS PYROLYSIS PRODUCTS, Kogyo Kagaku Zasshi 65, 1617 (1962); C. A. 58, 8053 (1963)

TGA studies were carried out. Infrared and ultraviolet absorption spectra of products of pyrolysis at 425°C were determined.

284 M. Panaitescu and E. Paltin, DEGRADATION AND STABILIZATION OF POLY(VINYL CHLORIDE) (PVC). THE SYNTHESIS OF CERTAIN ORGANOTIN DERIVATIVES, Rev. Chim. (Bucharest) 13, 724 (1962); C. A. 58, 14205 (1963)

285 Z. V. Popova, D. M. Yanovskii, G. O. Tatevos'yan and O. A. Shtekker, EFFECT OF INHIBITORS ON THE KINETICS OF DECOMPOSITION AND LIGHT STABILITY OF POLY(VINYL CHLORIDE) PLASTICS, Plasticheskie Massy 1962, No. 5,3; C. A. 57, 10030 (1962)

286 L. Mikhailov, STABILIZATION OF POLY(VINYL CHLORIDE), Khim. i Ind. (Sofia) 34 (6), 211 (1962); C. A. 59, 4110 (1963)

287 A. Potocki, A. Balas and B. Dudek, COLORIMETRIC DETERMINATIONS OF THE SPECIFIC STABILITY OF POLY(VINYL CHLORIDE), Polimery 8 (1), 16 (1963); C. A. 59, 12981 (1963)

Ref. No.

Colorimetric measurements of extinction in pyridine solutions of thermally degraded poly(vinyl chloride) showed that the intensity of color (yellow to dark brown) is proportional to the amount of HCl split off.

288 J. Urbanski, TESTS ON THE THERMAL STABILITY OF POLY(VINYL CHLORIDE). II, Polimery 8 (10), 370 (1963); C. A. 60, 13391 (1964)

A description of various industrial standard and technological methods of determination.

289 J. B. Gilbert and J. J. Kipling, THE CARBONIZATION OF POLYMERS. IV. TARS FORMED FROM SOME VINYL POLYMERS, Fuel 42, 5 (1963)

Yields of tars obtained by carbonizing some vinyl polymers are recorded as a function of temperature. Those produced from poly(vinyl chloride) and poly(vinyl acetate) were homogeneous in chemical nature but consisted of material covering a range of molecular weight.

290 S. Otani, CARBONIZATION AND GRAPHITIZATION OF ORGANIC COMPOUNDS. X[illegible]. ELECTRON SPIN RESONANCE OF PYROLYSIS PRODUCTS OF POLY(VINYL CHLORIDE), Kogyo Kagaku Zasshi 66 (7), 1012 (1963); C. A. 60, 9373 (1964)

291 Y. Nakamura, M. Saito and K. Tamura, MODIFICATION OF POLY(VINYL CHLORIDE) VII. DETERMINATION OF THE THERMAL STABILITY OF MODIFIED POLY(VINYL CHLORIDE), Kobunshi Kagaku 20 (222), 605 (1963); C. A. 60, 16057 (1964)

Thermal stabilities of morpholine-treated poly(vinyl chloride) containing nitrogen atoms were compared with those of discolored or crosslinked products by measurement of weight loss, degree of discoloration, and temperature at the beginning of breaking or of elongation on heating.

292 I. Velea, O. Popa, D. Cornilescu and T. Wexler, NEW STABILIZERS FOR VINYL POLYMERS BASED ON BORON COMPOUNDS. II. SYNERGISMS OF BORON COMPOUNDS WITH DIBASIC LEAD PHOSPHITE, Rev. Chim. (Bucharest) 14 (8), 435 (1963); C. A. 60, 8195 (1964)

Synergisms between various inorganic boron compounds and lead compounds in increasing the thermal resistance of poly(vinyl chloride) were investigated. The thermal resistance was measured by determination of the time induction for HCl liberation at 200° from poly(vinyl chloride).

293 J. Stepek, Z. Vymazal and B. Dolezel, THERMAL DEGRADATION OF POLY(VINYL CHLORIDE), Modern Plastics 40 (10), 146-7, 205 (1963)

294 M. Lisy, KINETICS OF THE THERMAL CLEAVAGE OF HYDROGEN CHLORIDE FROM POLY(VINYL CHLORIDE) IN A STREAM OF NITROGEN (AT 210-250°), Chem. Zvesti 17, 248 (1963); C. A. 59, 14124 (1963)

Ref. No.

295 G. A. Grode, W. R. Dunnavant, R. W. Pfeil, and J. W. Brasch, THERMAL STABILITY OF CHLORINATED ATACTIC POLYPROPYLENE-POLY(VINYL CHLORIDE) BLENDS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio, 1963, 11; C. A. 60, 9425 (1964)

The effects of heat and mechanical shear on poly(vinyl chloride), chlorinated, amorphous polypropylene, and mixtures of these polymers were studied by means of melt-viscosity measurements, DTA, and infrared spectroscopy.

296 M. Wajnryb, STABILIZATION OF POLY(VINYL CHLORIDE). II., Przemysl chem. 42 (1), 16 (1963); C. A. 59, 8938 (1963)

Reviews heat- and light-stabilizing action and the relation between color of poly(vinyl chloride) and rate of HCl evolution.

297 H. E. Blayden and D. T. Westcott, A MAGNETIC STUDY OF THE CARBONIZATION AND GRAPHITIZATION OF SOME REPRESENTATIVE POLYMERS, Proc. Conf. Carbon, 5th, Univ. Park, Penna., 1961 2, 97 (Pub. 1963); C. A. 59, 7716 (1963)

Magnetic susceptibility, electron spin resonance, and analytical data are presented for chars and C prepared at 300-3000° from poly (vinyl chloride) and poly(vinylidene chloride). Depending on the temperature of preparation, the C shows paramagnetic and diamagnetic susceptibilities.

298 B. I. Fedoseev, Z. V. Popova and D. M. Yanovskii, INTRINSIC STABILITY OF VINYL CHLORIDE POLYMERS AND COPOLYMERS, Vysokomolekul. Soedin. 5 (5), 659 (1963)

Investigated the effect of compounds containing a mobile H atom at the C atom (e.g. isopropylbenzene, dicumy(methane, etc.) on the thermal stability of poly(vinyl chloride) and of vinyl chloride/methyl methacrylate copolymers. Addition of these compounds to the reaction mixture during polymerization of the monomers increases the stability of the polymers.

299 M. N. Rafikov, I. N. Razinskaya, Z. V. Popova and B. P. Shtarkman, EVALUATION OF THE THERMAL STABILITY OF POLY(VINYL CHLORIDE), Tr. po. Khim. i Khim. Tekhnol. 1963 (2), 303; C. A. 61, 7178 (1964)

Studied loss of solubility in dichloroethane and change of melt viscosity of samples heated for different periods at 180 and at 200°. Also investigated the effect of several stabilizers.

300 A. A. Berlin, Z. V. Popova, and D. M. Yanovskii, POLYMERS WITH CONJUGATED BONDS IN THE MACROMOLECULAR CHAINS, SPE Trans. 3, No. 1, 27 (1963)

Studied the effect on stability of poly(vinyl chloride) of polymeric compounds with conjugated bonds, prepared by dehydrochlorination

Ref. No.

of poly(vinyl chloride) or by polymerization of phenylacetylene with p-diethynylbenzene. It was found that polymers with conjugated bonds are effective inhibitors of the thermal dehydrochlorination of poly (vinyl chloride).

301 A. A. Berlin, V. I. Kasatochkin, R. M. Aseeva and S. B. Finkel'shtein, POLYMERS WITH CONJUGATED BONDS AND HETEROATOMS IN THE CONJUGATE CHAIN. XXIX. PREPARATION AND PROPERTIES OF THE POLYMERIC PRODUCTS OF DEHYDROCHLORINATION AND CARBONIZATION OF POLY(VINYL CHLORIDE) AND OF CHLORINATED POLY(VINYL CHLORIDE), Vysokomolekul. Soedin. 5, 1303 (1963)

Poly(vinyl chloride) (alternating 1,3-distribution of Cl atoms) and chlorinated poly(vinyl chloride) (mixed distribution of Cl atoms) were heated in inert atmosphere at from 300 to 700°C for 1 hour. The products of thermolysis were analyzed chemically and their x-ray diagrams, electron spin resonance spectra, and electrical conductivity were determined. The extra Cl atoms in the chlorinated polymer caused a considerable increase in the yield of thermolysis products, and the solubility of these products was much higher. The soluble portion was composed mostly of high molecular weight unidentified products.

302 W. I. Bengough and H. M. Sharpe, THE THERMAL DEGRADATION OF POLY(VINYL CHLORIDE) IN SOLUTION. I. THE KINETICS OF THE DEHYDROCHLORINATION REACTION, Makromol. Chem. 66, 31 (1963)

The dehydrochlorination in EtOBz solution was studied at 178-212° in nitrogen. Kinetic data are reported. The presence of oxygen was found not to affect the rate of dehydrochlorination, but it caused a more rapid blackening of the polymer solution, and is accompanied by chain scission.

303 W. I. Bengough and H. M. Sharpe, THE THERMAL DEGRADATION OF POLY(VINYL CHLORIDE) IN SOLUTION. II. THE KINETICS OF THE CROSSLINKING REACTION, Makromol. Chem. 66, 45 (1963)

The effect of variation in polymer concentration and in polymer molecular weight on the time taken for the polymer solution to gel was observed, and the rate of crosslinking was calculated from such data. The mechanism is discussed.

304 M. Asahina and M. Onozuka, THERMAL DECOMPOSITION OF MODEL COMPOUNDS OF POLY(VINYL CHLORIDE). I. GASEOUS THERMAL DECOMPOSITION OF MODEL COMPOUNDS HAVING SECONDARY AND TERTIARY CHLORINE, J. Polymer Sci. A2, 3505 (1964)

305 M. Asahina and M. Onozuka, THERMAL DECOMPOSITION OF MODEL COMPOUNDS OF POLY(VINYL CHLORIDE). II. GASEOUS THERMAL DECOMPOSITION OF UNSATURATED CHAIN END MODEL COMPOUNDS, J. Polymer Sci. A2, 3515 (1964)

306 T. Inui and K. Hosokawa, DECOMPOSITION OF POLY(VINYL CHLORIDE) RESIN BY HEAT, AND MATERIALS FOR ITS INDUSTRIAL MOLDS, Kyushu Kogyo Daigaku Kenkyu Hokoku No. 14, 45 (1964); C. A. 61, 10636 (1964)

Poly(vinyl Chloride) - continued

Ref. No.

307 J. J. Kipling and B. McEnaney, THE CARBONIZATION OF POLYMERS. V. EFFECT OF CONDITIONS OF CARBONIZATION ON THE DECOMPOSITION, Fuel 43 (5), 367 (1964); C. A. 62, 1791 (1965)

308 K. Thinius, R. Schlimper, and D. Weichert, STABILITY OF MACROMOLECULES. VIII. THE BASIC PRINCIPLES OF EVALUATING THE EFFECTIVENESS OF POLY (VINYL CHLORIDE) (PVC) STABILIZERS, Koloriszt. Ertesito 6 (4), 205 (1964); C. A. 61, 16247 (1964)

309 G. Ya. Gordon, THERMAL DEHYDROCHLORINATION OF CHLORINE-CONTAINING HIGH POLYMERS, Plasticheskie Massy 1964 (4), 6; C. A. 61, 8473 (1964)

Studied the dehydrochlorination rate of poly(vinyl chloride) and vinyl chloride/vinylidene chloride copolymers.

310 A. A. Berlin, Z. V. Popova and D. M. Yanovskii, STABILIZATION OF POLY (VINYL CHLORIDE) BY POLYMERS CONTAINING CONJUGATED DOUBLE BONDS, Poliplasti 12 (74), 34 (1964); C. A. 61, 5853 (1964)

Poly(phenylacetylene), phenylacetylene/p-diethynylbenzene copolymer and thermally dehydrochlorinated poly(vinyl chloride) were studied as stabilizers for poly(vinyl chloride).

311 G. Talamini, G. Cinque, and G. Palma, METHODS FOR THE MEASUREMENT OF THE THERMAL STABILITY OF POLY(VINYL CHLORIDE), Materie Plastiche Elastomeri 30 (4), 317 (1964); C. A. 61, 12147 (1964)

312 Yu. M. Gvozdev, E. V. Paukov, and Yu. S. Simakov, METHODS FOR TESTING THE THERMAL STABILITY OF ADHESIVES, Izv. Vysshikh Uchebn. Zavedenii. Tekhnol. Legkoi Prom. 1964 (1), 28; C. A. 61, 776 (1964)

313 A. Rieche, PEROXIDE CHEMISTRY AND PEROXYGENATION OF HIGH POLYMERS, Kunststoffe 54 (7), 428 (1964) (Ger.); C. A. 62, 2844 (1965)

Discusses oxidative degradation of a number of polymers.

314 R. P. Sheldon and Sister K. Lane, THERMAL CONDUCTIVITIES OF POLYMERS I - POLYVINYL CHLORIDE, Polymer 6, 2, 77 (1965)

Miscellaneous

315 S. Straus and L. A. Wall, PYROLYSIS OF NEW FLUOROPOLYMERS, NASA Doc. N63-12806, 26 pp. (1962); C. A. 60, 9372 (1964)

Used vacuum pyrolysis to study rates of volatilization and identified decomposition products of poly(hexafluoropropylene), poly(perfluoroheptene), poly(4-chloroperfluoro-1,6-heptadiene) and poly(trifluorovinyl phenyl ether).

316 K. L. Paciorek, W. G. Lajiness, R. G. Spain & C. T. Lenk, DIFFERENTIAL THERMAL ANALYSIS OF FLUORINATED POLYMERS, J. Polymer Sci. 61, S41 (1962)

Miscellaneous - continued

Ref. No.

The order of stability of a series of polymers is reported to be as follows: polytetrafluoroethylene > polyethylene > vinylidene fluoride/perfluoropropene copolymer > poly(vinylidene fluoride) > poly(vinyl fluoride).

317 I. S. Gil'man, Z. A. Rogovin, and T. A. Aksenova, OSMOMETRIC STUDY OF THE DEGRADATION OF FLUORINE-CONTAINING POLYMERS, Vysokomolekul. Soedin. 5 (9), 1422 (1963)

318 Z. K. Brzozowski, HALOGEN-CONTAINING EPOXIDE RESINS. I., Przemysl Chem. 42 (6), 283 (1963); C. A. 59, 8938 (1963)

The methods of preparation and the properties of self-extinguishing epoxide resins (containing F, Cl, or Br as substituents) are reviewed.

319 D. E. Ilyina, B. A. Krentsel, and G. E. Semenido, LOW TEMPERATURE POLYMERIZATION OF CHLOROSUBSTITUTED ALDEHYDES, J. Polymer Sci. C4, Part 2, 999 (1963)

Polychloral was heated under vacuum at various temperatures. Possible processes occurring in the thermal decomposition are discussed.

320 D. A. Smith, THERMAL STABILITY OF CHLOROSULFONATED POLYETHYLENE, J. Polymer Sci. B2, 665 (1964)

TGA studies under nitrogen were carried out. Some kinetic results are reported.

321 J. M. Cox, B. A. Wright, and W. W. Wright, THERMAL DEGRADATION OF FLUORINE-CONTAINING POLYMERS. PART I. DEGRADATION IN VACUUM, J. Applied Polymer Sci. 8, 2935 (1964)

A large number of polymers were studied and compared.

322 J. M. Cox, B. A. Wright, and W. W. Wright, THERMAL DEGRADATION OF FLUORINE-CONTAINING POLYMERS. PART II. DEGRADATION IN OXYGEN, J. Applied Polymer Sci. 8, 2951 (1964)

Relative stabilities were determined for a considerable number of polymers (see Part I) (Ref. 321).

323 T. D. D'yachenko, N. A. Glukhov, M. M. Koton, and Yu. N. Sazanov, SYNTHESIS AND POLYMERIZATION OF α,α'-BIS(CHLOROMETHYL)-β-PROPIOLACTONE, Vysokomolekul. Soedin. Geterotsepnye Vysokomolekul. Soedin. 1964, 236; C. A. 61, 7110 (1964)

The polymers were degraded at 300° and the decomposition gases were measured in a gas buret. Decomposition is more rapid in air than in argon. The polymer is stable below 250°.

Polycarbonates

Ref. No.

324 G. Peilstocker, THE TEMPERATURE BEHAVIOR OF POLYCARBONATE, British Plastics 35, 365 (1962)

Various properties were studied as a function of temperature up to the decomposition temperature.

325 L. Huang Lee, STABILIZATION OF POLYCARBONATES, Am. Chem. Soc., Div. Org. Coatings, Plastic Chem., Preprints 22 (2), 131 (1962); C. A. 61, 779 (1964)

Since polycarbonates become unstable above 300°, the various modes of degradation (hydrolysis, oxidation, chain scission) were studied. Possible mechanisms are postulated.

326 M. Tomikawa, POLYCARBONATES. II. DECOMPOSITION OF POLYCARBONATES, Kobunshi Kogaku 20 (213), 11 (1963); C. A. 61, 1941 (1964)

Studied thermal decomposition and hydrolysis. The products evolved were determined.

327 A. Davis and J. H. Golden, DEGRADATION OF POLYCARBONATES. III. VISCOMETRIC STUDY OF THERMALLY INDUCED CHAIN SCISSION, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, L1; C. A. 60, 9375 (1964)

Thermal degradation of polycarbonates in vacuum without cross-linking or depolymerization was studied to determine changes in molecular weight (viscosity) and the extent of chain scission.

328 B. M. Kovarskaya, M. S. Akutin, A. I. Sidnev, M. P. Yazvikova, and M. B. Neiman, THERMOOXIDATIVE DEGRADATION OF POLYCARBONATES, Vysokomolekul. Soedin. 5 (5), 649 (1963)

329 B. M. Kovarskaya, I. E. Zhigunova, I. Ya. Slonim, Ya. G. Urman, and M. B. Neiman, DECOMPOSITION PRODUCTS AND THE MOBILITY CHANGE OF MOLECULAR CHAINS IN THE THERMAL DEGRADATION OF POLYCARBONATES, Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 33, C. A. 62, 659 (1965)

A polycarbonate is reported to thermally decompose above 400°. Gaseous products were determined. Some infrared and NMR measurements are reported.

330 B. M. Kovaraskaya, THE DEGRADATION OF POLYCARBONATES, Chem. Zvesti 18, 13, (1964); C. A. 61, 738 (1964)

Changes in structure during pyrolysis of polycarbonates were studied. Gaseous products were analyzed by chromatography, the solid residue by infrared spectroscopy, and the molecular movement by NMR.

Polycarbonates - continued

Ref. No.

331 A. Davis and J. H. Golden, DEGRADATION OF POLYCARBONATES. III. VISCOMETRIC STUDY OF THERMALLY INDUCED CHAIN SCISSION, Makromol. Chem. 78, 16 (1964)

332 Lieng-Huang Lee, MECHANISMS OF THERMAL DEGRADATION OF PHENOLIC CONDENSATION POLYMERS. I. STUDIES ON THE THERMAL STABILITY OF POLYCARBONATE, J. Polymer Sci. A2, 2859 (1964)

Bisphenol-A polycarbonate gradually degrades at temperatures above 310°C as detected by DTA. The first stage of degradation appears to be due to oxidation while the second (between 340 and 380°C) appears associated with depolymerization. TGA curves in air and under vacuum are also shown.

Polyesters

333 R. F. Schwenker, Jr. and R. K. Zuccarello, DIFFERENTIAL THERMAL ANALYSIS OF SYNTHETIC FIBERS, J. Polymer Sci. C6, 1

334 H. Schirmer, THE HEAT BEHAVIOR OF GLASS-FIBER-REINFORCED POLYESTERS, Plastverarbeiter 10, 161 (1959); C. A. 57, 12713 (1962)

Describes heat distortion methods.

335 P. Penczek, PROPERTIES OF THE POLYESTER RESIN, POLIMAL 130, WITH INCREASED HEAT RESISTANCE, Polimery 7 (11), 419 (1962); C. A. 60, 5703 (1964)

336 V. Zvonar, THERMODYNAMIC CONDITIONS OF SELF-EXTINGUISHING OF UNSATURATED POLYESTER RESINS, Chem. Prumysl 12, 321 (1962); C. A. 58, 11527 (1963)

337 B. M. Kovarskaya, THERMAL AND THERMO-OXIDATIVE DEGRADATION OF CERTAIN CONDENSATION POLYMERS, Plasticheskie Massy 1962, No. 10, 11; C. A. 58, 3552 (1963)

Studied thermal and thermo-oxidative degradation of a polycarbonate, a terephthalate polyester, an isophthalate polyester, and an epoxy resin. Some analyses of pyrolysis products are reported.

338 H. Kachi, THERMAL CHANGE OF POLYTEREPHTHALATES CONTAINING BRANCHED GLYCEROL UNITS, Kobunshi Kagaku 19, 224 (1962); C. A. 58, 4686 (1963)

Compare pyrolysis curves and rates of polyesters made from dimethyl terephthalate, ethylene glycol, and glycerol with those of poly(ethylene terephthalate). The main pyrolysis reaction of the polyester is little affected by the existence of branched units.

339 R. R. Freeman, SYNTHESIS OF POLYESTER ELASTOMERS FOR POTENTIAL HIGH-TEMPERATURE USE, U. S. Dept. Com., Office Tech. Serv., AD 275,520, 17 pp. (1962); C. A. 60, 739 (1964)

Ref. No.

340 P. D. Ritchie, NOTES ON THE THERMAL DECOMPOSITION OF ESTERS AND POLYESTERS, J. Oil Colour Chemists' Assoc. 45, 659, discussion 661 (1962); C. A. 57, 15333 (1962)

341 W. Sweeny, POLYMERIZATION OF DIALDEHYDES BY METAL ALKYLS, J. Applied Polymer Sci. 7, 1983 (1963)

A variety of metal alkyls were found to be catalysts for preparing a polyester from terephthalaldehyde via the Tischenko reaction. The polymer was examined by x-ray diffraction, infrared methods, and by DTA.

342 I. Vancso-Szmercsanyi and J. Paulik, THERMAL ANALYSIS OF POLYESTER RESINS. I., Magy. Kem. Folyoirat 69 (12), 545 (1963); C. A. 60, 10871 (1964)

343 Z. Kohman and M. Wajnryb, DETERMINATION OF THERMOMECHANICAL PROPERTIES OF THERMOSETTING PLASTICS WITH A MODIFIED HOEPPLER CONSISTOMETER, Polimery 8 (12), 460 (1963); C. A. 61, 4545 (1964)

344 H. H. Beacham, J. Litwin, and C. W. Johnston, HOW TO FORMULATE HEAT-RESISTANT DAP (DIALLYL PHTHALATE) POLYESTERS, Plastics Technol. 9, No. 5, 44 (1963); C. A. 59, 4112 (1963)

345 P. W. Morgan, LINEAR CONDENSATION POLYMERS FROM PHENOLPHTHALEIN AND RELATED COMPOUNDS, J. Polymer Sci. A2, 437 (1964)

Most of the polyesters were thermally stable for short periods up to 300°C and some did not rapidly decompose at higher temperatures.

346 C. W. Roberts, D. H. Haigh, and R. J. Rathsack, FIRE-RETARDANT POLYESTERS BASED UPON 2,3-DICARBOXY-5,8-ENDOMETHYLENE-5,6,7,8,9,9-HEXACHLORO-1,2,3,4,4a,5,8,8a-OCTAHYDRONAPHTHALENE ANHYDRIDE, J. Applied Polymer Sci. 8, 363 (1964)

347 V. V. Rode, I. V. Zhuravleva, S. R. Rafikov, V. V. Korshak, S. V. Vinogradove, and S. N. Salazkin, CHEMICAL CHANGES OF POLYMERS. XVIII. KINETICS OF THE THERMAL DEGRADATION OF POLYARYLATES FROM PHENOLPHTHALEIN, Vysokomolekul. Soedin. 6 (6), 994 (1964)

Thermal degradation of polyesters with heterogeneous chain from phenolphthalein and terephthalic or isophthalic acid was investigated. Vacuum degradation was carried out at 350-500° and the products were analyzed by gas chromatography.

348 I. M. Al'shits, L. A. Gladkaya, N. M. Grad, and O. A. Mudrov, SELF-EXTINGUISHING POLYESTER RESINS, Plasticheskie Massy 1964 (8), 11; C. A. 61, 14850 (1964)

349 L. A. Rodivilova, M. S. Akutin, S. A. Morozova, and V. P. Pshenitsina, THERMAL AGING OF FILM MATERIALS BASED ON POLYARYLATES OF D-4 TYPE, Plasticheskie Massy 1964) (6), 13; C. A. 61, 8470 (1964)

Poly(ethyl acrylate)

Ref. No.

350 R. T Conley and P. L. Valint, OXIDATIVE DEGRADATION OF POLY(ETHYL ACRYLATE), J. Applied Polymer Sci. 9, 785 (1965)

351 R. T. Conley, OXIDATION STUDIES ON ACRYLIC POLYMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, J1; C. A. 60, 10816 (1964)

Mechanisms for the thermal oxidative degradation of polyacrylonitrile and poly(ethyl acrylate) were studied. Infrared and gas chromatographic methods were used.

Poly(ethylene terephthalate)

352 R. M. Schulken, Jr., R. E. Boy, Jr., and R. H. Cox, DIFFERENTIAL THERMAL ANALYSIS OF LINEAR POLYESTERS, J. Polymer Sci. C6, 17

DTA was used to measure crystallization, melting, and glass transition temperatures of poly(ethylene terephthalate), poly(1,4-cyclohexylenedimethylene terephthalate), and some co-polyesters. DTA was also used to study the stability of these polymers to thermal and oxidative degradation.

353 H. Sobue and A. Kajiura, EFFECT OF HEATING ON POLY(ETHYLENE TEREPHTHALATE), Kogyo Kagaku Zasshi 62, 1766 (1959); C. A. 57, 13986 (1962)

Poly(ethylene terephthalate) was heated at 180-280° under vacuum. The evolved gases were studied by mass spectrometry, infrared spectroscopy and gas chromatography.

354 H. Zimmermann, CHEMICAL STUDIES ON FIBER-FORMING POLYESTERS. I. THERMAL STABILIZATION OF POLY(ETHYLENE TEREPHTHALATE), Faserforsch. Textiltech. 13, 481 (1962); C. A. 58, 14211 (1963)

The effects of catalyst used in the preparation on the polymerization rate and thermal decomposition of the polymer were studied.

355 N. V. Mikhailov, L. G. Tokareva, K. K. Buravchenko, G. M. Terekhova, and P. A. Kirpichnikov, STABILIZATION OF POLY(ETHYLENE TEREPHTHALATE) MELTS, Vysokomolekul. Soedin. 4, 1186 (1962)

The initial stage of the thermal oxidation of poly(ethylene terephthalate) was studied at 170°, 200° and 210°C.

356 Bacon Ke, DIFFERENTIAL THERMAL ANALYSIS OF HIGH POLYMERS. IV. SATURATED LINEAR POLYESTERS, J. Applied Polymer Sci. 6, 624 (1962)

DTA was used for the systematic investigation of poly(ethylene terephthalate) and related materials.

357 M. Mikhailov and E. Novakov, IMPROVING THE THERMAL STABILITY OF POLY (ETHYLENE TEREPHTHALATE) BY FUSION WITH ADDITIVES, Khim. i Ind. (Sofia) 35 (4), 137 (1963); C. A. 60, 6991 (1964)

Ref. No.

358 Z. Zamorsky, KINETICS OF THE THERMAL DEGRADATION OF POLY(ETHYLENE TEREPHTHALATE) AND ITS COPOLYMERS WITH ETHYLENE ISOPHTHALATE, Faserforsch. Textiltech. 14 (7), 271 (1963); C. A. 60, 3120 (1964)

The time dependence of viscosity was studied. The degradation of a 90/10 ethylene terephthalate/ethylene isophthalate copolymer was less in the <270° temperature range than that of pure poly(ethylene terephthalate).

359 G. M. Terekhova, N. V. Mikhailov, and L. G. Tokareva, THERMAL STABILITY OF POLY(ETHYLENE TEREPHTHALATE) (PET) CONTAINING PHOSPHOROUS ACID ESTERS, Khim. Volokna 1964 (4), 33; C. A. 61, 13480 (1964)

360 I. Kurlyama, K. Tomita, and K. Shirakashi, ANOMALOUS THERMAL EXPANSION OF POLY(ETHYLENE TEREPHTHALATE), Kobunshi Kagaku 21 (234), 584 (1964); C. A. 62, 5350 (1965)

Studied effects of cooling, melting temperature, and melting time on the thermal expansion, specific heat, and DTA of a poly(ethylene terephthalate) sample melted in vacuum.

361 I. E. Kardash, A. N. Pravednikov, and S. S. Medvedev, THERMAL DEGRADATION OF POLY(ETHYLENE TEREPHTHALATE), Dokl. Akad. Nauk SSSR 156 (3), 658 (1964); C. A. 61, 7128 (1964)

Degradation was carried out under vacuum and the process was followed viscometrically. Analysis of decomposition products is reported. A random mechanism of degradation is reported.

362 M. A. Hughes and R. P. Sheldon, SOME THERMAL STUDIES ON POLY(ETHYLENE TEREPHTHALATE), J. Applied Polymer Sci. 8, 1541 (1964)

DTA and TGA studies were carried out on samples of amorphous cold-drawn, heat-crystallized, and acetone-crystallized polymer. Some observations regarding the crystallization process, as followed by DTA, are recorded. The TGA gave evidence that a high temperature endothermic peak observed in DTA may not be directly associated with depolymerization.

363 P. R. Blakey and R. P. Sheldon, COLD-DRAWING AND CRYSTALLIZATION OF POLYETHYLENE TEREPHTHALATE, Polymer 6, No. 2, 107 (1965)

DTA was used to study crystallization of the title polymer.

Poly(isopropyl methacrylate)

364 C. J. Noel, THE THERMAL DEGRADATION OF POLY(ISOPROPYL METHACRYLATE), Am. Chem. Soc., Div. Polymer Chem., Preprints 4 (1), 378 (1963), C. A. 62, 657 (1965)

The degradation was studied by using a temperature-programmed apparatus which follows the appearance of volatile degradation products by thermal conductivity measurements (thermo-volatilimetric analysis, TVA). TVA curves were also obtained for poly(methacrylic anhydride), poly(isopropyl acrylate), poly(sec-butyl methacrylate) and poly(cyclohexyl methacrylate).

Poly(methyl methacrylate)

365 P. I. Levin, DECOMPOSITION OF POLY(METHYL METHACRYLATE) AT DIFFERENT DIGESTION TEMPERATURES, Plasticheskie Massy 1959, No. 3, 29; C. A. 58, 8053 (1963)

Investigated the change in the concentration of monomer in poly(methyl methacrylate) on varying the temperature and time of heating. Kinetic data are reported.

366 S. A. Arzhakov, E. E. Rylov, G. L. Slonimskii, and B. P. Shtarkman, THERMAL DESTRUCTION IN PRESSURE MOLDING OF A UNIFORM SOLID FROM POLY-(METHYL METHACRYLATE) POWDER, Dokl. Akad. Nauk SSSR 145, 595 (1962); C. A. 57, 16865 (1962)

367 S. N. Zhurkov and S. A. Abasov, RELATION BETWEEN MECHANICAL STRENGTH AND THERMAL DEGRADATION OF POLYMERS. III., Vysokomolekul. Soedin. 4, 1703 (1962)

Times to breakdown of poly(methyl methacrylate) film, poly(vinyl chloride) fibers, isotactic polypropylene fibers, polystyrene fibers and sheets, and poly(tetrafluoroethylene) fibers were determined under various stretching stresses and at various temperatures.

368 A. Barlow, R. S. Lehrle and J. C. Robb, RATE OF THERMAL DEGRADATION OF THIN POLYMER FILMS. CHOICE OF SAMPLE THICKNESS TO ELIMINATE THE EFFECTS OF DIFFUSION AND TEMPERATURE GRADIENT, Makromol. Chem. 54, 230 (1962)

Studied the rate of degradation of thin films of poly(methyl methacrylate) as a function of sample thickness.

369 J. R. MacCallum, KINETICS OF CHAIN-END INITIATED DEGRADATION OF POLYMERS, Trans. Faraday Soc. 59, 2099 (1963)

The kinetics of chain-end-initiated degradation of polymers is formulated and applied to available data on poly(methyl methacrylate).

370 N. Grassie and J. R. MacCallum, THE ENERGETICS OF THE DEPOLYMERIZATION OF POLY(METHYL METHACRYLATE), J. Polymer Sci. B1, 551 (1963)

371 J. E. Clark and H. H. G. Jellinek, THERMAL DEGRADATION OF POLY(METHYL METHACRYLATE) IN A CLOSED SYSTEM, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, D1; C. A. 60, 10817 (1964)

Thermal degradation of fractionated and infractionated poly-(methyl methacrylate) was studied by measuring the pressure developed in a quartz reaction vessel.

Ref. No.

372 H. H. G. Jellinek and J. E. Clark, A NEW TECHNIQUE FOR THE STUDY OF HIGH-POLYMER DEGRADATION REACTIONS, Can J. Chem. 41, 355 (1963)

A quartz spoon gauge, recording pressures automatically, is described. The technique was used for poly(methyl methacrylate) degradation.

373 N. Grassie, THE THERMAL AND PHOTOCHEMICAL DEGRADATION OF POLYMETHACRYLATES, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, B1; C. A. 60, 9376 (1964)

Poly(alkyl methacrylates), upon ultraviolet irradiation, produce monomers quantitatively, but only poly(methyl methacrylate) will produce monomer on heating. Mechanisms are discussed.

374 D. H. Grant and S. Bywater, THERMAL DEPOLYMERIZATION OF POLY(METHYL METHACRYLATE) IN DIPHENYL ETHER SOLUTION, Trans. Faraday Soc. 59 (489), Pt. 9, 2105 (1963)

375 S. A. Arzhakov, E. E. Rylov, G. L. Slonimskii, and B. P. Shtarkman, THERMAL DEGRADATION IN THE COMPRESSION MOLDING OF MONOLITHIC SOLIDS FROM POWDERED POLY(METHYL METHACRYLATE), Vysokomolekul. Soedin. 5 (10), 1513 (1963)

376 R. G. Nagler, DEGRADATION OF HOMOGENEOUS POLYMERIC MATERIALS EXPOSED TO HIGH HEAT FLUXES, Doc. N64-17494, 30 pp. (1964); C. A. 61, 14800 (1964)

An arc-imaging furnace was used to expose polymers to various heating rates under static flow conditions and under reduced pressures. Data are given for poly(methyl methacrylate), poly(tetrafluoroethylene), and polyethylene.

377 G. Putti, DIFFERENTIAL THERMAL ANALYSES OF POLYMERS, Materie Plastiche Elastomeri 30 (2), 190 (1964); C. A. 61, 10789 (1964)

378 Yu. A. Kirichenko, B. N. Oleinik, and T. Z. Chadovich, THERMAL PROPERTIES OF POLYMERS, Inzh.-Fiz. Zh., Akad. Nauk Belorussk, SSR 7 (5), 70 (1964); C. A. 61, 9595 (1964)

Coefficients of thermal diffusivity and thermal conductivity of poly(methyl methacrylate), poly(tetrafluoroethylene), polystyrene and high-pressure polyethylene were measured.

379 A. S. Shteinberg and N. A. Sokolova, LINEAR PYROLYSIS OF CONDENSED SUBSTANCES, Dokl. Akad. Nauk SSSR 158 (2), 448 (1964); C. A. 61, 16182 (1964)

The kinetic constants of high temperature degradation of poly(methyl methacrylate) were investigated.

380 G. V. Grebenshchikova and I. L. Farberov, THE ANALYSIS OF THE HEAT EFFECTS OF THE PYROLYSIS OF POLYMERS, Gazifikatsiya i Piroliz Topliv, Akad.

Poly(methyl methacrylate) - continued

Ref. No.

Nauk SSSR, Gos. Kom. po Topivn. Prom. pri Gosplane SSSR, Inst. Goryuch. Iskop., Sb. Statei 1964, 25; C. A. 62, 1794 (1965)

DTA was used to study poly(methyl methacrylate), polystyrene, and phenolformaldehyde.

381 G. G. Cameron and D. R. Kane, THE THERMAL DEGRADATION OF POLY(METHYL ACRYLATE), J. Polymer Sci. B2, 693 (1964)

Studied vacuum degradation at 286-300°C. Molecular weights of polymer residues were measured (viscosity) at various stages of reaction.

Poly(n-butyl methacrylate)

382 K. Ettre and P. F. Varadi, PYROLYSIS-GAS CHROMATOGRAPHIC TECHNIQUE EFFECT OF TEMPERATURE ON THERMAL DEGRADATION OF POLYMERS, Anal. Chem. 35, No. 1, 69 (1963)

Poly(vinyl acetate)

383 K. Chitoku and H. Baba, MASS SPECTROMETRIC STUDIES OF PYROLYSIS OF CHAIN POLYMERS, Kogyo Kagaku Zasshi 61, 865 (1958); C. A. 58, 1541 (1963)

Used TGA (under vacuum to 400°C) and mass spectrometer to study degradation of poly(vinyl acetate), poly(vinyl chloride) and poly(methyl acrylate).

Miscellaneous

384 V. V. Korshak, M. S. Akutin, S. V. Vinogradova, L. A. Rodivilova, P. M. Valetskii, A. S. Lebedeva and S. N. Salazkin, POLYARYLATES-NEW HEAT-RESISTANT POLYMERS, Plasticheskie Massy 1962, No. 1, 9; C. A. 57, 16849 (1962)

Thermomechanical curves of some polyarylates were determined. Thermal degradation by oxidation begins at 250° and proceeds slowly in comparison with that of polycarbonates.

385 Shih-K'ang Wu and Wen-Hui Chai, THERMAL DIFFERENTIAL STUDY OF HEAT-CRACKING OF MALEIC ANHYDRIDE RESIN, K'o Hsueh T'ung Pao 1962, No. 5, 44; C. A. 57, 16844 (1962)

386 E. C. Winslow and J. A. Marriott, EFFECT OF CRYSTALLIZATION ON THE THERMAL STABILITY OF POLYVINYLPHTHALIC ACID AND ITS METHYL ESTER, J. Polymer Sci. A1, 321 (1963)

The thermal behavior of the prepared polymers was studied by the techniques of DTA and TGA. Crystallization apparently retards thermal breakdown somewhat but the temperature of major weight loss by volatilization is essentially the same for the crystalline and

Miscellaneous - continued

Ref. No.

the noncrystalline polymer. DTA indicates that anhydride formation occurs in the noncrystalline polymeric acid at 200°C. This transition is less pronounced in the case of the crystalline polymer.

387 E. A. Militskova, A. D. Sokolov and E. S. Ezhkova, MOLDING POWDERS BASED ON POLY(ESTER ACRYLATES), Plasticheskie Massy 1962, No. 11, 10; C. A. 58, 8096 (1963)

388 Kei Matsuzaki, Takehiko Okamoto, Akira Ishida, and Hiroshi Sobue, POLYMERIZATION OF BUTYL ESTERS OF METHACRYLIC ACID AND HYDROLYSIS OF THE POLYMERS, J. Polymer Sci. A2, 1105 (1964)

Heat treatment of poly(methacrylic acids) and poly(tert-butyl methacrylates) showed that isotactic polymers form polymer anhydride faster than syndiotactic polymers.

OTHER SYNTHETIC C, H, O CONTAINING POLYMERS

Polyaldehydes

389 V. R. Alishoev, M. B. Neiman and B. M. Kovarskaya, THERMAL OXIDATION AND STABILIZATION OF POLYFORMALDEHYDE, Plasticheskie Massy 1962, No. 7, 11; C. A. 57, 16847 (1962)

DTA and TGA showed that polyformaldehyde decomposed above its melting point. The kinetics of isothermal decomposition were studied by measuring the pressure increase during decomposition.

390 J. Mejzlik and J. Berger, THERMAL STABILITY OF POLYFORMALDEHYDE, Chem. Prumysl 12, 461 (1962); C. A. 58, 10319 (1963)

The course of degradation (at 220-295°C) was followed by determination of formaldehyde formed. Terminal ester groups have no marked influence on the rate of thermal decomposition of the poly(oxymethylene) chain. Polymers with terminal BzO groups are much more stable than polymers containing AcO groups.

391 J. Pac, J. Mejzlik, and K. Vesely, ANIONIC DEPOLYMERIZATION OF POLYFORMALDEHYDE, Chem. Prumysl 12, 575 (1962); C. A. 58, 12698 (1963)

Found that thermal degradation of polyformaldehyde in vacuum occurs by an anionic reaction mechanism and is initiated at chain ends.

392 M. Baccaredda, E. Butta and P. Givsti, PRODUCTION OF POLYOXYMETHYLENE OF HIGH MOLECULAR WEIGHT AND HIGH CRYSTALLINITY FROM TRIOXANE, J. Polymer Sci. C, No. 4, Part 2, 953 (1963)

The kinetics of the thermal decomposition of polyoxymethylene were studied at 222°C.

Ref. No.

393 Y. Iwasa and T. Imoto, OVERALL RATE OF REVERSIBLE THERMAL DEPOLYMERIZATION OF α-POLY(OXYMETHYLENE), Nippon Kagaku Zasshi 84, 31 (1963); C. A. 59, 8894 (1963)

The kinetics of thermal depolymerization of α-poly(oxymethylene) was studied by measuring the rate of increase in the pressure of evolved HCHO.

394 A. I. Yakubchik and V. S. Shagov, STABILITY OF POLYALDEHYDES, Zh. Prikl. Khim. 36 (7), 1584 (1963); C. A. 59, 15398 (1963)

The thermal stability of amorphous and crystalline polyacetaldehyde (I), poly(trichloroacetaldehyde) (II), and poly(hexahydrobenzaldehyde) (III) was studied by measuring weight loss at 100° using a torsion balance. The rate of degradation decreases with increasing degree of crystallinity. The thermal stability increases in the order III> II> I. The weight loss of the most stable III is 4.0% after 0.5 hour, and 6.3% after 3 hours.

395 H. P. Frank, THE DEPOLYMERIZATION OF CRYSTALLINE POLYISOBUTYRALDEHYDE, Makromol. Chem. 63, 135 (1963)

The kinetics of depolymerization to monomer were studied under vacuum between 50 and 130°.

396 J. Mejzlik, J. Pac and L. Janeckova, THERMO-OXIDATIVE STABILIZATION OF POLYFORMALDEHYDE, Chem. Prumysl 13 (38), No. 12, 658 (1963); C. A. 60, 5705 (1964)

Tested about 60 stabilizers for polyformaldehyde with acetate end groups. Evaluation was carried out by exposing the sample at 222°C in an automatic balance and by measurement of weight loss and of the molecular weight on degrading the polymer in air at 90°C.

397 V. R. Alishoev, M. B. Neiman, B. M. K[illegible]kaya and V. V. Gut'yanova, THERMOOXIDATIVE DEGRADATION AND STABILIZATION OF POLYFORMALDEHYDE, Vysokomolekul. Soedin. 5 (5), 644 (1963)

Reports that the products of thermooxidative degradation of polyformaldehyde are HCHO, C oxides, hydrogen and water. Various antioxidants were tested.

398 G. S. Goncharov, A. N. Levin, and G. A. Ryvkin, CATALYTIC ACTION OF CERTAIN SUBSTANCES ON THE THERMAL DEGRADATION OF α-POLYOXYMETHYLENE, Plasticheskie Massy 1963, No. 2, 62; C. A. 58, 12698 (1963)

399 Yu. M. Luthkov, I. S. Volchek, G. Ya. Krichmar, V. D. Ramzaitsev, Yu. I. Vishnyak and N. Ya. Parlashkevich, AUTOMATIC APPARATUS FOR DETERMINATION OF THERMAL STABILITY OF POLYMERS, Plasticheskie Massy 1963 (8) 60; C. A. 59, 12943 (1963)

An apparatus is described which was used to follow the degradation of polyformaldehyde at 222°.

Ref. No.

400 L. A. Dudina, L. V. Karmilova, and N. S. Enikolopyan, THERMAL AND THERMOOXIDATIVE DEGRADATION OF POLYFORMALDEHYDE. IV KINETICS OF THERMOOXIDATIVE DEGRADATION, Vysokomolekul. Soedin 5 (8), 1160 (1963)

The kinetics of degradation of polyformaldehyde and acetylated polyformaldehyde were measured in the presence of oxygen and argon by polymer weight-loss and viscosity changes. The mechanism of the degradation is discussed.

401 L. A. Dudina and N. S. Enikolopyan, THERMAL AND THERMOOXIDATIVE DEGRADATION OF POLYFORMALDEHYDE. III. CHAIN-TRANSFER REACTION IN THE THERMOOXIDATIVE DEGRADATION, Vysokomolekul. Soedin 5 (7), 1135 (1963)

402 L. A. Dudina and N. S. Enikolopyan, THERMAL AND THERMOOXIDATIVE DEGRADATION OF POLYFORMALDEHYDE. II. TEMPERATURE DEPENDENCE OF THE THERMAL DEGRADATION, Vysokomolekul. Soedin. 5 (7), 986 (1963)

The thermal degradation of unstabilized and stabilized polyformaldehyde was studied by heating thin tablets of polymer. It was found that the difference in the degradation rates of the stabilized and nonstabilized polymers is determined only by the activation energies.

403 L. A. Dudina and N. S. Enikolopyan, THERMAL AND THERMOOXIDATIVE DEGRADATION OF POLYFORMALDEHYDE. I. ORDER OF THE THERMAL DEGRADATION REACTION, Vysokomolekul. Soedin. 5 (6), 861 (1963)

The mechanism and kinetics of thermal degradation were investigated by manometric measurement of evolved gases. The only gaseous product was formaldehyde and the degradation reaction is first order.

404 L. A. Dudina, L. V. Karmilova, and N. S. Enikolopyan, OXIDATIVE DESTRUCTION OF POLYFORMALDEHYDE, Dokl. Akad. Nauk SSSR 150 09 (1963); C. A. 59, 4055 (1963)

The pyrolysis of polyformaldehyde containing hydroxyl and acetate terminal groups was studied in the range 180-185° in the presence of oxygen.

405 L. A. Dudina, L. A. Agayants, L. V. Karmilova and N. S. Enikolopyan, THERMAL AND THERMOOXIDATIVE DEGRADATION OF POLYFORMALDEHYDE. V. Formic Acid Role in Thermooxidative Degradation, Vysokomolekul. Soedin. 5 (8), 1245 (1963)

Degradation of stabilized polyformaldehyde was carried out in the presence of formic acid in an inert atmosphere, in an oxygen atmosphere, and under pressure. The rate of degradation was greater in the presence of oxygen and formic acid than in the presence of oxygen alone. Formic acid did not accelerate the rate of degradation in an inert atmosphere. The results indicate a catalytic action of formic acid in the oxidation of the end groups of the broken polymer chains.

Polyaldehydes - continued

Ref. No.

406 K. Hayashi, H. Ochi and S. Okamura, RADIATION-INDUCED POST POLYMERIZATION OF TRIOXANE IN THE SOLID STATE, J. Polymer Sci. A2, 2979 (1964)

Results of thermal stability determinations on the polymers at 200°C in air are shown. Measurements of thermal decomposition rates indicate that the thermal stability improves when the polymerization time and the degree of polymerization are increased, because the thermal stability is proportional to the degree of polymerization.

407 W. T. Brady and H. R. O'Neal, POLYMERIZATION OF GLYOXAL, J. Polymer Sci. B2, 647 (1964)

The polymer is stable at room temperature, but decomposed upon heating to 150°C.

408 Masakazu Inoue, CRYSTALLIZATION AND MELTING OF COPOLYMERS OF POLYOXYMETHYLENE, J. Applied Polymer Sci. 8, 2225 (1964)

409 L. A. Dudina, L. V. Karmilova, and N. S. Enikolopyan, THE MECHANISM OF FORMATION OF FORMIC ACID IN THE OXIDATIVE DEGRADATION OF POLYFORMALDEHYDE, Vysokomolekul. Soedin. Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 228; C. A. 62, 658 (1965)

410 A. B. Blyumenfel'd, M. B. Neiman, and B. M. Kovarskaya, THERMAL DEGRADATION OF POLYFORMALDEHYDE, Dokl. Akad. Nauk SSSR 154 (3), 631 (1964); C. A. 60, 12129 (1964)

Degraded polyformaldehyde at 300° and determined the products given off.

411 S. Igarashi, I. Mita, and H. Kambe, THERMOGRAVIMETRIC ANALYSIS OF POLY(OXYMETHYLENE), Bull. Chem. Soc. Japan 37 (8), 1160 (1964)

412 J. Majer, IDENTIFICATION OF TERMINAL GROUPS OF DEGRADED POLY(OXYMETHYLENE), Collection Czech. Chem. Commun. 29 (12), 3171 (1964); C. A. 62, 2825 (1965)

413 Sadao Torikai, SOME ASPECTS OF THERMAL DECOMPOSITION OF POLYOXYMETHYLENE AND IRRADIATED POLYOXYMETHYLENE, J. Polymer Sci. A2, 3461 (1964)

The thermal decomposition of polyoxymethylene in vacuum was studied. Discusses kinetic aspects of the degradation.

414 Sadao Torikai, MAIN-CHAIN DEGRADATION AND THERMAL STABILIZATION OF POLYOXYMETHYLENE BY IONIZING RADIATION, J. Polymer Sci. A2, 239 (1964)

415 Sadao Torikai, EFFECTS OF γ-RAYS ON POLY(OXYMETHYLENE). DEPENDENCES OF DECOMPOSITION, VISCOSITY CHANGE, AND THERMAL STABILITY CHANGE ON THE IRRADIATION TEMPERATURE, Kobunshi Kagaku 21 (225), 31 (1964); C. A. 61, 1964 (1964)

Some Oxide Type Polymers

Ref. No.

416 V. D. Moiseev, M. B. Neiman, V. I. Suskina and G. I. Kushlina, THERMAL DESTRUCTION OF POLY(ETHYLENE OXIDE), Tr. po Khim. i Khim. Tekhnol. 1962 (2), 459; C. A. 59, 7669 (1963)

The thermal destruction of poly(ethylene oxide) at 300-360° was studied. The overall activation energy was not constant, but was 57 kcal/mole over a considerable range. The decomposition products are in accord with a radical-chain destruction mechanism.

417 R. S. Goglev and M. B. Neiman, THERMOOXIDATIVE DEGRADATION OF POLY(ETHYLENE OXIDE), Vysokomolekul. Soedin., Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 156; C. A. 62, 1793 (1965)

418 J. M. Cox, B. A. Wright, and W. W. Wright, THERMAL DEGRADATION OF POLY(PHENYLENE OXIDES), J. Applied Polymer Sci. 9, 513 (1965)

The thermal degradation in vacuum of a number of halogenated poly(phenylene oxide) polymers has been studied by a weight loss method. In general the thermal stability decreased as the degree of substitution in the phenylene nuclei increased. The chloro derivatives were relatively more stable than the corresponding bromo derivatives. The majority of the polymers showed an initial rapid loss in weight followed by the formation of a highly stable residue.

Epoxide Polymers

419 H. C. Anderson, QUALITATIVE AND QUANTITATIVE ASPECTS OF THE KINETICS AND MECHANISMS OF PYROLYSIS OF EPOXIDE POLYMERS, U. S. Dept. Com., Office Tech. Serv., PB Rept. 181,186, 15 pp (1961); C.A. 60, 3118 (1964)

The thermal degradation of epoxide polymers was studied using the techniques of isothermal and non-isothermal gravimetry, infrared spectroscopy and molecular distillation.

420 V. D. Moiseev, M. B. Neiman, B. M. Kovarskaya, I. E. Zenova, and V. V. Gur'yanova, THERMAL DEGRADATION OF POLYCONDENSATION RESINS. TRACER STUDY OF THE THERMAL DEGRADATION OF EPOXY RESINS, Plasticheskie Massy 1962 (6), 11; C. A. 61, 14848 (1964)

421 M. M. Fulk and K. S. Horr, SUBLIMATION OF SOME POLYMERIC MATERIALS IN VACUUM, Trans. Natl. Vacuum Symp. 9, 324 (1962); C. A. 59, 7714 (1963)

Data are given on weight loss in vacuum ($< 5 \times 10^{-6}$mm) of polymeric materials considered for use in spacecraft. Times up to 300 hours and temperatures of 50-100° were used. Among the commercial compositions evaluated were polyolefin wire insulation and tubing, epoxy molding compounds, nylons, phenolic laminates, silicone rubbers and potting compounds.

422 L. McAllister, J. Bolger, E. McCaffery, P. Roy, F. Ward and A. C. Walker, Jr., BEHAVIOR OF CHARRING POLYMERS DURING ABLATION, SPE Tech. Papers 1962, June, 28-48; C. A. 58, 8095 (1963)

Ref. No.

Plasma arc tests were conducted on a series of cured epoxide resins.

423 K. A. Andrianov and C. E. Golubkov, THERMOMECHANICAL AND ELECTRICAL PROPERTIES OF COMPOSITE EPOXY POLYSILOXANE POLYMERS, Vysokomolekul. Scedin. 4, 1375 (1962); C. A. 59, 809 (1963)

Experimental data given on the thermomechanical and electrical properties of two epoxy resins and four polymers obtained by addition of poly(methylphenylsiloxane) or poly(aluminumphenylsiloxane) to the epoxy resins.

424 H. C. Anderson, KINETICS OF PYROLYSIS OF EPOXIDE POLYMERS, Kolloid Z. 184, No. 1, 26 (1962)

425 K'Ai Shuang Ting, Chih-Lu Wang, Fen-Yu Li, San-Nan Kao, and Kung-Hsin Shen, CHLORINATED EPOXY RESINS, K'o Hsueh T'ung Pao 1962, No. 10, 36, C. A. 58, 11527 (1963)

To improve the heat resistance and fire-retarding properties of epoxide resins, SO_2Cl_2 was used as a chlorinating agent in preparing 2,2-bis(3,5-dichloro-4-hydroxyphenyl) propane which gave epoxides showing improvements in these properties.

426 D. W. Ovenall, ELECTRON SPIN RESONANCE OF FREE RADICALS IN EPOXIDE RESINS, J. Polymer Sci. B1, 37 (1963)

When epoxide resins are heated to 180°C in air, both formation and decay of free radicals occur. In vacuum the decay alone takes place. Formation of radicals requires the presence of air and probably involves oxidative scission of polymer chains.

427 B. J. Bremmer, FACTORS INFLUENCING THE HEAT STABILITY OF FIRE-RETARDANT EPOXY RESINS, Am. Chem. Soc., Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 115 (1963); C. A. 62, 692 (1965)

428 R. I. Thrune, GASES RELEASED WHEN FIRE-RESISTANT EPOXY RESINS ARE BURNED, Am. Chem. Soc., Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 15 (1963); C. A. 62, 699 (1965)

429 E. C. Jubb, Jr. DEGRADATION OF CURED PAPER-EPOXY RESULTING FROM LAMINATION, Modern Plastics 41 (4), 115-[illegible], 166 (1963)

Sheets of cured paper-epoxy can be laminated at 300°F or lower without degrading the tensile and impact strength. These properties are rapidly reduced by subjecting the laminate to 350° or higher during preparation. Laminating pressure did not affect the tensile strength, but the impact strength of the laminate prepared at 350°F was reduced with an increase in pressure.

430 Shih-Kang Wu and Yu-Chen Chang, THERMOMECHANICAL CURVES OF EPOXY RESINS HARDENED BY PHTHALIC ANHYDRIDE, Hua Hsueh Tung Pao 1963 (8), 504; C. A. 60, 5703 (1964)

Ref. No.

431 Lieng-Huang Lee, MECHANISMS OF THERMAL DEGRADATION OF PHENOLIC CONDENSATION POLYMERS. THERMAL STABILITY AND DEGRADATION SCHEMES OF EPOXY RESINS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio, 1963, F1; C. A. 60, 16049 (1964)

432 L. K. Solov'eva, V. V. Korshak, I. V. Kamenskii, and A. Askadskii, EPOXY RESINS WITH HIGH HEAT STABILITY, Tr. Mosk. Khim.-Tekhnol. Inst. 1963 (42), 110; C. A. 61, 16247 (1964)

433 B. J. Bremmer, HEAT STABILITY OF BROMINATED EPOXY RESINS, Ind. Eng. Chem., Prod. Res. Develop. 3 (1), 55 (1964)

434 B. M. Kovarskaya and I. E. Zhigunova, DEGRADATION OF EPOXY-PHENOLIC RESINS, Plasticheskie Massy 1964 (7), 17; C. A. 61, 10832 (1964)

435 J. K. Stille and B. M. Culbertson, CYCLOPOLYMERIZATION OF DIEPOXIDES, J. Polymer Sci. A2, 405 (1964)

Poly-1,2,5,6-diepoxyhexane prepared with the diethylzinc-water catalyst show a higher degree of crystallinity than those samples prepared with the phosphorus pentafluoride-water catalyst, as demonstrated by x-ray patterns and differential thermal analyses.

436 K. A. Torossian and S. L. Jones, STUDY OF POLYMERS APPLICABLE TO INSULATION SYSTEMS, J. Applied Polymer Sci. 8, 489 (1964)

TGA and isothermal data in air are reported. Some results for polymers such as epoxides, unsaturated polyesters, Butvar phenolic and silicones are given.

437 G. S. Learmonth, THERMAL DEGRADATION OF RESINS, J. Applied Polymer Sci. 8, 2873 (1964)

DTA and TGA were investigated from the view of predicting the thermal behavior and flammability of plastic materials. Paper-reinforced phenolic and epoxide resins were used. Found that with phenolic laminates the pattern of the thermograms was characteristic of the paper, while with epoxide laminates (and melamine) it was characteristic of the resin used. This cannot be correlated with fireproofness or flammability.

Phenolics

438 R. T. Conley, J. F. Bieron and P. Ferch, THERMAL STABILITY OF POLYMERIC MATERIALS. II. PHENOLIC RESINS, Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints 20, No. 2, 244 (1960); C. A. 57, 16847 (1962)

Continuously monitored the oxidative degradation by using infrared spectroscopy. Kinetic data obtained are in agreement with the postulated degradation schemes.

Ref. No.

439 H. C. Anderson, THERMAL DEGRADATION OF PHENOLIC POLYMERS, U. S. Dept. Comm., Office Tech. Serv., AD 260,252, 5 pp. (1961); C. A. 57, 15337 (1962)

By using vacuum TGA, the thermal decomposition of a number of phenolic polymers was studied over the range 25-920°. Included were regular phenolics, chlorinated phenolics, and phenolics copolymerized with nylon, silane, and phenol-furfural resins.

440 H. C. Anderson, THERMAL DEGRADATION OF PHENOLIC POLYMERS, U. S. Dept. Com., Office Tech. Serv., AD 260,252, 21 pp. (1961); C. A. 59, 810 (1963)

Used vacuum TGA to study the thermal degradation of 15 phenolic polymers. Included were regular phenolics, chlorinated phenolics, and phenolics copolymerized with silane, nylon, and phenol-furfural resins. Results are discussed in relation to the chemistry of phenolic polymers.

441 H. C. Anderson, PYROLYSIS OF PHENOLIC POLYMERS, SPE Trans. 2, No. 3, 202 (1962)

Reports vacuum TGA study of 15 polymers over the temperature range 25-920°.

442 W. M. Jackson and R. T. Conley, HIGH-TEMPERATURE OXIDATIVE DEGRADATION OF PHENOL-FORMALDEHYDE POLYCONDENSATES, NASA, Doc. N64-12122, 39 pp. (1963); C. A. 60, 16057 (1964)

443 R. T. Conley, OXIDATIVE MECHANISMS FOR THE DEGRADATION OF PHENOL-, FURAN-, AND UREA-BASED CONDENSATION POLYMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, 68 pp.; C. A. 60, 16049 (1964)

Oxidative degradation of phenolics, polybenzyl, polycarbonates, urea-formaldehyde and melamine resins was followed by solid-phase spectrophotometry and gas chromatography. The mechanisms of degradation are discussed.

444 R. T. Conley, A KINETIC STUDY OF THE OXIDATIVE DEGRADATION OF PHENOL-FORMALDEHYDE POLYCONDENSATES USING INFRARED SPECTROSCOPY, J. Applied Polymer Sci. 7, 171 (1963)

The oxidative degradation of cured phenolic resin was investigated by continuous monitoring of the infrared spectral changes occurring in the solid phase at temperatures between 140 and 220°C.

445 R. T. Conley, A STUDY OF THE OXIDATIVE DEGRADATION OF PHENOL-FORMALDEHYDE POLYCONDENSATES USING INFRARED SPECTROSCOPY, J. Applied Polymer Sci. 7, 103 (1963)

Infrared examination of oxidative degradation of acid- and base-catalyzed phenol-formaldehyde polycondensates was carried out in the

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temperature range of 100-200°C. Information is given on the degradation mechanism.

446 H. J. Doyle, DEVELOPMENT OF DESIGN DATA FOR THE APPLICATION OF PHENOLIC ASBESTOS LAMINATES ON FIRE VEHICLE HEAT PROTECTIVE SYSTEMS. ADDENDUM: ABLATION RESISTANCE OF PHENOLIC ASBESTOS LAMINATE, NASA. Doc. N63-19300, 113 pp. (1963); C. A. 60, 16058 (1964)

447 J. E. Hauck, HEAT RESISTANT PLASTICS, Mater Design Eng. 57, No. 4, 100, 190 (1963)

New data are given on high temperature properties of plastics Includes alkyd molding resins at 450°F, phenolic laminates at 700°F, carbon fiber composites at 700°F, acrylic laminates at 500°F, epoxy-phenolic preparations at 500°F, and silicone laminates at 800°F.

448 S. Kohn, THERMAL STABILITY OF PHENOLIC RESINS AND THE EFFECT OF AN ADDITION OF SMALL AMOUNTS OF MINERAL COMPOUNDS ON THEIR DEGRADATION, Rech. Aerospatiale 96, 39 (1963); C. A. 60, 8195 (1964)

449 M. S. Ogii and N. K. Moshinskaya, THERMAL DECOMPOSITION OF CONDENSATION RESINS BASED ON 9,10-BIS(CHLOROMETHYL)ANTHRACENE AND PHENOL, Tr. Dnepropetr. Khim.-Tekhnol. Inst. 1963 (16), 147; C. A. 61, 2011 (1964)

The thermal degradation of anthracene-phenol-formaldehyde resins was studied in vacuum and in air, carbon dioxide, and nitrogen by heating to 300-400°.

450 B. M. Kovarskaya, V. D. Moiseev, and M. B. Neiman, USE OF C^{14} IN INVESTIGATING THE THERMAL DEGRADATION OF CONDENSATION RESINS, Intern. J. Appl. Radiation Isotopes 14 (5), 251 (1963)

451 M. G. Young, HOW TEMPERATURE AFFECTS PLASTIC LAMINATES, Prod. Eng. 35 (15), 67 (1964); C. A. 62, 696 (1965)

Found that phenolics show higher retention of flexural strength at high temperatures than silicones.

452 G. A. Tirskii, ANALYSIS OF THE LAMINAR MULTICOMPONENT BOUNDARY LAYER ON THE SURFACE OF BURNING PLASTICS, Kosmich. Issled., Akad. Nauk SSSR 2 (4), 570 (1964); C. A. 62, 1792 (1965)

453 I. F. Bogdanov, M. L. Mishchenko, and I. L. Farberov, PYROLYSIS OF FUELS AND RESINS DURING THERMAL SHOCK, Gazifikaisiya i Piroliz Topliv, Akad. Nauk SSSR, Gos. Kom. po Toplivn. Prom. pri Gosplane SSSR, Inst. Goryuch. Iskop., Sb. Statei 1964, 3; C. A. 62, 1793 (1965)

454 G. V. Lakomskaya, M. I. Rogailin, and I. L. Farberov, REACTIVITY OF COKE RESIDUES FROM THE PYROLYSIS OF HIGH-MOLECULAR-WEIGHT RESINS, Gazifikatsiya i Piroliz Topliv, Akad. Nauk SSR, Gos. Kom. po Toplivn. Prom. pri Gosplane SSSR, Inst. Goryuch. Iskop., Sb. Statei 1964, 41; C. A. 62, 1792 (1965)

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455 E. N. Kan'kovskaya, S. S. Dmitrienko, and T. I. Pechennikova, STURCTURE OF THERMOPROCESSED PHENOL-FORMALDEHYDE RESINS, Plasticheskie Massy 1964 (10), 13; C. A. 62, 2876 (1965)

Infrared, ultraviolet and visible spectra of phenol-formaldehyde resins showed that their coloration under the action of light and heat is caused by the formation of tripherylmethane compounds.

456 K. I. Turchaninova and L. A. Igonin, PRODUCTS FORMED BY THERMAL DEGRADATION OF BIS(2-HYDROXY-3,5-DIMETHYLBENZYL) ETHER, Plasticheskie Massy 1964 (8), 45; C. A. 61, 13482 (1964)

Reactions occurring in the curing of phenol-formaldehyde resins were estimated by studying the degradation of the title compound at 160-170° in nitrogen for 30 minutes.

457 V. A. Popov, I. S. Druyan, and B. G. Varshal, STUDY, WITH THE HELP OF THERMAL ANALYSIS, OF THE PHENOMENA OCCURRING DURING THE HEATING OF POLYMERS. PHENOL-ALDEHYDE RESINS, Plasticheskie Massy 1964 (5), 15; C. A. 61, 9631 (1964)

458 W. M. Jackson and R. T. Conley, HIGH TEMPERATURE OXIDATIVE DEGRADATION OF PHENOL-FORMALDEHYDE POLYCONDENSATES, J. Applied Polymer Sci. 8, 2163 (1964)

The degradation of phenol-formaldehyde polycondensates was investigated at temperatures as high as 1000°C. By employing infrared spectrophotometric techniques and vapor-phase chromatographic methods, as well as thermogravimetric and x-ray analyses, it was possible to examine the oxidation chemistry of this resin system. It was found that the primary degradation route of phenol-formaldehyde polycondensates, regardless of whether the resin is exposed to elevated temperatures in air, argon, or nitrogen, is oxidation. At elevated temperatures, products are observed from thermal pyrolysis in addition to those from the oxidation path. However, throughout the temperature region studied, the oxidative degradation is always more pronounced. In this study, it was found that phenol-formaldehyde polycondensates of unusual thermal stability could be produced by high temperature postcuring. The comparison of the oxidation rates of the resin cured at low temperature and this material indicates greatly improved oxidative stability, as well as resistance to thermal pyrolysis. This undoubtedly is due to the complete crosslinking of the resin system.

459 R. H. White and T. F. Rust, CURE RATES OF PHENOLIC RESINS BY DIFFERENTIAL THERMAL ANALYSIS, J. Applied Polymer Sci. 9, 777 (1965)

Poly(vinyl Alcohol)

460 M. Shiraishi and M. Matsumoto, DEGRADATION OF POLY(VINYL ALCOHOL) IN HOT AQUEOUS ALKALI SOLUTION, Kobunshi Kagaku 19 (212), 722 (1962); C. A. 61, 3223 (1964)

Poly(vinyl Alcohol) - continued

Ref. No.

461 T. M. Ellison and H. G. Spencer, ELECTROCHEMICAL PROPERTIES OF IONOGENIC MEMBRANES PREPARED BY THERMAL AND OXIDATIVE DEGRADATION OF POLY(VINYL ALCOHOL), J. Polymer Sci. B1, 707 (1963)

Poly(vinyl alcohol), PVA, degraded under the mild conditions of 110°C in air had electrochemical properties indicative of low concentrations of ionogenic groups. This paper also presents the properties of PVA membranes after degradation under the more severe conditions of 175 ± 5°C in a stream of dry oxygen.

462 A. Ya. Gel'fman, D. S. Bidnaya, L. V. Sigalova, M. G. Buravleva, and V. S. Koba, ELECTRIC CONDUCTIVITY AND CONJUGATED DOUBLE BONDS IN PRODUCTS OF POLY(VINYL ALCOHOL) PYROLYSIS, Dokl. Akad. Nauk SSSR 154 (4), 894 (1964); C. A. 60, 13339 (1964)

463 O. O. Borodina and K. E. Perepelkin, THERMAL STABILITY OF POLY(VINYL ALCOHOL), Plasticheskie Massy 1964 (1), 7; C. A. 60, 10816 (1964)

Poly(vinyl Ketone)

464 J. N. Hay, COLORATION IN VINYL POLYMERS. I. POLY(METHYL VINYL KETONE), Makromol. Chem. 67, 31 (1963)

Miscellaneous

465 E. J. Vandenberg, THE STEREOREGULAR POLYMERIZATION OF VINYL ETHERS WITH TRANSITION METAL CATALYSTS, J. Polymer Sci. C, 207, No. 1

DTA was used to determine melting points.

466 G. P. Brown and A. Goldman, SYNTHESIS AND EVALUATION OF THERMALLY STABLE POLYMERS. I. POLYMER SYNTHESIS; D. C. Doyle, II. POLYMER EVALUATION, At. Energy Comm. WADD-TR-61-255, 99 pp. (1961); C. A. 59, 10243 (1963)

A poly(m-phenoxylene) showed 3% weight loss up to 500°. Methods of kinetic analysis of TGA data are illustrated with octamethylcyclotetrasiloxane and polytetrafluoroethylene.

467 S. M. Cohen, C. F. Hunt, R. E. Kass, and A. H. Markhart, POLYSPIROACETAL RESINS. PART II. STRUCTURE AND PROPERTIES OF POLYSPIROACETALS FROM PENTAERYTHRITOL-GLUTARALDEHYDE AND FROM (PENTAERYTHRITOL-DIPENTAERYTHRITOL)-(GLUTARALDEHYDE), J. Applied Polymer Sci. 6, 508 (1962)

Because of the general oxidative instability of many aliphatic or alicyclic ethers at elevated temperatures, the demonstrated improvement in thermal stability by these polyspiroacetals points in part to the contribution of the spirane neopentyl carbons. Films crosslinked with pyromellitic dianhydride exhibited good flexibility and tensile strength. Moreover, their oxidative thermal stability was only slightly less than that of crosslinked poly(ethylene terephthalate).

Ref. No.

468 I. V. Kamenskii, G. M. Tseitlin, T. L. Renard and Ya. S. Vygodskii, POLYMERIC MATERIALS FROM CONDENSATION PRODUCTS OF THE ALICYCLIC KETONES WITH ALDEHYDES. SYNTHESIS AND INVESTIGATION OF THE POLYETHERS FROM 2,2,6,6-TETRAKIS(HYDROXYMETHYL)CYCLOHEXANOL AND 2,2,5,5-TETRAKIS(HYDROXYMETHYL)CYCLOPENTANONE, Plasticheskie Massy 1963 (6), 18; C. A. 59, 10300 (1963)

The resins were used as adhesives for glass. The joints were resistant against prolonged boiling in water and to temperatures of 250-300°.

469 N. Grassie and J. N. Hay, THERMAL DEGRADATION OF POLY(METHYL VINYL KETONE) AND ITS COPOLYMERS WITH ACRYLONITRILE, Makromol. Chem. 64, 82 (1963)

Thermal degradation of poly(methyl vinyl ketone) is a function of the elimination of water and the production of a colored conjugated structure. The changes produced in the infrared spectra are shown. Methyl vinyl ketone produces an acceleration in the rate of condensation of nitrile groups in polyacrylonitrile.

470 H. J. O'Neill, R. E. Putscher, A. Dynako and C. Boquist, PYROLYSIS STUDIES OF FURFURYL ALCOHOL RESINS BY GAS CHROMATOGRAPHY, J. Gas Chromatog. 1 (2), 28 (1963)

471 C. W. Boquist, E. R. Nielsen, H. J. O'Neil, and R. E. Putcher, RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. XV. ALUMINA-CONDENSED FURFURYL ALCOHOL RESINS, U. S. Dept. Com., Office Tech. Serv. AD 418,260, 61 pp. (1963); C. A. 61, 3212 (1964)

Included are some TGA and DTA data.

472 P. R. Thomas, G. J. Tyler, T. E. Edwards, and A. T. Radcliffe, THE ANIONIC POLYMERIZATION OF SOME ALKYL VINYL KETONES, Polymer 5, No. 10, 525 (1964)

Thermal depolymerization of the crystalline poly(isopropyl vinyl ketones) obtained from anionic initiators indicated that the polymers contained some linkages in the chains other than those expected from 1, 2 addition polymerization.

473 W. De Winter and C. S. Marvel, SYNTHESIS AND CYCLOPOLYMERIZATION OF 4,4-DIMETHYL-1,6-HEPTADIENE-3-5-DIONE, J. Polymer Sci. A2, 5123 (1964)

TGA of a partial ladder polymer showed a weight loss of about 20% between 300 and 500°C and then very little additional loss up to 900°C.

474 T. Takahashi, K. Suzuki and K. Arai, EFFECT OF PIGMENTS ON DEGRADATION OF POLYMERS. III. THERMAL DEGRADATION OF POLYACETAL RESINS, Kobunshi Kagaku 21 (232), 498 (1964); C. A. 61, 14847 (1964)

Polyacrylonitrile

Ref. No.

475 R. T. Conley and J. F. Bieron, EXAMINATION OF THE OXIDATIVE DEGRADATION OF POLYACRYLONITRILE USING INFRARED SPECTROSCOPY, J. Applied Polymer Sci. 7, 1757 (1963)

The oxidative thermal degradation of polyacrylonitrile was examined using infrared spectroscopy. The mechanism of the process is discussed.

476 A. Shindo, GRAPHITE FIBER, Osaka Kogyo Gijutsu Shikensho Hokoku No. 317, 52 pp. (1961) (in English); C. A. 58, 6984 (1963)

Carbon fiber was obtained by pyrolysis of polyacrylonitrile. The proper conditions are described.

477 I. A. Drabkin and L. D. Rozenshtein, THERMAL CONVERSION OF POLYACRYLONITRILE AS STUDIED BY PHOTOCONDUCTIVITY, Izv. Akad. Nauk SSSR, Ser. Khim. 1964 (6), 1113; C. A. 61, 8475 (1964)

Heating polyacrylonitrile films in vacuum to 200-300° resulted in development of semiconductor properties. Above 200°, this treatment also developed photoconductivity in the material.

478 I. A. Drabkin, L. D. Rozenshtein, M. A. Geiderikh, and B. E. Davydov, THE MECHANISM BEHIND THE THERMAL CONVERSION OF POLYACRYLONITRILE, Dokl. Akad. Nauk SSSR 154 (1), 197 (1964); C. A. 60, 13389 (1964)

A polyacrylonitrile film was heat treated up to 300° and changes were followed by infrared and ultraviolet methods.

479 A. V. Airapetyants, R. M. Vlasova, M. A. Geiderikh, and B. E. Davydov, ELECTRICAL PROPERTIES OF POLYACRYLONITRILE DURING THERMAL TREATMENT, Izv. Akad. Nauk SSSR, Ser. Khim. 1964 (7), 1328; C. A. 61, 13440 (1964)

Kinetic curves were plotted for the variation of conductivity and thermal e.m.f. observed in polyacrylonitrile subjected to heat treatment at 400-450°.

480 A. V. Airapetyants, R. M. Voitenko, B. E. Davydov, B. A. Krentsel, and V. S. Serebryanikov, EFFECT OF ORIENTATION ON THE ELECTRIC PROPERTIES OF THERMALLY TREATED POLYACRYLONITRILE, Vysokomolekul. Soedin. 6 (1), 86 (1964)

Semiconducting materials were obtained by heat treatment at 520, 610, and 700° of polyacrylonitrile fibers oriented by drawing.

481 A. A. Berlin, A. M. Dubinskaya, and Yu. Sh. Moshkovskii, THERMAL TREATMENT OF POLYACRYLONITRILE IN DIMETHYLFORMAMIDE SOLUTION, Vysokomolekul. Soedin. 6 (11), 1938 (1964)

Ref. No.

Heating a 1% solution of polyacrylonitrile in dimethylformamide in a current of air or oxygen for 30-40 hours gave a colored polymer. Infrared spectra showed that oxidative degradation occurred with the formation of a conjugated system.

482 L. K. H. Van Beek, DIELECTRIC BEHAVIOR AND RESISTIVITIES OF POLYACRYLONITRILE AND SOME PYROLYZATES, J. Applied Polymer Sci. 9 553 (1965)

Polyamides

483 S. R. Rafikov, G. N. Chelnokova and R. A. Sorokina, CHEMICAL CHANGES IN POLYMERS. VIII. DEGRADATION OF POLY(HEXAMETHYLENEADIPAMIDE) AT HIGH TEMPERATURES, Vysokomolekul. Soedin. 4 (11), 1639 (1962)

The degradation was studied at 350-400° under nitrogen. The products of the degradation are reported.

484 J. Pellon and W. G. Carpenter, POLYAMIDES CONTAINING PHOSPHORUS. I. PREPARATION AND PROPERTIES, J. Polymer Sci. A1, 863 (1963)

A comparison of the thermal stability, adhesive bond strengths, and mechanical behavior of typical polyamides containing phosphine or phosphine oxide groups in their backbone structure to those of analogous regular nylons disclosed no major differences. The results of thermal stability tests are summarized in terms of the temperature at which 10% weight loss occurred.

485 J. Pellon, POLYAMIDES CONTAINING PHOSPHORUS. II. STRUCTURAL EFFECTS ON SOFTENING AND GLASS TRANSITION TEMPERATURES, J. Polymer Sci. A1, 3561 (1963)

A brief comparison with regular nylon analogs disclosed no major differences in terms of thermal stability or mechanical behavior. Glass transition temperatures were measured by DTA.

486 N. I. Antropova, K. N. Vlasova and M. L. Dobrokhotova, STABILIZATION OF POLYAMIDE FILMS, Plasticheskie Massy 1963, (8), 16; C. A. 59, 11726 (1963)

Literature data about stabilizers against photodegradation and oxidative and thermal degradation of polyamide films were checked by determining the change in mechanical properties of these films after 120 hours in the Weather-Ometer.

487 I. I. Levantovskay, M. P. Yazvikova, M. K. Dobrokhotova, B. M. Kovarskaya, and K. N. Vlasova, THERMO-OXIDATIVE DEGRADATION AND STABILIZATION OF SOME POLYAMIDES, Plasticheskie Massy 1963, No. 3, 19; C. A. 58, 14206 (1963)

488 L. A. Kotorlenko, A. P. Gardenina, and V. G. Oleinik, OXIDATIVE DESTRUCTION OF POLYAMIDES. I. STUDY OF THERMAL AND RADIATIVE OXIDATION OF POLYCAPROLACTAM BY INFRARED SPECTROSCOPY, Ukr. Khim. Zh. 30 (4), 370 (1964); C. A. 61, 16181 (1964)

Ref. No.

489 G. N. Chelnokova and S. R. Ratikov, CHEMICAL CHANGES IN POLYMERS. XVI. HIGH-TEMPERATURE DEGRADATION OF POLYENANTHAMIDE AND POLYCAPROLACTAM IN A CLOSED SYSTEM, Vysokomolekul. Soedin. 6 (4), 710 (1964)

Degraded title polymers by heating for 4 hours at 370-420 in a closed oxygen-free system. The products of degradation were determined and the mechanism is discussed.

490 R. A. Dine-Hart, B. J. C. Moore, and W. W. Wright, AROMATIC POLYAMIDES, J. Polymer Sci. B2, 369 (1964)

Some information is given on the thermal and oxidative stabilities of the polymers.

491 A. M. Schiller, J. C. Petropoulos, and C. S. Hsia Chen, LINEAR POLYMERS OF 4,4'-(2,2-BUTYLIDENE)DIBENZOIC ACID, J. Applied Polymer Sci. 8, 1699 (1964)

TGA studies are reported. Initial decomposition temperatures and the temperature corresponding to 10% weight loss are reported for a series of polymers.

492 J. Preston and F. Dobinson, NEW HIGH TEMPERATURE AROMATIC POLYAMIDES, J. Polymer Sci. B2, 1171 (1964)

DTA was used to determine polymer melting temperatures.

493 I. I. Levantovskaya, B. M. Kovarskaya, G. V. Dralyuk, and M. B. Neiman, MECHANISM OF THE THERMOOXIDATIVE DEGRADATION OF POLYAMIDES, Vysokomolekul. Soedin. 6 (10), 1885 (1964)

494 E. P. Krasnov and L. B. Sokolov, THERMAL DECOMPOSITION OF POLYAMIDES. I. KINETIC PATTERNS OF THERMAL DECOMPOSITION OF POLYAMIDES OF VARIOUS CHEMICAL STRUCTURES, Vysokomolekul. Soedin. Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 275; C. A. 62, 659 (1965)

Studied the thermal degradation of several polyamides at 275-400° by measuring the total amount of volatile products.

495 S. R. Rafikov, G. N. Chelnokova, V. V. Rode, I. V. Zhuravleva and R. A. Sorokina, CHEMICAL CHANGES IN POLYMERS. XV. SPECIFIC FEATURES OF THE THERMAL DEGRADATION OF POLYENANTHAMIDE, Vysokomolekul. Soedin. 6 (4), 652 (1964)

Investigated thermal degradation of polyenanthamide at 300-350°. The polymer was much more resistant to high temperatures both in the presence and in the absence of oxygen than polycaprolactam and polyhexamethyleneadipamide.

496 B. A. Zhubanov, S. R. Rankov, L. V. Pavletenko, S. A. Moshkevich, and N. I. Akimova, POLYMER SYNTHESIS. XV. SYNTHESIS OF POLYAMIDES FROM m-AND p-XYLYLENEDIAMINES AND ADIPIC, SEBACIC, AND ISOPHTHALIC ACIDS, Tr. Inst. Khim. Nauk, Akad. Nauk Kaz. SSR 11, 36 (1964); C. A. 61, 12099 (1964)

Ref. No.

Thermograms are given for poly(m-xylyeneadipamide), poly(p-xylylenesebacamide), and poly(m-xylyleneisophthalamide).

497 I. I. Levantovskaya, B. M. Kovarskaya, M. B. Neiman, E. G. Rozantsev, and M. P. Yazvikova, INHIBITION OF THERMOOXIDATIVE DEGRADATION OF POLYAMIDES BY AROMATIC AMINES AND STABILIZERS OF THE RADICAL TYPE, Plasticheskie Massy 1964 (3), 14; C. A. 61, 1962 (1964)

498 B. A. Zhubanov and I. Ya. Sadchikov, APPARATUS FOR DIFFERENTIAL THERMAL ANALYSIS (DTA) OF POLYMERS, Tr. Inst. Khim. Nauk, Akad. Nauk Kaz. SSR 11, 161 (1964); C. A. 61, 14798 (1964)

499 V. P. Sarzhevskaya, K. A. Kornev, S. E. Smirnova-Zamkova, S. Z. Levin, V. N. Kuchinskii, and V. E. Griz, POLYAMIDES WITH AROMATIC AND HETEROCYCLIC LINKS IN THE CHAIN. V. POLYAMIDES BASED ON BIS(4-AMINOCYCLOHEXYL)METHANE AND SOME HETEROCYCLIC DICARBOXYLIC ACIDS, Ukr. Khim. Zh. 30 (1), 83 (1964); C. A. 60, 15997 (1964)

Some thermal degradation data are reported.

500 P. Smilek, CALORIMETRIC DETERMINATION OF HEATS OF MELTING OF POLYMERS, Plasticke Hmoty Kaucuk 1 (8), 233 (1964); C. A. 61, 12102 (1964)

Discrepancies in published data on heats of melting of polymers were analyzed. DTA of polyamides and polypropylene was used.

501 E. P. Krasnov, L. B. Sokolov, and T. A. Polyakova, THERMAL DEGRADATION OF POLYAMIDES. II. EFFECT OF IMPURITIES ON THE THERMAL DEGRADATION OF POLYOXAMIDES, Vysokomolekul. Soedin. 6 (7), 1244 (1964)

Vacuum thermal degradation of poly(decamethyleneoxamide) and poly(hexamethyleneoxamide) was carried out. Evolved gas pressures were measured and decomposition products were determined chemically and by gas chromatography.

Polyazines

502 A. V. Topchiev, Yu. V. Korshak, B. E. Davydov and B. A. Krentsel, POLYAZINES, A NEW CLASS OF POLYMERS WITH CONJUGATED BONDS, Dokl. Akad. Nauk SSSR 147, 645 (1962); C. A. 58, 2047 (1963)

Decomposition temperatures (210-300°C) are reported for a series of polyazines.

Polybenzimidazoles

503 H. Vogel and C. S. Marvel, POLYBENZIMIDAZOLES. II, J. Polymer Sci. A1, 1531 (1963)

Polybenzimidazoles were prepared which had very good thermal stability.

Ref. No.

504 J. K. Gillham, POLYMER STRUCTURE: CROSS-LINKING OF A POLYBENZIMIDAZOLE, Science 139, 494 (1963)

The torsional braid technique was used to monitor the changes in rigidity and damping characteristics of a polybenzimidazole as it changes from a thermoplastic polymer to a thermoset resin at about 450°.

505 V. V. Korshak, T. M. Frunze, V. V. Kurashev and A. A. Izyneev, POLYBENZIMIDAZOLES, Dokl. Akad. Nauk SSSR 149, 104 (1963); C. A. 59, 6527 (1963)

506 A. A. Izyneev, V. V. Korshak, T. M. Frunze, and V. V. Kurashev, PREPARATION OF POLYMERS BY THE POLYCYCLIZATION REACTION. II. THE REACTION OF POLYBENZIMIDAZOLE FORMATION, Izv. Akad. Nauk SSSR, Ser. Khim. 1963 (10), 1828; C. A. 60, 9366 (1964)

Gives some thermal stability data.

507 V. V. Korshak, I. F. Manucharova, T. M. Frunze, and V. V. Kurashev, INVESTIGATION OF THE THERMAL STABILITY OF SOME HOMOGENEOUS AND MIXED POLYBENZIMIDAZOLES BY THE DIFFERENTIAL THERMAL ANALYSIS METHOD, Vysokomolekul. Soedin. 6 (8), 1964

508 V. V. Korshak, T. M. Frunze, V. V. Kurashev, and G. P. Lopatina, SYNTHESIS OF SOME HOMOGENEOUS AND MIXED POLYBENZIMIDAZOLES AND INVESTIGATION OF THEIR PROPERTIES, Vysokomolekul. Soedin. 6 (7), 1251 (1964)

509 Yoshio Iwakura, Keikichi Uno, and Yoshio Imai, POLYPHENYLENEBENZIMIDAZOLES, J. Polymer Sci. A2, 2605 (1964)

Thermal stability was determined in air by TGA. Only minor weight loss was observed below 450°C in air both in the case of m- and p-substituted polyphenylenebenzimidazoles, and then in both cases decomposition occurred.

510 Yoshio Iwakura, Keikichi Uno, and Yoshio Imai, POLYBENZIMIDAZOLES. II. POLY(ALKYLENEBENZIMIDAZOLES), Makromol. Chem. 77, 33 (1964)

Thermal stability data are reported.

511 Y. Iwakura, K. Uno, Y. Imai and M. Fukui, POLYBENZIMIDAZOLES. III. POLYAMIDES CONTAINING BENZIMIDAZOLE RINGS, Makromol. Chem. 77, 41 (1964)

512 A. Ya. Yakubovich, G. G. Rozantsev, G. I. Braz and V. P. Bazov, FLUORINATED POLYBENZIMIDAZOLES, Vysokomolekul. Soedin. 6 (5), 838 (1964)

Some thermal degradation studies of the following polymers are reported: poly(2,2'-m-phenylene-5,5'-dibenzimidazole), poly(2,2'-trimethylene-5,5'-dibenzimidazole), and poly[2,2'-(perfluorotrimethylene)-5,5'-dibenzimidazole].

Polybenzimidazoles - continued

Ref. No.

513 R. Phillips and W. W. Wright, THE THERMAL STABILITY OF POLY 2,2'-(m-phenylene)-5,5'-bibenzimidazole, J. Polymer Sci. B2, 47 (1964)

Thermal stability on heating for a period of time in the presence and absence of air at various temperatures is reported. Activation energies at various stages of reaction are reported.

514 L. Plummer and C. S. Marvel, POLYBENZIMIDAZOLES. III, J. Polymer Sci. A2, 2559 (1964)

Several polymers were prepared and TGA curves are shown.

515 R. T. Foster and C. S. Marvel, POLYBENZIMIDAZOLES. IV. POLYBENZIMIDAZOLES CONTAINING ARYL ETHER LINKAGES, J. Polymer Sci. A3, 417 (1965)

Several polymers were prepared and their thermal stabilities were studied.

Polybenzoxazoles

516 T. Kubota and R. Nakanishi, PREPARATION OF FULLY AROMATIC POLYBENZOXAZOLES, J. Polymer Sci. B2, 655 (1964)

TGA was used to assess thermal stability in nitrogen and in air. Decomposition started at about 500°C in air. When heated to 900°C in a nitrogen atmosphere, the weight loss was about 27% compared to 35% in air.

Poly(caprolactam)

517 V. V. Savarenskii, DETERMINATION OF TEMPERATURE LIMITS IN UTILIZATION OF POLYMERIC MATERIALS FOR MACHINE PARTS, Plasticheskie Massy 1963 (6), 65; C. A. 59, 7716 (1963)

Heat resistance of poly(ε-caprolactam) and of poly(vinyl chloride) estimated by measurement of dielectric constant at increasing temperatures. The same relations were found between the temperature changes of both dielectric constant and mechanical properties, as they are induced by the same structure changes.

Polyester-Urethanes

518 J. H. Engel, Jr., S. L. Reegen and P. Weiss, EFFECT OF STRUCTURE ON TEMPERATURE STABILITY AND SOLUBILITY OF POLYESTER-URETHANES, J. Polymer Sci. 7, 1679 (1963)

Data obtained from isothermal heat aging and TGA, both carried out in air and in inert atmosphere, indicate that thermal stability increases with increasing ester/urethane ratio and is independent of crosslinking density where the ester/urethane ratio is held constant. In addition, data obtained from heat aging and TGA indicated that decomposition of the samples occurs as rapidly in inert atmosphere as

Ref. No.

in air, indicating that the decomposition occurs chiefly by a non-oxidative mechanism.

Polyimides

519 J. I. Jones, F. W. Ochynski and F. A. Rackley, POLYPYROMELLITIMIDES: A NEW CLASS OF THERMALLY STABLE POLYMERS, Chem. Ind. 1962, 1686

Differential thermogravimetric curves are shown for several of the polymers when heated in air and in argon.

520 L. W. Frost and G. M. Bower, AROMATIC POLYIMIDES, Am. Chem. Soc., Div. Polymer Chem., Preprints 4 (1), 357 (1963); C. A. 62, 641 (1965)

Several polyimide polymers suffered less than 10% weight loss after aging for 400 hours at 325° in air.

521 G. M. Bower and L. W. Frost, AROMATIC POLYIMIDES, J. Polymer Sci. A1, 3135 (1963)

Several of the polymers in the form of films suffered less than 10% weight loss after aging 400 hours at 325°C. in air.

522 S. Nishizaki and A. Fukami, DIFFERENTIAL THERMAL ANALYSIS OF LINEAR POLYIMIDES, Kogyo Kagaku Zasshi 66 (3), 382 (1963); C. A. 59, 11673 (1963)

DTA showed that aromatic polyimides decompose above 400° in nitrogen. Polyimides with connections at the para positions of aromatic diamine nuclei have higher decomposition temperatures than those connected at the meta positions. Thermal oxidative degradation at the CH_2 groups in the main chain and decomposition at methyl groups in the side chain occur at 200-300° in air. Ether linkages between aromatic nuclei in diamine units are stable.

523 Anon., POLYIMIDE PLASTICS FOR USE TO 570°F, Mater. Design Eng. 57, No. 1, 145,147 (1963)

It is reported that polyimide resins maintain 90% of their tensile strength after 1000 hours of exposure to air at 570°F.

524 I. P. Zhuravleva, E. A. Zgadzai, and A. I. Maklakov, SOME PROPERTIES OF POLY(PHENYLENIMINE), Vysokomolekul. Soedin. 6 (3), 488 (1964)

Included is a study of weight loss of the title polymer on heating in vacuum and in air.

525 P. M. Hergenrother, Wolfgang J. Wrasidlo, and H. H. Levine, HIGH-TEMPERATURE STRUCTURAL ADHESIVES, 116 pp. (1964), AD 602679, Avail. OTS; C. A. 62, 696 (1965)

Polyimides, polybenzothiazoles, polyquinoxalines and polythiazolothiazoles were studied. Some TGA results are reported.

Polyimides - continued

Ref. No.

526 A. D. Mair, M. C. Shen, and A. V. Tobolsky, HIGH-TEMPERATURE POLYMERS: H-FILM AND SP-POLYMER, 13 pp. (1964), AD 604010, Avail. OTS; C. A. 62, 4165 (1965)

Studied a family of polyimides stable up to 400° in air. They show no glass transition and no melting point up to 500°.

527 S. Nishizaki and A. Fukami, THERMAL DEGRADATION OF POLYPYROMELLITIMIDES, Kogyo Kagaku Zasshi 67 (3), 474 (1964); C. A. 16181(1964)

Studied thermal degradation up to 600° in nitrogen and in air by TGA analysis and infrared absorption spectra.

528 S. D. Bruck, THERMAL DEGRADATION OF AN AROMATIC POLYPYROMELLITIMIDE IN AIR AND VACUUM I - RATES AND ACTIVATION ENERGIES, Polymer 5, No. 9, 435 (1964)

The thermal degradation of a polypyromellitimide (condensation product of pyromellitic anhydride and an aromatic diamine) was studied in air and vacuum in the range of 400° to 700° by TGA. This polymer is stable in air up to approximately 420°C, but at 485°C practically total volatilization takes place within about 5 hours. Under vacuum, the polymer shows no appreciable weight loss even after prolonged exposure to temperatures up to approximately 500°C. Above this temperature it begins to volatilize leaving a brittle, carbonized residue which appears to reach a limiting weight corresponding to approximately 45% of the original sample.

529 S. D. Bruck, THERMAL DEGRADATION OF AN AROMATIC POLYPYROMELLITIMIDE IN AIR AND VACUUM II - THE EFFECT OF IMPURITIES AND THE NATURE OF DEGRADATION PRODUCTS, Polymer 6, 1, 49 (1965)

Purification of the polymer in dimethylformamide decreases rates of degradation both in air and vacuum, but only slightly reduces activation energies. Infrared and mass spectrometric data suggest participation of polypyromellitamic acid impurity in the degradation.

530 L. C. Scala and W. M. Hickam, THE BEHAVIOR OF POLYPYROMELLITIMIDE RESINS AT HIGH TEMPERATURES, J. Applied Polymer Sci. 9, 213 (1965)

Polyoxadiazoles

531 Y. Iwakura, K. Uno and S. Hara, POLY-1,3,4-OXADIAZOLES. I. POLYPHENYLENE-1,3,4-OXADIZOLES, J. Polymer Sci. A3, 45 (1965)

TGA curves are shown. For both poly-(p-phenylene-1,3,4-oxadiazole) and poly-(m-phenylene-1,3,4-oxadiazole) only minor weight loss was observed below 450°C in air, and an abrupt weight loss occurred above 450°C.

Polyphenylpyrozoles

Ref. No.

532 J. P. Schaefer and J. L. Bertram, THERMALLY STABLE POLYMERS. I. POLYPHENYLPYRAZOLES, J. Polymer Sci. B3, 95 (1965)

A TGA curve is shown. No weight loss was observed up to 400°.

Polyphthalocyanines

533 A. A. Berlin, L. G. Cherkashina, E. L. Frankevich, E. M. Balabanov and Yu. G. Aseev, POLYMERS WITH A CONJUGATED BOND SYSTEM L. SYNTHESES AND STUDY OF THE ELECTROPHYSICAL PROPERTIES OF POLYMERIC PHTHALOCYANINES, Vysokomolekul Soedin. 6 (5) 832 (1964)

A study of the thermal stability of polyphthalocyanines is described. Polymers that during treatment underwent hydrolysis of the nitrile groups break down in air as a rule at higher temperatures (300-350°) than the nitrile containing analogs (250°).

Polyquinoxalines

534 Gabriel de Gaudemaris, B. Sillion, and J. Preve, HEAT-STABLE POLYMERS. I. POLYQUINOXALINES, Bull. Soc. Chim. France 1964 (8), 1793; C. A. 62, 1757 (1965)

Thermal stability was studied by using pressed polymer pellets in argon at 400-650° and in air at 300-550°. There was no detectable weight loss below 450° in argon or at 350-450° in air.

535 J. K. Stille and J. R. Williamson, POLYQUINOXALINES, J. Polymer Sci. A2, 3867 (1964)

TGA in air and nitrogen was carried out. These polymers are stable in air to 500°C and under nitrogen lose only 20% of their weight at 800°C.

536 G. P. de Gaudemaris and B. J. Sillion, NEW POLYMERS OBTAINED BY POLYHETEROCYCLIZATION: POLYQUINOXALINES, J. Polymer Sci. B2, 203 (1964)

Some TGA results are included.

537 J. K. Stille and J. R. Williamson, POLYQUINOXALINES, J. Polymer Sci. B2, 209 (1964)

TGA shows that the quinoxaline polymers have thermal stabilities in air and nitrogen which are comparable to the polybenzimidazoles. Temperatures are reported at which the polymer had lost 20% of its weight under nitrogen, and at which the break in the curve occurred in air.

Polythiazole

538 J. M. Craven and T. M. Fischer, Jr., FILM-FORMING POLYTHIAZOLES, J. Polymer Sci. B3, 35 (1965)

Weight losses for two polythiazoles are reported between 320 and 700°C in air and under helium.

Ref. No.

539 P. E. Slade, Jr. and L. T. Jenkins, THERMAL ANALYSIS OF POLYURETHANE ELASTOMERS, J. Polymer Sci. C6, 27

Differential thermal analysis and thermogravimetric analysis were used to evaluate the thermal properties of several types of polyurethane elastomers. The decomposition of polymers made with 4,4'-diphenylmethane diisocyanate (MDI) occurred above 400°C and was at least a two-step process, while the decomposition of polymers containing toluene diisocyanate (TDI) occurred below 400°C and appeared to be a one-step reaction.

540 C. M. Cusano, E. P. Dunigan and P. Weiss, POLYESTER-URETHANE BLOCK TERPOLYMERS, J. Polymer Sci. C, No. 4, Part 1, 743 (1963)

The heat stability of the block terpolymers was investigated by TGA in air and by heat aging at 250°C for 20, 40 and 60 minutes. Indices (ipdt) of thermal stability are reported.

541 H. C. Beachell and C. P. Ngoc Son, COLOR FORMATION IN POLYURETHANES, J. Applied Polymer Sci. 7, 2217 (1963)

The pyrolysis of a polyurethane obtained from tolylene 2,4-diisocyanate and ethylene glycol was studied in nitrogen, air, and oxygen from the point of view of structural change and color formation. Some products of degradation are described.

542 E. N. Walsh, E. N. Uhing, and T. M. Beck, FLAME-RETARDANT POLYURETHAN AND POLYESTER RESINS, Am. Chem. Soc. Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 1 (1963); C. A. 62, 699 (1965)

543 R. C. Nametz, R. D. Deanin, and P. M. Lambert, FLAME-RESISTANT RIGID POLYURETHAN FOAMS FROM MONOBROMINATED TOLYLENE DIISOCYANATE, Am. Chem. Soc. Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 126 (1963); C. A. 62, 699 (1965)

544 J. J. Anderson, RETENTION OF FLAME PROPERTIES OF RIGID POLYURETHAN FOAMS, Ind. Eng. Chem., Prod. Res. Develop. 2 (4), 260 (1963)

Studied the effect of various chemical and physical factors on the retention of initial flame resistance. Excellent permanency of flame resistance was furnished by the reactive-type agent as compared with physical additives.

545 J. D. Ingham and N. S. Rapp, POLYMER DEGRADATION. II. MECHANISM OF THERMAL DEGRADATION OF POLYOXYPROPYLENE GLYCOL-TOLUENE 2,4-DIISOCYANATE POLYMER (POPG-TDI) AND A BLOCK POLYETHER GLYCOL-TDI POLYMER, J. Polymer Sci.A2, 4941 (1964)

Degradation was studied under vacuum. At temperatures of ~200°C the predominant degradation involves random scission of urethane linkages to give considerable amounts of isocyanate and hydroxyl. Kinetic data suggests that the weakest links in POPG-TDI polymer are spaced at intervals of 210,000 in molecular weight and that they may be eliminated by pretreatment of the POPG with ethylene oxide to form a block copolyether which is used to prepare the polyurethane. Above 250°C the kinetics of degradation of POPG-TDI are similar to the results for POPG and indicate scission of polyether bonds by a combination of intramolecular proton abstraction and free radical unzipping reactions, in agreement with previous studies of POPG of much higher molecular weight.

Polyurethanes - continued

Ref. No.

546 J. D. Ingham, N. S. Rapp, and J. Hardy, POLYMER DEGRADATION III. CARBON-14 AS A TRACER FOR STUDIES OF THE THERMAL DEGRADATION OF POLYURETHANS, J. Polymer Sci. B2, 675 (1964)

Information is given on the degradation of polyoxypropylene glycol-toluene diisocyanate polymer. Followed the change in intrinsic viscosity and carbon-14 activity at 207°C.

547 N. S. Rapp and J. D. Ingham, POLYMER DEGRADATION. I. COLUMN ELUTION FRACTIONATION AND THERMAL DEGRADATION OF POLYOXYPROPYLENE GLYCOLTOLUENE DIISOCYANATE (PPG-TDI) POLYMERS, J. Polymer Sci. A2, 689 (1964)

The polymer was heated in vacuum at 200°C for 24 hours and the molecular weight distribution of the degraded polymer was studied.

548 H. C. Beachell and C. P. NGOC SON, STABILIZATION OF POLYURETHANE TO THERMAL DEGRADATION, J. Applied Polymer Sci. 8, 1089 (1964)

A number of N-substituted polyurethanes were prepared, including the methyl, benzyl, benzoyl, acetyl. Comparative studies at 150-155°C showed that the N-methyl and N-benzyl polymers possess outstanding stability under the test conditions used.

549 V. A. Orlov and O. G. Tarakanov, THERMAL DEGRADATION OF POLYURETHANS, Vysokomolekul. Soedin. 6 (6), 1157 (1964)

Polyurethans were degraded at 250° in order to study the decomposition products.

550 H. Piechota, SOME CORRELATIONS BETWEEN RAW MATERIALS, FORMULATION, AND FLAME-RETARDANT PROPERTIES OF RIGID URETHAN FOAMS, J. Cellular Plastics 1 (1), 186 (1965); C. A. 62, 2875 (1965)

551 J. K. Backus, W. C. Darr, P. G. Gemeinhardt, and J. H. Saunders, THERMAL DECOMPOSITION OF RIGID URETHAN FOAMS, J. Cellular Plastics 1 (1), 178 (1965); C. A. 62, 4162 (1965)

552 E. L. Wittbecker and W. S. Spliethoff, POLYURETHANE ANALOG OF THE POLYESTER, POLYETHYLENE TEREPHTHALATE, J. Applied Polymer Sci. 9, 213 (1965)

Some information on thermal degradation is given.

Poly(vinylpyridine)

553 C. Noel, DETERMINATION OF THE TRANSITION POINT OF POLY(2-VINYLPYRIDINE) BY DIFFERENTIAL THERMAL ANALYSIS, Compt. Rend. 258 (14), 3702 (1964); C. A. 61, 3213 (1964)

Miscellaneous

554 J. E. Mulvaney, J. J. Bloomfield and C. S. Marvel, POLYBENZBORIMIDAZOLINES, J. Polymer Sci. 62, 59 (1962)

Ref. No.

Three new benzborimidazoline polymers were prepared by condensation of aromatic diboronic acid derivatives and 3,3'-diaminobenzidine. Polymers prepared from benzene diboronic esters showed good thermal stability (TGA) up to 500-600°C. A polymer prepared from ferrocene diboronic acid or ester began to decompose extensively between 300 and 400°C.

555 B. H. Clampitt and A. P. Mueller, POLYMERIZATION OF 2,4,6-TRIALLYLOXYPYRIMIDINE, J. Polymer Sci. 62, 15 (1962)

The preparation of triallyloxypyrimidine is described, together with the polymerization characteristics of this compound under DTA conditions. The DTA curves show a doublet first exotherm near 100°C., and a singlet exotherm at 225°C. Combining the heat values obtained from the DTA curves with infrared spectral data indicates that the complex first exotherm represents a total polymerization of two allyl groups, while the second exotherm involves rearrangement to the barbiturate structure.

556 Ya. M. Paushkin and A. F. Lunin, NEW NITROGEN- AND OXGEN-CONTAINING POLYMERS SYNTHESIZED FROM Na_2CO_3 AND NH_4CL, Dokl. Akad. Nauk SSSR 150 (4), 823 (1963); C. A. 59, 7663 (1963)

Polycyanamide and polycyanic acid were prepared by heating NH_4Cl, Na_2CO_3 and $NaHCO_3$ in an autoclave at 250-300° and 20-25 atm. pressure for 25-30 hours in the presence of $ZnCl_2$. The products were crystalline, infusible, decomposed around 700°, and were soluble in formamide and various organic and inorganic acids.

557 V. V. Korshak, S. L. Sosin and V. A. Vasnev, SYNTHESIS OF POLYMERS FROM NITRILES OF AROMATIC AND ALIPHATIC ACIDS BY A POLYRECOMBINATION REACTION, Dokl. Akad. Nauk SSSR 152 (4), 872 (1963); C. A. 60, 6935 (1964)

Various polymers are described which decompose from 300° to 600°.

558 Yu. A. Popox, B. E. Davydov, M. V. Shishkina, and B. A. Krentsel, THERMAL TRANSFORMATIONS OF POLYMERIC SCHIFF BASES, Izv. Akad. Nauk SSSR, Ser. Khim. 1963 (11), 2014; C. A. 60, 9368 (1964)

559 R. H. Michel and W. A. Murphey, POLYMERS FROM THE CONDENSATION OF DIHYDRAZIDES WITH DIALDEHYDES AND DIKETONES, J. Applied Polymer Sci. 7, 617 (1963)

Prepared a series of poly(acylhydrazones) and examined the thermal and hydrolytic stability of one of them. Studies were made in water at 97°C and in air at 180°C.

560 Y. Iwakura, M. Sakamoto and Y. Awata, POLYURETHANE SULFIDES CONTAINING CYCLOHEXANE RING IN THE POLYMER CHAIN, J. Polymer Sci. A2, 881 (1964)

TGA data are reported.

Ref. No.

561 H. C. Beachell and C. P. NGOC SON, THERMAL DEGRADATION OF ETHYLENE BIS-(N-PHENYLCARBAMATE), J. Polymer Sci. A2, 4773 (1964)

The pyrolysis of the title compound was studied as the simplest model of a polyurethane. Products of degradation were identified by elemental analysis, infrared spectra and mixed melting point. A mechanism of degradation is proposed. Studies were made under nitrogen at approximately 200-450°C.

562 G. F. L. Ehlers and J. D. Ray, SYNTHESIS AND CHARACTERIZATION OF POLY-S-TRIAZINYLENEIMIDES, J. Polymer Sci. A2, 4989 (1964)

TGA and DTA studies were made under nitrogen. The major thermal breakdown of most of these polymers (inversion point of the TGA curve) occurs around 450°C. Chlorine-containing polymers lose some weight at fairly low temperatures, but retain more weight at high temperatures.

563 F. Dawans, B. Reichel and C. S. Marvel, 2,7-DISUBSTITUTED 1,3,6,8-TETRAAZOPYRENE AND RELATED POLYMERS, J. Polymer Sci. A2, 5005 (1964)

TGA, in nitrogen and in air, was used. It appears that these new polymers are slightly less thermally stable than aromatic polybenzimidazoles in nitrogen or air, based on the starting temperatures of decomposition.

564 E. Dyer and R. J. Hammond, THERMAL DEGRADATION OF N-SUBSTITUTED POLYCARBAMATES, J. Polymer Sci. A2, 1 (1964)

The initial rates of thermal degradation of these polymers and of unsubstituted analogs were determined at 230-285°C by following the evolution of carbon dioxide. The results (based on overall activation energy) showed that polymers derived from the substituted aliphatic diamines were more thermally stable than those derived from aromatic diamines. The low thermal stability was shown to be caused by amine endgroups. Some evidence as to modes of thermal degradation was obtained from a study of volatile products.

565 S. S. Stivala, G. R. Sacco, and L. Reich, POLYMERS CONTAINING AZULENE. I. POLY-SCHIFF BASES, J. Polymer Sci. B2, 943 (1964)

TGA indicated that a number of Poly-Schiff bases containing azulene showed good thermal stability (in vacuum) up to 400°C, but above this temperature there is rapid degradation. Arbitrary thermal stability indices (ipdt) are reported.

566 A. H. Frazer W. Sweeny, and F. T. Wallenberger, POLY(1,3,4-OXADIAZOLES): A NEW CLASS OF POLYMERS BY CYCLODEHYDRATION OF POLYHYDRAZIDES, J. Polymer Sci. A2, 1157 (1964)

TGA was used to assess the thermal stability of poly(1,3,4-oxadiazoles). Aromatic poly(1,3,4-oxadiazoles) were found to decompose

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between 450 and 500°C. Aliphatic polyoxadiazoles degrade in the range 400-450°C.

567 A. H. Frazer and F. T. Wallenberger, POLY(1,3,4-OXADIAZOLE) FIBERS: NEW FIBERS WITH SUPERIOR HIGH TEMPERATURE RESISTANCE, J. Polyme Sci. A2, 1171 (1964)

Found that all-aromatic bulk polymer was thermally stable up to 450°C and decomposed at 500°C. Aliphatic poly(1,3,4-oxadiazoles) were found to degrade at 400-450°C.

568 A. F. Nikolaev and V. M. Bondarenko, POLY(VINYLAMINE) AND ITS DERIVATIVES. I. REACTION OF POLY(VINYLAMINE) WITH BENZALDEHYDE, SALICYLALDEHYDE, AND FURFURAL, Vysokomolekul. Soedin. 6 (10), 1825 (1964); C. A. 62, 2840 (1965)

Data are given on the thermal stability of the polymers resulting from the reactions.

569 A. A. Berlin, B. I. Liogon'kii, and V. P. Parini, 4,4'-BISDIAZONIOBIPHENYL DIFLUORO POLYMERS, Vysokomolekul. Soedin., Geterotsepnye Vysokomolekul. Soedin. 1964, 134; C. A. 61, 9593 (1964)

Weight loss data are reported for heating the polymers in air and in nitrogen. Data are also reported showing the deformation of the polymers as a result of the combined action of pressure and temperature (up to 480°).

570 A. A. Berlin, B. I. Liogon'kii and V. P. Parini, POLYMERS WITH A CONJUGATED SYSTEM. LVI. SYNTHESIS AND PROPERTIES OF THE POLYMER BASED ON BIS(NITROSOACETYL)BENZIDINE, Izv. Akad. Nauk SSSR, Ser. Khim. 1964 (4), 705; C. A. 61, 5797 (1964)

Describes preparation of a polymer that decomposed at 500° in air.

INORGANIC AND SEMI-INORGANIC SYSTEMS

Boron containing polymers

571 J. Green, M. M. Fein, F. J. Loprest, A. Lum, and N. Mayes, THERMALLY STABLE BORON-CONTAINING POLYMERS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, R1; C. A. 60, 10789 (1964)

Polyesters of 2000 to 20,000 molecular weight were prepared by reaction of carborane diols and diacids with each other or with organic or fluorocarbon diacids and diols. Data on the thermal stability of a number of these polymers are reported.

572 N. A. Adrova, L. K. Prokhorova, and M. M. Koton, SYNTHESIS OF POLYMERS WITH DIBENZOBORIMIDAZOLINE LINKS IN THE MAIN CHAIN, Dokl. Akad. Nauk SSSR 158 (1), 130 (1964); C. A. 61, 16170 (1964)

Ref. No.

Some weight loss data at elevated temperatures are reported.

Coordination and Chelate Polymers

573 J. B. Rust, HIGH-TEMPERATURE POLYMERS. I. TITANIUM AND ALUMINUM CHELATES, U. S. Dept. Com., Office Tech. Serv., AD 262,701, 51 pp. (1961); C. A. 58, 6979 (1963)

Studied mechanical properties of composites containing these chelates at room temperature and at 500°F.

574 T. W. Campbell and E. A. Tomic, POLYTHIOSEMICARBAZIDES. I. PREPARATION AND PROPERTIES OF THE POLYMERS AND SOME SIMPLE METALLIC CHELATES, J. Polymer Sci. 62, 379 (1962)

Wet-spun fibers of the polythiosemicarbazide decomposed in air at about 205°C. However, the copper-containing chelate fibers were stable in air up to about 250-260°C. Similar observations were made with the other chelates.

575 E. A. Tomic, THERMAL STABILITY OF COORDINATION POLYMERS, Am. Chem. Soc., Div. Polymer Chem., Preprints 4 (1), 237 (1963), C. A. 62, 659 (1965)

576 A. P. Terent'ev, V. V. Rode, and E. G. Rukhadze, INVESTIGATION OF CHELATE POLYMERS. VII. CHELATE POLYMERS ON THE BASIS OF 2,6-DIACETYLPYRIDINE, Vysokomolekul. Soedin 5 (11), 1658 (1963)

Some thermal degradation studies of chelate polymers of nickel, cobalt and iron are reported.

577 R. G. Charles, METAL CHELATE POLYMERS DERIVED FROM TETRAACETYLETHANE, J. Polymer Sci. A1, 267 (1963)

TGA studies were made under argon. The heat stabilities of the polymeric materials appear to be of the same general magnitude as those of the structurally analogous metal acetylacetonates.

578 L. E. Mattison, M. S. Phipps, L. Alfred, S. Taylor, J. Thompson & B. Saul, COORDINATION COMPOUNDS OF p-NITROBENZENEAZOTYROSINE, J. Polymer Sci. A1, 3449 (1963)

Thermal analysis data showed that the bimetallic polymeric chelates have no exceptional stability. E.g., the decomposition range of a Zn (II)/Cu (II) is 315-325°C.

579 R. H. Horrocks and E. C. Winslow, OXINE-FORMALDEHYDE POLYMERS AND THEIR METALLIC CHELATES, J. Polymer Sci. A1, 3655 (1963)

Heat stability was determined by TGA and DTA. All samples began to lose weight at 270°C or below. The mode of decomposition of the polymer chelates appears to be independent of the metallic ion, but the free polymer is different. Its initial weight loss (between

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270 and 320°C) is very gradual compared to the chelates. At 320°C it reverts to a form similar to that of the chelate. A second difference of the free polymer is that the rate of decomposition is a function of temperature, while that of the polymer chelates is not. The chelates may therefore hold interest in use as ablative materials. A third difference is that the free polymer melts beginning at about 190°C. The chelates do not melt.

580 E. C. Winslow and A. A. Manning, SALICYLALDEHYDE-FORMALDEHYDE POLYMERS AND THEIR METALLIC CHELATES, J. Polymer Sci. A2, 4903 (1964)

TGA studies are reported. Chelated polymers were stable in air at temperatures which were about 50°C higher than the decomposition temperature of the corresponding nonchelated polymers.

581 G. P. Brown and S. Aftergut, BIS(IMIDAZOLATO)-METAL POLYMERS, J. Polymer Sci. A2, 1839 (1964)

TGA revealed that the Co- and Zn-containing materials had unusually high thermal stability. No loss in weight could be detected below 500-575°C when heated in nitrogen.

582 A. H. Frazer and F. T. Wallenberger, METAL CHELATES OF POLYHYDRAZIDES, J. Polymer Sci. A2, 1825 (1964)

All the metal chelate fibers, irrespective of the nature of the metal ion used, decomposed rapidly (<1 hour) at temperatures in excess of 350°C.

583 V. M. Bondarenko, A. F. Nikolaev, and K. A. Makarov, POLY(VINYLAMINE) AND ITS DERIVATIVES. II. CORRDINATION POLYMERS BASED ON POLY(N-SALICYLIDENEVINYLAMINE), Vysokomolekul. Soedin 6 (10), 1829 (1964)

Reports the thermal stability of the chelates in air as $Cu^{++} > Co^{++} > Ni^{++} > Zn^{++} > Fe^{++}$.

584 R. C. Degeiso, L. G. Donaruma, and E. A. Tomic, PREPARATION AND CHELATING PROPERTIES OF 8-HYDROXYQUINOLINE-FORMALDEHYDE POLYMERS, J. Applied Polymer Sci. 9, 411 (1965)

Thermal degradation was studied for the unchelated polymer and for chelates of iron, aluminum, nickel and zinc.

Glass Containing Systems

585 S. V. Glorioso, GLASS CLOTH-REINFORCED PLASTICS - ROOM AND ELEVATED TEMPERATURE PROPERTIES, U. S. Dept. Com., Office Tech. Serv., AD 286,329, 105 pp. (1959); C. A. 60, 9430 (1964)

Empirical data were obtained for establishing design criteria at room and elevated temperatures for various combinations of glass fabrics and resins.

Glass Containing Systems - continued

Ref. No.

586 J. H. Freeman, E. J. Traynor, J. Miglarese and R. H. Lunn, GLASS-REINFORCED ORGANIC-RESIN LAMINATES FOR SERVICE TO 300°, SPE Tech. Papers 8, Session 8, Paper No. 2, 1 (1962); C. A. 57, 13985 (1962)

Aromatic polyamides and polyimides can be used as bonding agents in glass-reinforced laminated structures giving products that are useful as heat-resistant structural and insulating materials.

587 O. F. Shlenskii and M. P. Afinogenov, DETERMINATION OF SOME THERMOPHYSICAL PROPERTIES OF GLASS-RESIN LAMINATES IN THE TEMPERATURE RANGE 20-600°, Plasticheskie Massy 1962, No. 11, 53; C. A. 58, 9282 (1963)

The volumetric heat capacity and the density were measured for glass-resin laminates as a function of the heating intensity and the time of heating.

588 K. A. Andrianov and A. M. Chernyakova, STK 41, A GLASS FIBER-REINFORCED THERMALLY STABLE MATERIAL, Plasticheskie Massy 1963 (6), 21; C. A. 59, 14165 (1963)

Describes preparation of electrical insulators with high thermal stability, based on glass fiber reinforced poly(methylphenylsiloxane).

589 M. A. Denney and J. C. Martindale, PLASTICS IN AIRCRAFT. IV. TESTING OF REINFORCED PLASTICS AT ELEVATED TEMPERATURES, Aircraft Eng. 35, 10 (1963); C. A. 60, 5706 (1964)

Describes a test program for evaluation of the effect of temperature variation on the mechanical properties of reinforced plastics. The tests give design data from which, after prototype testing, the performance of aircraft components at elevated temperatures can be reliably predicted. Data are reported for polyester resin/glass cloth, epoxy resin/glass cloth, and phenolic resin/asbestos mat.

590 R. E. Rosensweig, THEORY FOR THE ABLATION OF FIBERGLAS-REINFORCED PHENOLIC RESIN, AIAA (Am. Inst. Aeron. Astronaut.) J. 1 (8), 1802 (1963); C. A. 60, 5702 (1964)

A model is given for the stagnation-point ablation of a system consisting of a heterogeneous dispersion of C particles in glass. Ablation for this system approximates the dynamic ablation characteristics of fiberglas-reinforced phenolic resin materials.

Iron Containing Polymers

591 A. A. Dulov, A. A. Slinkin, and A. M. Rubinshtein, ELECTRIC AND MAGNETIC PROPERTIES OF THERMALLY TREATED FERROCENE POLYMERS, Vysokomolekul. Soedin. 5 (10), 1441 (1963)

The polymers (as pressed disks) heated at 200° and 270° have semiconductor properties.

Ref. No.

592 J. R. Soulen and M. S. Silverman, POLYMERIZATION OF PHOSPHONITRILIC CHLORIDE TRIMER AT HIGH PRESSURES AND TEMPERATURES, J. Polymer Sci. A1, 823 (1963)

Thermal stability comparisons were made by TGA under nitrogen. There appears to be no difference in hydrolytic or thermal stability between elastomer formed under high pressure conditions and that obtained by the more usual polymerization at 1 atm.

593 V. V. Korshak, I. A. Gribova, and M. A. Andreeva, PHOSPHORUS-CONTAINING CURABLE RESINS, Plasticheskie Massy 1963 (10), 11; C. A. 60, 723 (1964)

The burning properties of a number of phosphorus containing resins (2.5-4.9% P) were investigated. All resins burned in a flame and only the halogen containing products were self-extinguishing.

594 V. I. Kirilovich, I. K. Rubtsova, and E. L. Gefter, PHOSPHORUS-CONTAINING POLYESTERS OBTAINED BY TRANSESTERIFICATION OF DIALKYL PHOSPHITES AND HYDROXYL-CONTAINING COMPOUNDS, Plasticheskie Massy 1963 (7), 20; C. A. 59, 11674 (1963)

Polymers were prepared that were useful as fire-retardant additives to other compatible resins, especially after additional chlorination of the polymers.

595 E. Steininger and M. Sander, SYNTHESIS, STRUCTURE, AND STABILITY OF SOME POLYPHOSPHINATES AND POLYPHOSPHINE OXIDES, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, sl; C. A. 60, 9368 (1964)

596 R. R. Hindersinn and N. E. Boyer, FIRE RESISTANT UNSATURATED POLYESTER RESINS FROM TRIALKYL PHOSPHITES, Am. Chem. Soc., Div. Org. Coatings, Plastics Chem., Preprints 23 (1), 50 (1963); C. A. 62, 700 (1965)

597 A. N. Pudovik, N. G. Khusainova and E. I. Kashevarova, POLYMERIZATION AND COPOLYMERIZATION OF PHOSPHORUS-CONTAINING METHACRYLIC ESTERS, Vysokomolekul. Soedin. 5, 1376 (1963)

Copolymers with at least ≥ 5-6 weight percent phosphorus stopped burning immediately after removal from a flame.

598 P. Z. Li, Z. V. Mikhailova, and L. V. Bykova, PREPARATION OF SELF-EXTINGUISHING, CHLORINE-CONTAINING POLYESTER RESINS FROM UNSATURATED ORGANOPHOSPHORUS COMPOUNDS, Plasticheskie Massy 1964 (2), 12; C. A. 60, 10876 (1964)

599 S. M. Zhivukhin, V. B. Tolstoguzov, V. V. Kireev, N. V. Aulova, L. T. Gerasimenko, and F. I. Yakobson, THERMAL STABILITY OF POLY(DIHYDROXYARYLENEPHOSPHONITRILATES), Plasticheskie Massy 1964 (10), 19; C. A. 62, 659 (1965)

Thermooxidative degradation was studied by loss in weight of polymer samples after exposure to 300°, 400° and 500° for various periods. DTA results are also reported.

Phosphorus Containing Polymers - continued

Ref. No.

600 S. M. Zhivukhin, V. B. Tolstoguzov, and V. V. Kireev, THERMOMECHANICAL PROPERTIES OF PHOSPHONITRILE POLYMERS, Vysokomolekul. Soedin. 6 (6), 1111 (1964)

601 N. A. Adrova, M. M. Koton and L. K. Prokhorova, THE PREPARATION OF POLYMERS WITH PHENYLENE GROUPS AND TIN, ANTIMONY, AND PHOSPHORUS IN THE CHAIN, Vysokomolekul. Soedin, Geterotsepnye Vysokomolekul. Soedin. 1964, 9; C. A. 61, 5784 (1964)

The thermal stability of the polymers is compared.

602 N. E. Boyer and A. E. Vajda, FIREPROOFING OF POLYMERS WITH DERIVATIVES OF PHOSPHINES AND WITH HALOGEN-PHOSPHORUS COMPOUNDS, SPE, Trans. 4 (1), 45 (1964)

Silicon Containing Polymers

603 I. Ya. Poddubnyi and S. V. Aver'yanov, VULCANIZATION OF SILOXANE RUBBERS BY γ-RADIATION, Tr. 2-go [Vtorogo] Vses. Soveshch. po Radiats. Khim. Nauk, Moscow 1960, 563 (Pub. 1962); C. A. 58, 2555 (1963)

The thermal stability of poly(dimethylsiloxane) and poly(vinylmethylsiloxane) rubbers was improved by irradiation, and the vulcanizates retained their physical properties for several days at 300-380°C.

604 C. G. Collins, COMBINED RADIATION-TEMPERATURE EFFECTS ON SILICONE RUBBERS AND TEFLON, U. S. At. Energy Comm. DC-60-3-244, 28 pp. (1960); C. A. 59, 10326 (1963)

Experimental measurements of combined radiation-temperature effects are reported in work directed toward defining the radiation limitations of high-temperature, flexible, moistureproof electrical insulations.

605 E. W. Bergstrom and A. C. Hanson, HEAT STABILITY OF ARYLENE-MODIFIED SILOXANES AT TEMPERATURES OF 700,800, AND 900°F, U. S. Dept. Com., Office Tech. Serv. PB Rept. 155,487, 6 pp. (1961); C. A. 60, 9423 (1964)

606 A. Kh. Lablokoff and M. Hediard, EFFECT OF STRUCTURE AND THERMOELASTIC PROPERTIES OF SOME SILICON RESINS ON THE BEHAVIOR OF LAMINATES AT HIGH TEMPERATURES, NASA (Natl. Aeron. Space Admin.), Doc. N62-16037, 37 pp. (1962); C. A. 60, 10876 (1964)

The mechanical properties of silicon-resin-glass fiber laminates at high temperatures depend upon the resin curing conditions.

607 S. A. Fuqua and R. M. Silverstein, SPECIALTY SILICONE ELASTOMERS, NASA, Doc. N63-15,280, 39 pp. (1962); C. A. 60, 741 (1964)

1-[p-(ethoxydimethylsilyl)phenyl]-3-[m-(ethoxydimethylsilyl)-phenyl]hexafluoropropane formed a homopolymeric gum. On heating this polymer under vacuum, a monomeric cyclic disiloxane was formed.

Ref. No.

608 K. H. Boller, STRENGTH PROPERTIES OF REINFORCED PLASTIC LAMINATES AT ELEVATED TEMPERATURES (SILICONE-ASBESTOS, R/M PYROTEX FELT 45-RPD), Forest Prod. Lab., Madison, Wis. Contract No. AF33 (616), 61-06 ASD-TDR-62-406, 47 pp. (1962), NASA Accession No. N62-15508; C. A. 61, 16244 (1964)

609 J. M. Maselli, CHEMISTRY OF SILICON-NITROGEN POLYMERS, U. S. Dept. Com., Office Tech. Serv. AD274,520, 31 pp. (1962); C. A. 58, 10311 (1963)

p-(H$_2$NSi(Me)$_2$O)$_2$C$_6$H$_4$ lost NH$_3$ when heated at 200°C to form an elastic coating on metal which remained elastic for 8 hours at 350°C in air. At 400°C the coating charred. p-[H$_2$NSi(Me)CHCH$_2$O)$_2$C$_6$H$_4$ gave a polymer by loss of NH$_3$, with considerably less thermal stability than the one described above.

610 I. Nakazima, THE CLEAVAGE OF SILOXANE POLYMERS, Kogyo Kagaku Zasshi 65, 1693 (1962); C. A. 58, 7010 (1963)

Poly(dimethylsiloxane) or poly(methylvinylsiloxane) rubbers with DP exceeding 5000 were depolymerized by heating at 120-300°C with water in an autoclave to give a polysiloxane oil. The viscosity of the product depended on the reaction temperature and time. Poly(dimethylsiloxane) rubber was also depolymerized by heating at 130-150°C for 2 hours with Bu$_6$Sn$_2$O to give a clear oil.

611 K. A. Andrianov, T. N. Ganina and N. N. Sokolov, SYNTHESIS OF POLY(ORGANOFERROSILOXANES) AND OF POLY(ORGANOALUMINOFERROSILOXANES), Vysokomolekul. Soedin. 4, 678 (1962)

Report that poly(phenylferrosiloxanes) are highly thermostable and have low volatility at 200-300°C.

612 K. A. Andrianov and M. N. Ermakova, CONDENSATION OF α,ω-DIHYDROXYDIMETHYLSILOXANE OLIGOMERS WITH (PHENYLAMINOMETHYL)METHYLDIETHOXYSILANE, Izv. Akad. Nauk SSSR, Otd. Khim. Nauk 1962, 1577; C. A. 58, 1541 (1963)

Some thermomechanical curves of the polymers are shown.

613 K. A. Andrianov and A. A. Zhdanov, SOME STRUCTURAL PROPERTIES OF POLY(ORGANOSILOXANES) AND POLY(ORGANOMETALLOSILOXANES), Plasticheskie Massy 1962, No. 7, 24; C. A. 57, 15337 (1962)

Introduction of Al, As, or Ti into cyclic polysilanes improves their heat stability. They do not melt even at 700°, but they are soluble in organic solvents.

614 K. A. Andrianov and I. F. Manucharova, STUDY OF THE THERMAL STABILITY OF POLY(ORGANOSILOXANES) AND POLY(ORGANOMETALLOSILOXANES) BY USING THE METHOD OF DIFFERENTIAL THERMAL ANALYSIS, Izv. Akad. Nauk SSSR, Otd. Khim. Nauk 1962, 420; C. A. 57, 11364 (1962)

Ref. No.

Heated several types of siloxanes, including derivatives of Al, Ti and Sn up to 800°. The heat stability increases when the oxygen atom in the polymer backbone are substituted by phenylene radicals as well as when Al, Sn, or Ti replace Si atoms.

615 K. A. Andrianov and E. Z. Asnovich, POLY(NAPHTHENOALUMINOPHENYLSILOXANES), Tr. Vses. Elektrotekhn. Inst. No. 71, 7 (1963); C. A. 61, 10786 (1964)

Some thermomechanical curves were determined for these polymers.

616 K. A. Andrianov, DIRECTED ALTERATION OF PROPERTIES OF POLYMERIC SUBSTANCES, Dokl. Akad. Nauk SSSR 151 (5), 1093 (1963); C. A. 59, 15458 (1963)

Introduction of groups such as OTiO, P(O)O and O_2AlOP(O) into poly(dimethylsiloxane) improved the thermooxidative resistance.

617 I. Wada, M. Ishizuka, I. Iwamatsu and K. Kawazumi, PYROLYSIS OF SILICONE POLYMERS HAVING A SILYLPHENYLENE GROUP, Kogyo Kagaku Zasshi 66 (5), 631 (1963); C. A. 59, 15397 (1963)

618 A. S. Kuz'minskii and E. A. Goldovskii, EFFECT OF MOLECULAR OXYGEN ON DEGRADATION OF THE MAIN CHAIN OF POLY(DIMETHYLSILOXANE) RUBBER, Dokl. Akad. Nauk SSSR 149 (3), 606 (1963); C. A. 59, 4148 (1963)

Kinetic curves are given for relaxation of dimethylsiloxane rubber in nitrogen at 278°, in oxygen, in oxygen-argon mixtures at 2?2°, and for relaxation of oxidized specimens in oxygen or argon at 268°. The results show that the action of oxygen results in an accumulation of reactive groups from oxidation of methyl side chains, and probably in an ionic cleavage of the main chain as a result of their formation.

619 A. S. Kuz'minskii and E. A. Goldovskii, OXIDATIVE DEGRADATION OF THE MOLECULAR CHAIN OF POLY(DIMETHYLSILOXANE), Chem. Prumysl 13 (7), 377 (1963); C. A. 59, 12998 (1963)

A poly(dimethylsiloxane) elastomer was degraded in air, in oxygen and, in nitrogen. The rate of formation of lower molecular weight compounds, both organic and organosilicon, and chemical stress relaxation were studied at 258, 280 and 302°.

620 G. Garzo and T. Szekely, REACTION GAS-CHROMATOGRAPHIC STUDY OF THE EFFECT OF HEAT ON CROSS-LINKED ORGANOSILICONES, Vortr. Symp. Gas-Chromatog. 4, Leuna, Ger. 1963, 48; C. A. 60, 5697 (1964)

621 V. D. Solodovnik, A. B. Davydov, Z. G. Ivanova, Ya. I. Minklin, and N. S. Leznov, INVESTIGATION OF THE PROPERTIES OF ORGANIC BORON-SILICON POLYMERS AND THEIR POSSIBLE USEFULNESS AS COMPONENTS OF HEAT-RESISTANT ADHESIVES, Plasticheskie Massy 1963, No. 3, 39; C. A. 59, 815 (1963)

Ref. No.

Prepared two types of B-Si polymers. Type (A) was prepared by reaction of $PhSi(OEt)_3$ with H_3BO_3 in the molar ratio 1:1. Type (B) was prepared by reaction of a mixture of $PhSi(OEt)_3$ and $MeSi(Ph)(OEt)_2$ with H_3BO_3 in the molar proportion 1.8:0.5:1.31. The weight loss after exposure to 350°C for 100 hours was 9.8% for (A) and 14.3% for (B). Weight loss after heat treatment at 600-800°C was 22% for (A) and 23.8% for (B). The weight loss was reduced by addition of Al powder.

622 S. B. Dolgoplosk, L. M. Chebysheva, A. L. Klebanskii, E. Yu. Shvarts and L. P. Fomina, PROPERTIES OF RUBBERS MADE FROM SILOXANE POLYMERS CONTAINING ARYL RINGS IN THE BACKBONE CHAIN, Kauchuk i Rezina 22 (9), 1 (1963); C. A. 60, 745 (1964)

Rubbers containing aryl rings in the backbone showed better mechanical properties than the poly(dimethylsiloxane) rubbers. The thermal stability was equal to that of better samples of poly(dimethylsiloxane) rubbers. After aging 15 days at 250°C, the rubbers retained good mechanical properties.

623 H. A. Hartung and R. C. Borchert, DEGRADATION OF POLY(DIMETHYLSILOXANE) RUBBER IN AIR AT HIGH TEMPERATURES; STABILIZATION WITH METAL DERIVATIVES, Am. Chem. Soc., Div. Polymer Chem., Preprints 4 (1), 243 (1963); C. A. 62, 713 (1965)

624 R. Brown, PREPARATION AND POLYMERIZATION OF A NEW SILOXANE, J. Polymer Sci. B1, 207 (1963)

Some TGA experiments were carried out.

625 K. A. Andrianov, G. E. Golubkov, K. I. Zabyrina, S. I. Dzhenchel'skaya, V. A. Kolganova, and N. I. Bolondaeva, THERMOOXIDATIVE DEGRADATION OF POLY(METHYLPHENYLSILOXANES), Plasticheskie Massy 1964 (2), 22; C. A. 60, 13340 (1964)

626 A. I. Petrashko and K. A. Andrianov, THERMOOXIDATIVE DEGRADATION OF POLYMERS WITH AN INORGANIC BACKBONE, Vysokomolekul. Soedin. 6 (8), 1505 (1964)

The effect of Ti, Sn and Al on the heat stability of poly(metallorganosiloxanes) was studied.

627 T. I. Ponomareva, T. A. Krasovskaya, and M. V. Sobolevskii, PROPERTIES OF POLYMERS WITH ALTERNATING SILOXANE AND SILPHENYLENE LINKS, Plasticheskie Massy 1964 (6), 21; C. A. 61, 8420 (1964)

Some data are given on thermal and thermooxidative degradation.

628 Yu. V. Zherdev, A. Ya. Korolev, and N. S. Leznov, THE EFFECT OF VARIOUS CURING CATALYSTS ON THE THERMOOXIDATIVE DEGRADATION OF POLYORGANOSILOXANES, Plasticheskie Massy 1964 (10), 16; C. A. 62, 2875 (1965)

Ref. No.

629 A. B. Davydov and V. A. Valovoi, THERMAL AND THERMOXIDATIVE DEGRADATION OF ORGANIC SILICON RESIN COMPOSITIONS, Teplofiz. Vysokikh Temperatur, Akad. Nauk SSSR 2 (1), 102 (1964); C. A. 61, 2004 (1964)

The degradation of cured poly(methylsiloxane), poly(methylphenylsiloxane) and poly(phenylsiloxane) resins was studied. At 620-870°K the degradation in air was measured by weight changes and at 620-1100°K in vacuum by rate of gas evolution and gas chemical composition.

630 R. W. Farmer, ISOTHERMAL THERMOGRAVIMETRY OF REINFORCED PLASTICS, Proc. Ann. Tech. Management Conf. Reinforced Plastics Div. Soc. Plastics Ind. 19 (4-G), 12 pp. (1964); C. A. 61, 16241 (1964)

The weight loss of several structural plastics in air at 300-1000°F was studied for periods up to 1000 hours. The materials studied included high-temperature epoxy, phenolic, phenylsilane and silicone resins reinforced with an E-glass fabric, and phenolic and silicone resins reinforced with asbestos felts.

631 R. I. Kobzova, G. S. Tubyanskaya, E. M. Oparina, and N. K. Levkina, STABILIZATION OF POLYSILOXANES WITH ANTIOXIDANTS, Khim. i Tekhnol. Topliv i Masel 9 (9), 53 (1964); C. A. 61, 16246 (1964)

632 W. J. Bobear, HEAT-AGING STUDIES ON SILICONE RUBBER STOCKS, Rubber Age (N. Y.) 95 (1), 71 (1964); C. A. 61, 4571 (1964)

633 R. E. Moore, THERMAL STABILITY EVALUATION OF ELASTOMERIC SEAL MATERIALS, U. S. At. Energy Comm. WAPD-TM-432, 17 pp. (1964); C. A. 62, 1828 (1965)

Various elastomeric sealants were tested under conditions simulating service in an atomic power station by exposing them to air at 200-550°F, as well as to steam for periods from 100 to 1000 hours. The rubbers are ranked in the order of air-oven stability.

634 R. L. Merker and M. J. Scott, PREPARATION AND PROPERTIES OF POLY(TETRAMETHYL-p-SILPHENYLENE-SILOXANE), J. Polymer Sci. A2, 15 (1964)

The thermal stability of poly(tetramethyl-p-silphenylene-siloxane) was compared to that of polydimethylsiloxane by oven heating in air to 200°C, 255°C and 305°C. After 200 hours at 200°C, both polymers were substantially unchanged.

635 J. B. Ganci and F. A. Bettelheim, POLYMERIZATION OF CHLORINATED DIPHENYLSILOXANES, J. Polymer Sci. A2, 4011 (1964)

Chlorinated phenyl silicones resist air oxidation and are thermally stable up to at least 450°C.

636 C. M. Murphy and H. Ravner, THE EFFECT OF CERIUM ON THE THERMAL STABILITY OF POLYSILOXANES, J. Polymer Sci. B2, 715 (1964)

Ref. No.

Got improvement in pyrolytic stability at 400°C of both dimethyl- and mixed dimethyl-methylphenyl silicones by incorporation of cerium compounds. With cerium present, the generation of cyclics was markedly reduced. Studies were made at 400°C under vacuum.

637 J. E. Curry and J. D. Byrd, SILANE POLYMERS OF DIOLS, J. Applied Polymer Sci. 9, 295 (1965)

Polydiphenylsiloxybiphenyl is stable to 600°C for short periods of time. It forms a hard protective coating on Al, remains stable after being heated at 500°C for 60 minutes and shows no change after 96 hours at 270°C.

638 J. F. Brown, Jr., DOUBLE CHAIN POLYMERS AND NONRANDOM CROSSLINKING, J. Polymer Sci. C, No. 1, 83

A double chain polyphenylsilsesquioxane was prepared by equilibration in bulk at 250-300°C. When heated in air in a thermobalance, weight loss started at 525°C.

Sulfur Containing Polymers

639 M. Homma and E. H. Kawasaki, THERMAL DEGRADATION OF POLYMERIC MATERIALS. I. GAS EVOLUTION FROM POLYSULFIDE POLYMERS, U. S. Dept. Com., Office Tech. Serv., AD268,041, 40 pp. (1960)

640 R. A. Florentine, G. Barth-Wehrenalp, I. Mockrin, I. Popoff and R. Riordan, SULFUR-NITROGEN SYSTEMS. IV. EVALUATION OF SULFAMIDE-MELAMINE-FORMALDEHYDE POLYMERS, U. S. Dept. Com., Office Tech. Serv., AD256,811, 49 pp. (1961); C. A. 58, 1591 (1963)

Acid- and base-catalyzed polymers involving sulfamides, melamine, and formaldehyde were prepared and evaluated. The products are resistant to chemical attack, but their lack of thermal stability (decomposed at 225°C in nitrogen) limits their use for high-temperature applications.

641 N. G. Polyanskii and P. E. Tulupov, THERMAL STABILITY OF CATION-EXCHANGE RESINS. I. THERMAL DESULFURIZATION OF THE HYDROGEN FORM OF RESIN KU-2 IN HYDROCARBON MEDIA, Zh. Prikl. Khim. 35, 2281 (1962); C. A. 58, 5837 (1963)

The thermal stability of a sulfonated polystyrene in the H form was determined by the loss in the sorptive capacity on heating in air, in tert-amylenes, and in isopentane at 100-200°C for different periods.

642 A. A. Berlin, A. V. Ragimov, and B. I. Liogon'kii, POLY(SULFOPHENYLENE-QUINONES), Izv. Akad. Nauk SSSR, Otd. Khim. Nauk 1962, 1863; C. A. 59, 2958 (1963)

The products showed stepwise weight loss of 40% or more on being heated to 600°C, but were quite stable at 300°C.

Ref. No.

643 N. G. Polyanskii and P. E. Tulupov. THERMAL STABILITY OF CATION-EXCHANGE RESINS IN ORGANIC MEDIA. II. EFFECT OF MOISTURE IN KU-2 RESIN ON ITS THERMAL STABILITY AND CATALYTIC ACTIVITY IN THE PRESENCE OF HYDROCARBONS, Zh. Prikl. Khim. 36 (10), 2244 (1963); C. A. 60, 6389 (1964)

644 N. G. Polyanskii and P. E. Tulupov, THERMAL STABILITY OF STRONGLY ACID CATION-EXCHANGE RESINS IN ORGANIC LIQUIDS, Chem. Prumysl 13 (10), 550 (1963); C. A. 60, 8195 (1964)

645 H. A. Smith, A NEW PLASTIC MATERIAL FOR THE JET AGE, Rubber Plastics Age 44 (9), 1048 (1963)

TGA showed that a poly(p-phenylene sulfide) was stable both in air and nitrogen to 400°. At higher temperatures, a friable glass formed which was stable to 900°.

646 S. Nishizaki and H. Kusakawa, PHYSICAL AND CHEMICAL PROPERTIES OF PYROLYZED ION-EXCHANGE RESINS, Kogyo Kagaku Zasshi 66 (6), 861 (1963); C. A. 60, 6938 (1964)

The free acid and Na salt of a highly acidic polystyrene cation-exchange resin were heat-treated at 200-550° under vacuum. The moisture absorption, infrared absorption spectra, electrical conductivity, and electron spin resonance spectra of the products were examined. The free SO_3 radical was decomposed at 200°, and the moisture absorbability of the product became low at this temperature, while SO_3 in the Na salt was stable up to 400°. The electrical conductivity was increased by the decomposition of SO_3.

647 H. Q. Smith and F. L. Scott, POLYMERS FROM SULFAMIDE. I. PREPARATION J. Polymer Sci. A2, 481 (1964)

Sulfamide and formaldehyde react at pH 10 to give a polymeric white solid which decomposes at 234-235°C.

No significant improvement in thermal stability of the polymers was achieved.

648 R. A. Florentine, G. Barth-Wehrenalp, I. Mockrin. I. Popoff and R. Riordan, POLYMERS FROM SULFAMIDE. II. EVALUATION AND STRUCTURE, J. Polymer Sci. A2, 489 (1964)

Acid- and base-catalyzed polymers involving sulfamide, melamine, and formaldehyde were prepared. The products are insoluble and their thermal stability does not exceed 225°C under nitrogen.

649 D. W. Thomson and Gerhard F. L. Ehlers, AROMATIC POLYSULFONATES: PREPARATION AND PROPERTIES, J. Polymer Sci. A2, 1051 (1964)

Thermal gravimetric analysis (TGA) in a nitrogen atmosphere was used to evaluate the thermal stability of the polysulfonates. A fairly sharp onset of weight loss is noted around 300°C, which levels

Ref. No.

off at 500°C, leaving approximately 50% residue up to 900°C. Since the majority of the polymers show loss of weight in the 300-340°C region, the upper limits of stability appear to be governed by the stability of the sulfonate linkage.

650 E. H. Hill and J. R. Caldwell, POLYSULFONES OF NORBORNENE AND DERIVATIVES, J. Polymer Sci. A2, 1251 (1964)

Thermal stabilities were determined by heating a weighed sample of the polymer in a test tube at 190°C and determining the weight loss due to the breakdown of the polymer into monomer and sulfur dioxide at intervals of 0.5, 1 and 3 hours. The stability can be improved by the addition of stabilizers which have been shown to be effective for other polysulfones.

651 Shigemitsu Tsunawaki and C. C. Price, PREPARATION OF POLY(ARYLENE SULFIDES), J. Polymer Sci. A2, 1511 (1964)

The weight loss of poly(phenylene sulfide) after heating for 1 hour at various temperatures up to 600°C under reduced pressure is reported. This polymer is seemingly stable up to 500°C but at 600°C some crosslinking may occur to give infusible, insoluble materials. After 2 hours at 500°C, the molecular weights of residue and sublimate indicated that only fractional distillation had occurred. Therefore, the weight loss at 500°C does not indicate thermal degradation.

652 A. H. Frazer, THERMAL STABILITY OF THE COPOLYMER OF SULFUR DIOXIDE AND CIS,CIS-1,5-CYCLOOCTADIENE, J. Polymer Sci. A2, 4031 (1964)

Degradation of this copolymer followed first-order kinetics at 220°C or above with random cleavage of the polymer chain. Pyrolysis of the copolymer up to 75% loss of weight gave the monomers as cracking products and in the mole ratio of the copolymer composition.

653 E. Wellisch, E. Gipstein, and Orville J. Sweeting, THERMAL DECOMPOSITION OF POLYSULFONES, J. Applied Polymer Sci. 8, 1623 (1964)

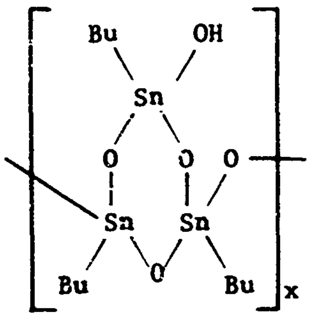
The thermal decomposition of C_4, C_6 and C_8 poly(methylene sulfones) was investigated under vacuum at 275°C, by identification of the decomposition products.

Tin Containing Polymers

654 S. M. Zhivukhin, E. D. Dudikova and N. B. Pshiyalkovskaya, SYNTHESIS AND STUDY OF POLY(ORGANOSTANNOXANES). III., Zh, Obshch. Khim. 33 (9), 2958 (1963); C. A. 60, 5651 (1964)

Tin Containing Polymers - continued

Ref. No.

The polymer  began to pyrolyze above 250°C.

655 G. A. Baum and W. J. Considine, ORGANOTIN CHEMISTRY. V. POLYDIORGANOTIN OXIDES - THERMAL BEHAVIOR AND PHYSICAL PROPERTIES, J. Polymer Sci. B1, 517 (1963)

Miscellaneous

656 H. H. Drause, Jr., ORGANOMETALLIC POLYMERS - A PATH TO THERMAL STABILITY, Battelle Tech. Rev. 11 (11), 2 (1962); C. A. 60, 5641 (1964)

A discussion is given of the structures and properties of the more significant organometallic polymers.

657 I. T. Gridunov and N. I. Astrakhantseva, INCOMBUSTIBLE HEAT-RESISTANT RUBBERS FROM NAIRIT AND CHLOROSULFONATED POLYETHYLENE, Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol. 6 (1), 142 (1963); C. A. 59, 4146 (1963)

658 E. C. Winslow and N. E. Gershman, PHTHALOCYANINE-CROSSLINKED POLYVINYLPHTHALIC ACID, J. Polymer Sci. A1, 2383 (1963)

Copper phthalocyanine-crosslinked poly-4-vinylphthalic acid was prepared with the expectation that some increased thermal stability could be achieved with these thermally stable linkages. Thermal decomposition in air occurs at about 310°C. The crosslinked polymer proved to be less stable than the starting material, poly(4-vinylphthalic acid). Analysis shows that an average of one copper phthalocyanine crosslink is formed for every twelve 4-vinylphthalic acid segmers in the poly(4-vinylphthalic acid) chain.

COPOLYMERS

659 S. Patai and H. Cross, SOLID-STATE CHEMICAL REACTIONS (WITH SPECIAL REFERENCE TO THE KINETICS OF THE REACTION OF INORGANIC OXIDANTS WITH POLY(DIVINYLBENZENE)). II., U. S. Dept. Com., Office Tech. Serv., AD 268,246, 93 pp. (1961); C. A. 58, 8089 (1963) III. S. Patai and M. Albeck, ibid. 268,247, 26 pp.

660 E. W. Bergstrom, AGING OF ELASTOMER VULCANIZATES AT TEMPERATURES UP TO 900°F, U. S. Dept Com., Office Tech. Serv., PB Rept. 171,517, 33 pp. (1961); C. A. 57, 12682 (1962)

Ref. No.

The effects of prolonged exposure to high temperatures on the retention of physical properties by isobutylene/isoprene, silicone, and vinylidene fluoride/hexafluoropropylene vulcanizates were studied. Isobutylene/isoprene vulcanizates had good heat resistance for at least 28 days at 300°F, and certain silicone and vinylidene fluoride/hexafluoropropylene vulcanizates had good property retention after 28 days at 500°F or 7 days at 600°F. All the vulcanizates aged poorly at 700, 800, and 900°F.

661 K. Thinius and R. Schlimper, STABILITY OF MACROMOLECULES. VII. THERMAL STABILITY AND STABILIZATION OF COPOLYMERS OF VINYL CHLORIDE, Plaste Kautschuk 9, 165 (1962); C. A. 57, 16863 (1962)

The thermal stability of poly(vinyl chloride) and vinyl acetate/vinyl chloride copolymers was studied by determining the HCl and AcOH evolved.

662 V. A. Popov, R. N. Smirnov, Z. T. Kulyai and V. A. Kondrat'eva, PREPARATION OF HEAT-RESISTANT POLYMERS BY MEANS OF PYROLYSIS. GRAPHITE FOAMS, Plasticheskie Massy 1962, No. 12, 18; C. A. 58, 9288 (1963)

Prepared heat-resistant foam materials by thermal treatment of various types of foamed polymers near the graphite-forming temperature in the absence of air. Experiments were carried out with a foamed blend of phenol-formaldehyde-novolak type resin and a foamed phenol-furfural-formaldehyde novolak-type resin.

663 T. D. Nagibina, L. S. Yasenkova, G. I. Alikberova and L. V. Yas'ko, COPOLYMERIZATION OF BUTADIENE AND ISOPRENE WITH DIMETHYLVINYLETHYNYLCARBINOL AT 5°, Kauchuk i Rezina 21, No. 7, 6 (1962); C. A. 58, 7007 (1963)

The copolymers were easier to plasticize than high-temperature polymers, and their vulcanizates showed higher thermal stability.

664 V. V. Korshak, V. A. Zamyatma and R. M. Organesyan, COPOLYMERIZATION OF NITROGEN-SUBSTITUTED BORAZOLES WITH HEXAMETHYLENE DIISOCYANATE, Izv. Akad. Nauk SSSR, Otd. Khim. Nauk 1962, 1669; C. A. 58, 6978 (1963)

Some thermomechanical curves are shown.

665 Y. Nakamura, DIFFERENTIAL THERMAL ANALYSIS OF UREA-FORMALDEHYDE RESIN, Kogakubu Kenkyu Hokoku 15, 115 (1962); C. A. 57, 13964 (1962)

DTA studies of urea-formaldehyde resin were carried out to investigate the mechanism of the curing reaction and to find a convenient method for the quality control of this resin.

666 H. C. Beachell and J. C. Spitsbergen, KINETICS OF THE THERMAL OXIDATION OF BUTADIENE-ACRYLONITRILE COPOLYMER, J. Polymer Sci. 62, 73 (1962)

Data from infrared studies at several temperatures are reported.

Ref. No.

667 A. R. Shultz, N. Knoll, and G. A. Morneau, TRIFLUORONITROSOMETHANE/TETRAFLUOROETHYLENE COPOLYMER: DEGRADATION BY HEAT AND BY RADIATION, J. Polymer Sci. 62, 211 (1962)

668 G. G. Wanless, ANALYSIS OF COPOLYMERS BY PYROLYSIS AND MASS SPECTROMETRY, J. Polymer Sci. 62, 263 (1962)

The depolymerization behavior of copolymers of 1-pentene and 4-methyl-1-pentene was studied. Regularities in cracking patterns are shown and these regularities reflect the copolymer composition. Thus they can be used in a simplified mass spectrometric method for the analysis of such copolymers.

669 T. G. Degteva, I. M. Sedova, and A. S. Kuz'minskii, THERMAL DEGRADATION OF A FLUORINE-CONTAINING ELASTOMER OF THE KEL-F TYPE ABOVE 300°. II., Vysokomolekul. Soedin. 5, 378 (1963)

The thermal degradation of an elastomeric copolymer of trifluorochloroethylene and vinylidene fluoride was studied under vacuum at 340-380°C. Kinetic data are reported.

670 T. G. Degteva, I. M. Sedova and A. S. Kuz'minskii, MECHANISM OF THE THERMAL DEGRADATION OF A KEL-F-TYPE ELASTOMER IN THE TEMPERATURE RANGE 200-380°, Vysokomolekul. Soedin. 5 (10), 1485 (1963)

Two elastomeric copolymers of $CH_2{:}CF_2$ and Cl_2CHCF_3 units were studied as to thermal stability and the mechanism of their thermal degradation.

671 H. Kambe, Y. Shibazaki, and T. Iwamoto, THERMAL DEGRADATION OF STYRENE-ACRYLONITRILE COPOLYMER, Tokyo Daigaku Koku Kenkyusho Shuho 3 (7), 690 (1963); C. A. 60, 10817 (1964)

Thermal degradation of styrene-acrylonitrile copolymer at 160-210° was studied by infrared spectroscopy.

672 W. R. Moore and E. Donnelly, THERMAL DEGRADATION OF MELAMINE-FORMALDEHYDE RESINS, J. Appl. Chem. (London) 13 (12), 537 (1963)

TGA and infrared analysis were used to study the thermal degradation of 3 melamine-formaldehyde resins in air from 150 to 350°C. The mechanism of degradation in various temperature ranges is discussed.

673 K. J. Bombaugh and B. H. Clampitt, INVESTIGATION OF COMONOMER DISTRIBUTION IN COPOLYMERS WITH THERMAL METHODS, Proc. Battelle Symp. Thermal Stability Polymers, Columbus, Ohio 1963, V1; C. A. 60, 9373 (1964)

Copolymers of ethylene/methyl acrylate, ethylene/ethyl acrylate, ethylene/methyl methacrylate, and ethylene/vinyl acetate were pyrolyzed, and their pyrolyzates were examined in an effort to determine the mode of decomposition.

674 B. Wunderlich and D. Poland, THERMODYNAMICS OF CRYSTALLINE LINEAR HIGH POLYMERS. II. THE INFLUENCE OF COPOLYMER UNITS ON THE THERMODYNAMIC PROPERTIES OF POLYETHYLENE, J. Polymer Sci. A1, 357 (1963)

Ref. No.

Copolymers of polyethylene containing -CO- and -$CHCH_3$ units were investigated by means of DTA and X-ray methods.

675 N. L. Zutty and F. J. Welch, SYNTHESIS OF VINYL POLYMERS CONTAINING α-SUBSTITUTED γ-BUTYROLACTONE GROUPS IN THEIR BACKBONES, J. Polymer Sci. A1, 2289 (1963)

When vinyl chloride-methyl methacrylate copolymers having a uniform chain-to-chain composition, are pyrolyzed at temperatures around 150°C, an intramolecular lactonization occurs forming α-methyl-γ-butyrolactone groups in the polymer backbone concomitant with the quantitative elimination of methyl chloride.

676 H. F. Mark and N. Ogata, COPOLYMERIZATION OF ALDEHYDES, J. Polymer Sci. A1, 3439 (1963)

The thermal stability of the copolymers of formaldehyde and acetaldehyde reaches a minimum in the composition range of 40/60 to 60/40. If it is supposed that the thermal degradation occurs at the end of the polymer chain, the copolymers with a composition in the range of 40/60 to 60/40 of formaldehyde and acetaldehyde, may undergo degradation with relative ease because of the large number of branches in the polymer chain.

677 K. Hayashi, H. Watanabe, and S. Okamura, RADIATION INDUCED SOLID STATE COPOLYMERIZATION OF OXETANES, J. Polymer Sci. B1, 397 (1963)

Some DTA studies are reported.

678 E. M. Barrall II, R. S. Porter, and Julian F. Johnson, GAS CHROMATOGRAPHIC ANALYSIS OF POLY(ETHYLENE ETHYL ACRYLATE) AND POLY(ETHYLENE VINYL ACETATE) PYROLYZATES, Anal. Chem. 35, No. 1, 73 (1963)

679 S. Igarashi and H. Kambe, THERMOGRAVIMETRIC ANALYSIS OF STYRENE-ACRYLONITRILE COPOLYMERS, Makromol. Chem. 79, 180 (1964)

Effect of molecular weight and composition on thermal stability of title copolymers was studied by TGA under nitrogen at 258-458°. The molecular weight of the copolymer has little effect on thermal decomposition and the amount of residue after decomposition increases with the acrylonitrile content of the copolymer.

680 Y. Shibazaki and H. Kamebe, THERMAL DEGRADATION PRODUCTS OF POLYMERS BY GAS CHROMATOGRAPHY. III. STYRENE-ACRYLONITRILE COPOLYMERS, Kobunshi Kagaku 21 (225), 71 (1964); C. A. 61, 3220 (1964)

681 I. Hayashi, COPOLYMERIZATION OF PROPYLENE. IV. DIFFERENTIAL THERMAL ANALYSIS OF A PROPYLENE-STYRENE COPOLYMER, Kogyo Kagaku Zasshi 67 (4), 633 (1964); C. A. 61, 12094 (1964)

682 T. Takeuchi and M. Kakugo, ANALYSIS OF HIGH POLYMERS BY A PYROLYSIS METHOD WITH A COMMERCIAL PIPETTER FOR THE GAS CHROMATOGRAPH, Kogyo Kagaku Zasshi 67 (2), 308 (1964); C. A. 61, 1942 (1964)

Ref. No.

683 Y. Shibazaki, STUDIES ON THERMAL DEGRADATION PRODUCTS OF POLYMERS BY GAS CHROMATOGRAPHY. IV. BOUNDARY EFFECT ON THE THERMAL DEGRADATION OF COPOLYMERS, Kobunshi Kagaku 21 (226), 125 (1964); C. A. 61, 7127 (1964)

Rapid thermal degradation of copolymers gives monomers, the yield of which differs from that of monomers produced by pyrolysis of each component homopolymer. The difference is attributed to a different probability of splitting off a monomer unit from the end of the chain having a free radical according to whether the neighboring units are the same or not. This phenomenon is called the "boundary effect". Proposes a method for quantitative evaluation of the boundary effect.

684 H. T. G. Degteva and A. S. Kuz'minskii, THERMOOXIDATIVE DEGRADATION OF A COPOLYMER OF TRIFLUOROCHLOROETHYLENE AND VINYIDENE FLUORIDE AT TEMPERATURES ABOVE 300°, Vysokomolekul. Soedin. Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 110; C. A. 62, 2897 (1965)

685 Ya. M. Slobodin, V. E. Maiorova, and A. M. Smirnova, THERMAL DEGRADATION OF ETHYLENE-PROPYLENE RUBBERS. I. C_{2-6} HYDROCARBONS AS THERMAL DEGRADATION PRODUCTS, Vysokomolekul. Soedin. 6 (3), 541 (1964)

686 M. S. Akutin, B. M. Kovarskaya, A. N. Shabadash, and B. E. Konovalova, PYROLYTIC SYNTHESIS OF BLOCK COPOLYMERS, Dokl. Akad. Nauk SSSR 154 (2), 369 (1964); C. A. 60, 12179 (1964)

Heating an epoxy resin with styrene-acrylonitrile rubber to 250° for 1 hour gave a block copolymer. The infrared spectrum confirmed the presence of structural units of both starting materials. Similar block copolymers were formed in 1 hour at 220° from an epoxy resin and polyethylene.

687 V. S. Shibalovich and I. S. Okhrimenko, THERMAL OXIDATIVE DEGRADATION OF BUTADIENE-STYRENE COPOLYMER SKS-30 AND PROPERTIES OF PRODUCTS OBTAINED, Zh. Prikl. Khim. 37 (1), 150 (1964); C. A. 60, 12211 (1964)

688 B. M. Kalinushkin and A. V. Ryabov, THERMAL DEGRADATION OF METHYL METHACRYLATE-METHACRYLIC ACID AND METHYL METHACRYLATE-METHACRYLAMIDE COPOLYMERS, Vysokomolekul. Soedin. Khim. Svoistva i Modifikatsiya Polimerov, Sb. Statei 1964, 58; C. A. 62, 2844 (1965)

Used a tagged atom method (C^{14}) to investigate the products from and the mechanism of vacuum thermal degradation of the title copolymers.

689 Z. Vymazal and J. Stepek, THERMAL DEGRADATION OF VINYL CHLORIDE-VINYL ACETATE COPOLYMERS, Plasticke Hmoty Kaucuk 1 (11), 338 (1964); C. A. 62, 5354 (1965)

690 G. Stanescu, O. Radulescu, and M. Keul, THERMAL DEGRADATION OF RESOL-BUTYRAL POLYMERS STUDIED BY IR SPECTROPHOTOMETRY, Materiale Plast. 1 (2), 84 (1964) (Rom); C. A. 62, 2882 (1965)

Ref. No.

691 G. P. Happ and D. P. Maier, IDENTIFICATION OF POLYMERS BY MASS SPECTROMETRIC EXAMINATION OF BOTH VOLATILE AND NONVOLATILE PYROLYSIS PRODUCTS, Anal. Chem. 36 (8), 1678 (1964)

692 M. Baer, ANIONIC BLOCK POLYMERIZATION. II. PREPARATION AND PROPERTIES OF BLOCK COPOLYMERS, J. Polymer Sci. A2, 417 (1964)

TGA was used to compare heat stability. Studied block copolymers of α-methylstyrene/styrene, methyl methacrylate/styrene and ethylene oxide/styrene. The temperature at the inflection point in the TGA curve for the various polymers is tabulated and compared.

693 K. Okuda, STRUCTURES OF VINYLIDENE CHLORIDE-VINYL CHLORDIE COPOLYMERS, J. Polymer Sci. A2, 1749 (1964)

Specific heats were measured in the powder state with an automatic recording differential thermal analyzer and an adiabatic calorimeter.

694 P. H. Hess D. F. Percival, and R. R. Miron, AMBIENT TEMPERATURE CURE IN UNSATURATED POLYESTER-STYRENE COPOLYMERIZATIONS. RELATIVE EFFECTIVENESS OF INITIATOR-PROMOTER SYSTEMS, J. Polymer Sci. B2, 133 (1964)

695 Y. P. Castille and V. Stannett, THE RADIATION INDUCED COPOLYMERIZATION OF FORMALDEHYDE AND STYRENE, J. Polymer Sci. B2, 1097 (1964)

Reports results of a DTA and TGA study of polyoxymethylene, polystyrene, and the title copolymer. Found that incorporation of styrene groups in the polyoxymethylene chain, even in very small amounts, causes a substantial improvement in the thermal stability of the polyoxymethylene.

696 D. K. Thomas, HEAT AGING IN FLUOROELASTOMERS, J. Applied Polymer Sci. 8, 1415 (1964)

Continuous and intermittent stress relaxation measurements were made on a copolymer of vinylidene fluoride and hexafluoropropylene crosslinked with diamines or high energy radiation, and a study was made of the effect of heat on the raw polymer. The results show that heat aging in diamine vulcanizates is the result of two simultaneous processes. One is a rapid oxidative reaction in and at the crosslinks resulting in replacement of primary crosslinks by a more thermally stable type, and the other is an oxidative reaction in the polymer main chain leading to a very slow breakdown of the rubber network.

697 H. E. Hoyt, B. D. Halpern, and K. C. Tsou, EVALUATION OF POLY(2,6-DIMETHYL)-1,4-PHENYLENE OXIDES AND RELATED COPOLYMERS FOR HIGH TEMPERATURE ADHESIVE APPLICATION, J. Applied Polymer Sci. 8, 1633 (1964)

Most of the high temperature evaluations were carried out at 500°F. and 600°F. over periods from 30 min. to one week. All specimens show thermal decomposition at 750°F. to give a hard solid residue. Thus, this temperature must be accepted as the upper limit for the uncompounded adhesive.

Ref. No.

698 R. J. Schaffhauser, M. C. Shen, and A. V. Tobolsky, VISCOELASTIC PROPERTIES OF STYRENE-ACENAPHTHYLENE COPOLYMERS IN THE TRANSITION REGION, J. Applied Polymer Sci. 8, 2825 (1964)

Some DTA studies are reported.

699 K. J. Bombaugh and B. H. Clampitt, INVESTIGATION OF COMONOMER DISTRIBUTION IN ETHYLENE COPOLYMERS WITH THERMAL METHODS, J. Polymer Sci. A3, 803 (1965)

Pyrolysis-gas chromatography was used to study ethylene-acrylate and ethylene-vinyl acetate copolymers. Some DTA studies are also reported.

700 J. B. Kinsinger, J. R. Panchak, R. L. Kelso, J. S. Bartlett, and R. K. Graham, METHYL α-CYANOACRYLATE. II. COPOLYMERIZATION STUDIES, J. Applied Polymer Sci. 9, 429 (1965)

Reports some thermal degradation results for poly(methyl α-cyanoacrylate), methyl α-cyanoacrylate/methyl methacrylate copolymers, methyl α-cyanoacrylate/styrene copolymers, methyl α-cyanoacrylate/vinyltoluene copolymers, and methyl α-cyanoacrylate/methylstyrene copolymers.

NATURAL POLYMERS AND MATERIALS DERIVED FROM THEM

701 L. R. Parks and L. H. Sperling, PHYSICOCHEMICAL STUDIES OF CELLULOSE ACETATE DECOMPOSITION REACTIONS, J. Applied Polymer Sci. 8, 2239 (1964)

Studied the origin, mechanism of formation, and structure of the colored compounds formed upon heating cellulose acetate in the presence of plasticizer.

702 W. K. Tang, EFFECT OF FLAME RETARDANTS ON PYROLYSIS AND COMBUSTION OF α-CELLULOSE, J. Polymer Sci. C, No. 6, [illegible]

Thermogravimetric and differential thermal analyses were conducted to determine the effect of low concentrations of flame retardants on the kinetics of pyrolysis and phenomena of combustion of α-cellulose.

PART 2 - SUBJECT INDEX

PART 3 - AUTHOR INDEX

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13 ABSTRACT

A bibliography of references, many of them annotated, is presented. This bibliography is the result of a literature survey on thermal degradation, thermal oxidation and thermal analysis of high polymers. These references cover the period from about 1 October 1962 to 1 March 1965. 702 items are given. These are grouped under general and material headings. A subject index and an index of authors are provided. This bibliography brings PLASTEC NOTE 7, published June 1963, up-to-date.

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14 KEY WORDS	LINK A		LINK B		LINK C	
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