

AD 631655

FOR THE	
TERMS	
Hardcopy	Microfilm
\$4.00	\$1.00 157.00
ARCHIVE COPY	
<i>Code 1</i>	

PLASTEC NOTE 10

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



JANUARY 1966

PLASTEC

PLASTICS TECHNICAL EVALUATION CENTER

PICATINNY ARSENAL
DOVER, NEW JERSEY

Authorized by the Office of Director of Defense Research and Engineering, the Plastics Technical Evaluation Center (PLASTE^C) evaluates and disseminates technical information on current development, engineering, and application work in the field of plastics and reinforced plastics. It engages in materials surveys and other special assignments, and provides the Department of Defense with technical data and advice on research and development programs on plastics.

Army, Navy and Air Force installations, and contractors and other suppliers of defense needs may request information from this center directly.

PLASTE^C documents are distributed automatically to qualified organizations and individuals, according to the stated interest established in its Field of Interest Register (FOIR).

Unless otherwise stated below, PLASTE^C reports are available to qualified requesters from the Defense Documentation Center (DDC), Cameron Station, Alexandria, Virginia, 22314; and to the general public through the Clearinghouse for Federal Scientific and Technical Information (CFSTI), 5285 Port Royal Road, Springfield, Virginia 22151.


Harry E. Pebly, Jr., Director

Copies available at CFSTI - \$4.00

PLASTEC NOTE 10

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

By

DOROTHY A. TEETSEL
DAVID W. LEVI

January 1966

Polymer Research Branch
Plastics and Packaging Laboratory
Picatinny Arsenal

for

Plastics Technical Evaluation Center
Picatinny Arsenal, Dover, New Jersey

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.

CONTENTS

	Page
ABSTRACT	i
INTRODUCTION	1
PART 1. BIBLIOGRAPHY	3-94
GENERAL:	
Books and General Reviews	3
Theory and Mathematical Treatment	4
Miscellaneous	6
MATERIALS:	
Polystyrene and Related Polymers	11-13
Polystyrene	11
Poly(methylstyrenes)	13
Polyethylene and Some Other Polyolefins	13-26
Polyethylene	13
Polypropylene	19
Polybutenes	24
Miscellaneous	26
Polyphenyls	26
Some Hydrocarbon Polymers From Dienes and Related Materials	26-32
Poly(acetylene)	26
Polybutadiene	27
Polyisoprene	27
Rubber	27
Miscellaneous	31
Some Halogen Substituted Materials	32-41
Chlorinated Polypropylene	32
Kel-F	32
Polychloroprene	32
Polytetrafluoroethylene	33
Poly(chlorotrifluoroethylene)	35
Poly(vinyl chloride)	35
Miscellaneous	40
Polymers and Related Compounds Containing Acid and	
Ester Groups	42-50
Polycarbonates	42
Polyesters	43
Poly(ethyl acrylate)	45
Poly(ethylene terephthalate)	45
Poly(isopropyl methacrylate)	46
Poly(methyl methacrylate)	47
Poly(methyl methacrylate)	49
Poly(n-butyl methacrylate)	49
Poly(vinyl acetate)	49
Miscellaneous	49
Other Synthetic C, H, O Containing Polymers	50-61
Polyaldehydes	50
Some Oxide Type Polymers	54
Epoxide Polymers	54
Phenolics	56
Poly(vinyl alcohol)	59
Poly(vinyl ketone)	60
Miscellaneous	60

PART 1. BIBLIOGRAPHY - Continued	
MATERIALS - Continued	
Nitrogen Containing Synthetic Polymers -----	62-75
Polyacrylonitrile -----	62
Polyamides -----	63
Polyazines -----	65
Polybenzimidazoles -----	65
Polybenzoxazoles -----	67
Poly(caprolactam) -----	67
Poly(ester-urethanes) -----	67
Polyimides -----	68
Polyoxadiazoles -----	69
Polyphenylpyrozoles -----	70
Polyphthalocyanines -----	70
Polyquinoxalines -----	70
Polythiazoles -----	70
Polyurethanes -----	71
Poly(vinylpyridine) -----	72
Miscellaneous -----	72
Inorganic and Semi-Inorganic Systems -----	75-88
Boron Containing Polymers -----	76
Coordination and Chelate Polymers -----	76
Glass Containing Systems -----	77
Iron Containing Polymers -----	78
Phosphorus Containing Polymers -----	79
Silicon Containing Polymers -----	80
Sulfur Containing Polymers -----	85
Tin Containing Polymers -----	87
Miscellaneous -----	88
Copolymers -----	88-94
Natural Polymers and Materials Derived From Them -----	94
PART 2. SUBJECT -----	95-137
PART 3. AUTHOR INDEX -----	139-150

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. Lefebvre, 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

Ref. No.

- 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. A. 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. Semchenko 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

Ref. No.

- 19 S. Strella, DIFFERENTIAL THERMAL ANALYSIS OF POLYMERS. II. MELTING, J. Applied Polymer Sci. 7, 1281 (1963)

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)

- 24 R. M. Fuoss, O. Salyer and H. S. Wilson, EVALUATION OF RATE CONSTANTS FROM THERMOGRAVIMETRIC DATA, J. Polymer Sci. A2, 3147 (1964)

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)

THEORY AND MATHEMATICAL TREATMENT - Continued

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 (1954)

MISCELLANEOUS - Continued

Ref. No.

- 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 HYPER-THERMAL 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.
- 38 B. Ya. Teitel'baum, T. I. Sogolova and G. L. Slonimskii, THE USE OF THE THERMOMECHANICAL CURVE METHOD IN POLYMER INVESTIGATIONS, Vysokomolekul. Soedin. 4, 1879 (1962)
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, Kunststoff-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.

MISCELLANEOUS - Continued

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.
- 45 J. B. Gilbert and J. J. Kipling, THE CARBONIZATION OF POLYMERS. II. ANALYSIS OF GASEOUS PRODUCTS FROM SOME VINYL POLYMERS, AND MATERIAL BALANCE, Fuel 41, 249 (1962)
- 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 MICRO-REACTOR, J. Applied Polymer Sci. 7, S19 (1963)
- Instrumentation is described for pyrolysis of polymers followed by gas chromatographic analysis.
- 51 A. Barlow, R. S. Lehrle, and J. C. Robb, POLYMER DEGRADATION EXAMINED DIRECTLY BY GAS CHROMATOGRAPHY, Soc. Chem. Ind. Monograph 17, 267 (1963); C. A. 61, 722 (1964)

MISCELLANEOUS - Continued

Ref. No.

- 52 T. R. Manley, DIFFERENTIAL THERMAL ANALYSIS AND ITS APPLICATION TO POLYMER SCIENCE, Soc. Chem. Ind. (London), Monograph No. 17, 175 (1963)

- 53 N. Grassie, THERMAL DEGRADATION AND STABILIZATION OF POLYMERS, Trans. Inst. Rubber Ind. 39 (4), T200 (1963); C. A. 60, 1851 (1964)

Discusses structural features offering the best prospects for synthesis of organic polymers resistant to high temperature.

- 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)

- 55 D. Braun, ANALYSIS OF HIGH POLYMERS BY GAS CHROMATOGRAPHY OF PYROLYSIS PRODUCTS. I. IDENTIFICATION OF PYROLYSIS PRODUCTS OF POLYMERS, Farbe Lack 69, 820 (1963); C. A. 60, 6929 (1964)

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°.

- 56 H. J. Taschow, BEHAVIOR OF HIGHLY POLYMERIC ORGANIC SEALING MATERIALS TOWARDS OXYGEN, Plaste Kautschuk 10 (10), 594 (1963); C. A. 60, 6989 (1964)

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.

- 57 B. L. Smushkovich, M. D. Frenkel and S. S. Gromov, NEW INSTRUMENTS FOR THE DETERMINATION OF THE HEAT RESISTANCE OF PLASTICS, Plasticheskie Massy 1963 (2), 53; C. A. 60, 6986 (1964)

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

- 58 G. R. Riser, J. J. Hunter, J. S. Ard and L. P. Witnauer, EPOXY ACIDS AND THEIR SALTS AS STABILIZERS FOR VINYL PLASTICS, SPE J. 19 (8), 729 (1963)

- 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)

MISCELLANEOUS - Continued

Ref. No.

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.

- 62 W. E. Donaldson and T. T. Castronguay, THERMAL STUDIES OF REINFORCED-PLASTIC MATERIALS. I. DIFFUSIVITY OF FIVE REINFORCED-PLASTIC HEAT BARRIERS, U. S. Dept. Com., Office Tech. Serv., AD 403,360, 16 pp. (1963); C. A. 60, 16053 (1964)
- 63 K. H. Schwarz, TESTING INSULATING MATERIALS FOR HEAT AND FIRE RESISTANCE, Kunststoffe 53, 111 (1963); C. A. 58, 12727 (1963)
- 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.

- 66 J. J. Kipling, J. N. Sherwood, P. V. Shooter, and N. R. Thompson, FACTORS INFLUENCING THE GRAPHITIZATION OF POLYMER CARBONS, Carbon 1 (3), 315 (1964); C. A. 61, 13436 (1964)

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)

- 70 G. G. Esposito, APPLICATION OF PYROLYTIC GAS CHROMATOGRAPHY TO THE ANALYSIS OF THERMOSETTING ACRYLIC COATING RESINS, U. S. Dept. Com., Office Tech. Serv., AD 432,590, 21 pp. (1964); C.A. 61, 14850 (1964)

- 71 J. Beznoska, FLAMMABILITY TESTS OF PLASTICS, Plasticke Hmoty Kaucuk 1, (10), 301 (1964); C. A. 62, 1792 (1965)

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

- 73 D. Hansen and Chong C. Ho, THERMAL CONDUCTIVITY OF HIGH POLYMERS, J. Polymer Sci. A3, 659 (1965)

MATERIALS

POLYSTYRENE AND RELATED POLYMERS

Polystyrene

Ref. No.

- 74 B. Wunderlich and D. M. Bodily, DYNAMIC DIFFERENTIAL THERMAL ANALYSIS 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 -vinyl naphthalene 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)

Polystyrene - Continued

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 M_w 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).

- 84 H. Kamebe and Y. Shibasaki, THERMAL DEGRADATION PRODUCTS OF POLYMERS BY GAS CHROMATOGRAPHY II. POLYSTYRENE, *Kobunshi Kagaku* 21 (225), 65 (1964); C. A. 61, 3219 (1964)

- 85 E. 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. I. Bogdanov, PYROLYSIS OF LINEAR POLYMERS DURING THERMAL SHOCK, *Gazifikatsiya i Piroliz Topliva*, 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. Karpov, 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. Slovkhotova, 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 BRITTLNESS, 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 practice, 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 mechano-thermal means was studied by fractionation of degradation products and examination of their molecular weight distribution curves. Both thermal and mechano-thermal 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

Polyethylene - continued

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 NO₂ 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, 7713 (1963)

The degradation of polyethylene in NO₂ 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. Shibasaki, 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. Tsverkova, 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)

Polyethylene - continued

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. Bitukov, 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. Slovkhotova, 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. Grebenschikov and I. L. Farberov, THERMOGRAPHIC INVESTIGATION OF SOME POLYMERS AND POLYCONDENSATES, Gazifikatsiya i Piroliz Toplivo, 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.

Polyethylene - continued

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

Polypropylene - continued

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, 1895 (1964)

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

Polypropylene - continued

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. Shlyapnikov, 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)

Polypropylene - continued

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

Polybutenes - continued

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), Plasticskie 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 CUFRENE 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 (1), 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 PROXIMATION TEMPERATURE EFFECTS ON HOSE AND SEAL ELASTOMERS, U. S. At. Energy Com. 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.

Rubber - continued

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. Kuz'minskii, 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.

Rubber - continued

Ref. No.

- 224 M. L. Bhaumik, D. Banerjee, and A. K. Sircar, THERMAL DETERMINATIONS IN HARD RUBBER REACTIONS WITH DIFFERENTIAL THERMAL ANALYSIS, Pre-print 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.

Rubber - continued

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, Q1; 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. Sinitsyn 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°. 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°, 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)

Polychloroprene - continued

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. N62-101, 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 10⁻⁵-10⁻⁶mm.

- 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 POLY-TETRAFLUOROETHYLENE 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. Sibilis 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 CHLORIDE), Acta. Chem. Scand. 14 (2), 49 (1960) (in English); C. A. 60, 5660 (1964)

The thermal stability of poly(vinyl chloride) (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 CHLORIDE EVOLUTION FROM POLY(VINYL CHLORIDE), Monatsber. Deut. Akad. Wiss. Berlin 3, No. 11/12, 668 (1961); C. A. 57, 15350 (1962)

HCl evolution from poly(vinyl chloride) 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.

Poly(vinyl Chloride) - continued

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

Poly(vinyl Chloride) - continued

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. XIII. 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, C. 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)

Poly(vinyl Chloride) - continued

Ref. No.

- 295 G. A. Grode, W. R. Dunnivant, 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, dicumyl(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

Poly(vinyl Chloride) - continued

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, 1636 (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. Vozdev, 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. Kieche, 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. Semenidov, 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. Geterotsepyne 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 Kagaku 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, 11; 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, THERMOXIDATIVE DEGRADATION OF POLYCARBONATES, Vysokomolekul. Soedin. 5 (5), 649 (1963)
- 329 B. M. Kovarskaya, I. E. Zhiguncva, 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. Kovarskaya, 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 (1954)
- 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)
- 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)

Describes heat distortion methods.

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)
- 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)

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.

Polyesters - continued

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 HOEPLER 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. Vinogradova, 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)

Poly(ethylene terephthalate) - continued

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

Poly(isopropyl methacrylate) - continued

Ref. No.

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.

Poly(methyl methacrylate) - continued

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. Grebenshehikova and I. L. Farberov, THE ANALYSIS OF THE HEAT EFFECTS OF THE PYROLYSIS OF POLYMERS, *Gazifikatsiya i Piroliz Topliva*, *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. Ettore 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 i'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. Alishoey, 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.

Polyaldehydes - continued

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(oxyethylene) 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. . . . 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°.

Polyaldehydes - continued

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* 150 109 (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, 2929 (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 Polymerov, 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, THERMOOXIDATIV 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)

Epoxide Polymers - continued

Ref. No.

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

- 423 K. A. Andrianov and G. 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. Bremner, 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), 115-7, 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)

Epoxide Polymers - continued

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-diepoxihexane 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.

Phenolics - continued

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

Phenolics - continued

Ref. No.

- 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. 51, 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. Aerosp. 96, 39 (1963); C. A. 60, 8195 (1964)
- 449 M. S. Ogi 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 C¹⁴ 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. Misuchenko, and I. L. Farberov, PYROLYSIS OF FUELS AND RESINS DURING THERMAL SHOCK, Gazifikatsiya i Piroiliz Toplivo, 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 Piroiliz Toplivo, Akad. Nauk SSR, Gos. Kom. po Toplivn. Prom. pri Gosplane SSSR, Inst. Goryuch. Iskop., Sb. Statei 1964, 41; C. A. 62, 1792 (1965)

Phenolics - continued

Ref. No.

- 455 E. N. Kan'kovskaya, S. S. Dmitrienko, and T. I. Pechennikova, STRUCTURE 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 triphenylmethane 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), Plastik i 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. Vanderberg, 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-phenoxy)lene) 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).

Miscellaneous - continued

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'Neill, and R. E. Putscher, 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 ketone) 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)

NITROGEN CONTAINING SYNTHETIC POLYMERS

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)

Polyacrylonitrile - continued

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.

- 434 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)

Polyamides - continued

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-XYLYLENDIAMINES AND ADIPIC, SEBACIC, AND ISOPHTHALIC ACIDS, *Tr. Inst. Khim. Nauk, Akad. Nauk Kaz. SSR* 11, 36 (1964); *C. A.* 61, 12099 (1964)

Polyamides - continued

Ref. No.

Thermograms are given for poly(m-xylyleneadipamide), 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 THERMOXIDATIVE 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, *Plastické 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. Z. 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.

Polybenzimidazoles - continued

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(ϵ -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

Polyester-Urethanes - continued

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 CH₂ 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 502679, 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 polypyromellitic 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-OXADIAZOLES, 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.

Polyphenylpyrazoles

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. SYNTHESIS 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.

Polyurethanes

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)

Miscellaneous - Continued

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-TRIALLYLOXY-PYRIMIDINE, 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 indicated 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. Lumin, 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°C and 20-25 atm. pressure for 25-30 hours in the presence of ZnCl_2 . The products were crystalline, infusible, decomposed around 700°C, 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. Popov, 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.

Miscellaneous - continued

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-TRIAZINYLENEMIMIDES, 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 POLY-CARBAMATES, 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

Miscellaneous - continued

Ref. No.:

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, SALICYL-ALDEHYDE, 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'-BISDIAZONIOPHENYL DIFLUORO POLYMERS, Vysokomolekul. Soedin., Geterotsepye 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)

Boron containing polymers - continued

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-DIACETYLPIRIDINE, 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

Coordination and Chelate Polymers - continued

Ref. No.

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. COORDINATION 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 fiberglass-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.

Phosphorus Containing Polymers

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. Geftter, 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, 51; *C. A.* 60, 9368 (1964)
- 596 R. R. Hindersinn and N. E. Eeyer, 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 \geq 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, Geterotsepye 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(vinyl-methylsiloxane) 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.

Silicon Containing Polymers - continued

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. 51, 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-(H₂NSi(Me)₂O)₂C₆H₄ lost NH₃ 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-[H₂NSi(Me)CHCH₂O]₂C₆H₄ gave a polymer by loss of NH₃, 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 Bu₆Sn₂O 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)METHYLDIETHOXYSILOXANE, 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)

Silicon Containing Polymers - continued

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 O₂AlOP(C) 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 272°, 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)

Silicon Containing Polymers - continued

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 $600\text{--}800^\circ\text{C}$ 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(metall-organosiloxanes) 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)

Silicon Containing Polymers - continued

Ref. No.

- 629 A. B. Davydov and V. A. Valovoi, THERMAL AND THERMOXIDATIVE DEGRADATION OF ORGANIC SILICON RESIN COMPOSITIONS, *Teplofiz. Vysokikh Temperatur*, *Acad. 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, 6241 (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)

Silicon Containing Polymers - continued

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)

Polydiphenylsiloxylbiphenyl 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. Honma and E. H. Kawasaki, THERMAL DEGRADATION OF POLYMERIC MATERIALS. I. GA^c 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. Rior-dan, 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.

Sulfur Containing Polymers - continued

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, 6289 (1964)

- 644 N. G. Polyanskii and P. E. Tulupov, THERMAL STABILITY OF STRONGLY ACID CATION-EXCHANGE RESINS IN ORGANIC LIQUIDS, Chem. Promysl 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 form 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 SO₃ radical was decomposed at 200°, and the moisture absorbability of the product became low at this temperature, while SO₃ in the Na salt was stable up to 400°. The electrical conductivity was increased by the decomposition of SO₃.

- 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

Sulfur Containing Polymers - continued

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)

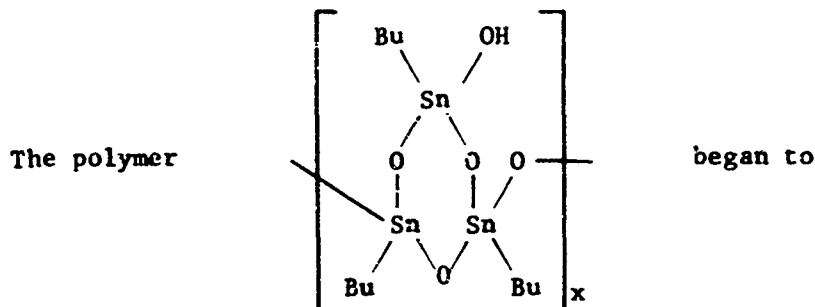
The thermal decomposition of C₄, C₆ and C₈ poly(methylene sulfones) was investigated under vacuum at 275°C, by identification of the decomposition products.

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.



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 POLYVINYL-PHTHALIC 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 segments 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. Zamyatna 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_2CF_2 and Cl_2CHCF_3 units were studied as to thermal stability and the mechanism of their thermal degradation.

- 671 H. Kambe, Y. Shibasaki, 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°C 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, VI; 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 -CHCH₃ 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. Shibasaki 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. Shibasaki, 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 VINYLIDENE 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. C₂₋₆ 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 (C¹⁴) 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 CHLORIDE 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, 17

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

<u>Subject</u>	<u>Reference No.</u>
A	
Ablation -----	11, 446
heat of, for teflon for polyethylene -----	257
of epoxides -----	422
of fiberglas-reinforced phenolic resins -----	590
rate -----	62
Ablative materials -----	579
Acenaphthylene/styrene copolymers -----	698
Acetal Resins -----	80
Acetaldehyde/formaldehyde copolymers -----	676
Acetylated polyformaldehyde -----	400
Acetylated poly(oxymethylene) -----	411
Acrylic laminates -----	447
Acrylonitrile/butadiene copolymers -----	666
Acrylonitrile/methyl vinyl ketone copolymers -----	469
Acrylonitrile/norbornadiene copolymer -----	250
Acrylonitrile/styrene copolymers -----	671, 679, 680, 682, 683
Adhesives -----	34, 312, 468
Adhesives, high temperature -----	697
Aidol condensation thermally induced in poly(methyl vinyl ketone) -----	464
Alkyds -----	447
Aluminum chelates of 8-hydroxyquinoline-formaldehyde polymers -----	584
Aluminum containing polymers -----	423, 573, 613, 614, 615, 616, 626
Aluminum coordination polymers -----	575
Analysis of degradation products of Kel-F -----	670
Analysis of pyrolysis products by gas chromatography ----	83
Anhydride formation by heat treatment -----	388
Antimony containing polymers -----	601
Antioxidants	
for polyamides -----	487, 497
for polybutadiene -----	208, 210
for poly(dimethylsiloxane) -----	631
for polyethylene -----	95, 98, 102, 103, 107, 117, 166, 185
for poly(ethylene oxide) -----	417
for polyformaldehyde -----	389, 397
for polypropylene -----	147, 157, 160, 162, 165, 166, 167
for poly(vinyl chloride) -----	296
for rubber -----	171, 175, 179, 185, 227, 234, 242, 244, 245
for vulcanizates -----	230
review of -----	12
thermal for polyethylene -----	92

Subject

Reference No.

A - Continued

Argon, degradation under	
of acetylated polyformaldehyde -----	400
of poly(α,α' -bis(chloromethyl)- β -propiolactone) ----	323
of polyformaldehyde -----	400
of poly(3-methylbutene-1) -----	203
of polypyromellitimides -----	519
of polyquinoxalines -----	534
of rubber -----	214
Aromatic polyimides -----	521
Aromatic polysulfonates -----	649
Arsenic containing polymers -----	613
Aryl containing siloxane polymers -----	622
Asbestos felt reinforced plastics -----	630
Azulene containing polymers -----	565

B

Balata -----	247
Bending tests -----	57
Benzborimidazoline polymers -----	554
Benzyl oil -----	83
4,4'-Bisdiazoniobiphenyl difluoro polymers -----	569
Bis(2-hydroxy-3,5-dimethylbenzyl) ether -----	456
Bis(imidazolato)-metal polymers -----	581
Bis(nitrosoacetyl)benzidine, polymer based on -----	570
Block copolymers -----	88, 545, 686
of ethylene oxide/styrene -----	692
of methyl methacrylate/styrene -----	692
of α -methylstyrene/styrene -----	692
Borazoles, in copolymers -----	664
Boron containing polymers -----	571, 572, 621, 656
Boundary effect, in copolymer degradation -----	683
Bovine serum albumin -----	139
Branching, and thermal degradation of acetaldehyde/formaldehyde copolymers -----	676
Burning behavior of phosphorus containing methacrylic esters -----	597
Burning behavior of phosphorus containing polymers -----	593
Burning of halogenated epoxide resins -----	428
Butadiene/dimethylvinylethynylcarbinol copolymers -----	663
Butadiene/neoprene copolymers -----	633
Butadiene/octafluorocyclohexa-1,3-diene copolymers -----	321, 322
Butadiene/styrene copolymers -----	220, 231, 233, 633, 687
4,4'-(2,2-butylidene)dibenzoic acid polymers -----	491
Butyl rubber -----	217, 231, 232, 233, 248

C

Carbon black, effect on polyethylene thermal antioxidants -----	92
--	----

Subject

Reference No.

C - Continued

Carbon dioxide, degradation under, of anthracene-phenol-formaldehyde resins -----	449
Carbon fiber composites -----	447
Carbon-14 tracer, study of polyurethane degradation by --	546
Catalysts, for poly(oxymethylene) thermal degradation ---	398
Cellulose -----	43, 83, 702
Cellulose acetate -----	83, 131, 307, 701
Cellulose acetatebutyrate -----	83
Cellulose acetate glutarate -----	691
Cellulose acetate maleate -----	691
Cellulose acetate 3-nitrophthalate -----	691
Cellulose hexahydrophthalate -----	691
Cellulose nitrate -----	312, 382
Cellulose phthalate -----	691
Cerium compounds, effect on thermal stability of silicones -----	636
Chain transfer -----	79
Chain transfer, in polyformaldehyde oxidation -----	401
Chain transfer, in polypropylene degradation -----	180
Chelate polymers -----	583, 584
derived from tetraacetylene -----	577
of polythiosemicarbazides -----	574
Chelates	
of formaldehyde-salicylaldehyde -----	580
of oxine-formaldehyde polymers -----	579
of titanium and aluminum -----	573
thermal decomposition of -----	578
thermal degradation of -----	582
Chlorinated atactic polypropylene -----	295
Chlorinated phenolics -----	439, 440
Chlorinated phenyl silicones -----	635
Chlorinated polypropylene -----	252, 253
Chlorinated poly(vinyl chloride)-----	301
Chloroprene/octafluorocyclohexa-1,3-diene copolymer -----	321, 322
Chlorosulfonated polyethylene -----	221, 320, 657
Chlorotrifluoroethylene/vinylidene fluoride copolymers --	271, 321, 322
Cis, cis-1,5-cyclooctadiene/sulfur dioxide copolymer ----	652
Cis-polybutadiene -----	247
Cis-polyisoprene -----	247
Coating resins, acrylic -----	70
Cobalt chelate polymers -----	583
Cobalt containing chelate polymers -----	576
Coloration, of phenol-formaldehyde resins -----	455
Color formation in degradation of polyurethanes -----	541
Colorimetric study, of poly(vinyl chloride) stability ---	287
Column elution fractionation -----	547
Compression molding, degradation of poly(methyl methacrylate) in -----	375
Coordination polymers -----	656
Co-polyesters -----	352
Copolymer degradation -----	321, 322
Copolymers -----	557

SubjectReference No.

C - Continued

Copolymers, thermal degradation of -----	316
Copolymers, thermal degradation of acetaldehyde/formaldehyde copolymers -----	676
Copolymers, thermomechanical curves for -----	664
Copper-catalyzed oxidation of polypropylene -----	146
Copper-catalyzed thermal oxidation of polypropylene -----	181
Copper chelate polymers -----	583
Coumerone/indene copolymer -----	691
Crosslinking and thermal degradation of polyester-urethanes -----	518
Crosslinking, in poly(phenylene sulfide) degradation ----	651
Crosslinking, in thermal degradation of chlorinated polypropylene -----	253
Cryoscopic molecular weight, in polypropylene degradation -----	172
Crystallinity and thermal degradation of polyacetaldehyde -----	394
Crystallization, by differential thermal analysis -----	46
Crystallization, effect on thermal stability of poly(methyl vinylphthalate) -----	386
of poly(vinylphthalic acid) -----	386
Crystallization phenomena studied by differential thermal analysis -----	362, 363
Cure rates, of phenolics by differential thermal analysis -----	459
C ¹⁴ , use in investigating thermal degradation of epoxides -----	450
of phenol-formaldehyde polymers -----	450
of polyarylates -----	450
Cyclopolymers of 1,6-heptadiene -----	249
of 1,5-hexadiene -----	249
of 2-methyl-1,5-hexadiene -----	249
of 3-methyl-1,5-hexadiene -----	249

D

Dehydrochlorination of chlorinated polypropylene -----	252, 253
Dehydrochlorination of poly(vinyl chloride) -----	276, 282
Dehydrochlorination, thermal -----	
of poly(vinyl chloride) -----	285, 300, 302, 309
of vinyl chloride/vinylidene chloride copolymers ---	309
Density of polyethylene, effect of oxidative degradation upon -----	154
Deuterated polypropylene, oxidation of -----	186
Dielectric behavior of polyacrylonitrile pyrolyzates ----	482
Dielectric constant of poly(ϵ -caprolactam) as a function of temperature -----	517
Dielectric constant of poly(vinyl chloride) as a function of temperature -----	517
Dielectric studies of polyp. propylene -----	145
p-Diethynylbenzene/phenylacetylene copolymer -----	310

SubjectReference No.

D - Continued

Differential thermal analysis -----	32, 44, 52, 466, 699
crystallization by -----	143
crystallization melting behavior by -----	89
determination of crystallinity of poly(1,2,5,6- diepoxyhexane) by -----	435
dilatometry -----	191, 192
for determination melting and crystallization behavior -----	46
for polyethylene melting point determination -----	133
glass transition study by -----	26, 27
instrumentation -----	184
of cellulose -----	43
of chlorinated atactic polypropylene -----	295
of phenol-formaldehyde resins -----	380
of polyacetals -----	43
of polyacrylonitrile -----	43, 377
of polyamides -----	43, 298
of polyesters -----	43
of polyethylene -----	43
of poly(methyl methacrylate) -----	377, 380
of polypropylene -----	43
of polystyrene -----	380
of poly(vinyl alcohol) -----	43
of poly(vinyl chloride) -----	43, 295
melting and crystallization study by -----	31
melting by -----	247
melting point from -----	19, 65
melting points of poly(vinyl ethers) by -----	465
of acenaphthylene/styrene copolymers -----	698
of aluminum containing polymers -----	614
of balata -----	247
of cellulose -----	702
of chelate polymers -----	576
of chelates of oxine-formaldehyde polymers -----	579
of cis-polybutadiene -----	247
of co-polyesters -----	352
of copolymers -----	674
of 2,6-dimethylstyrene) -----	87
of epoxides -----	457
of ethylene/propylene copolymers -----	174
of formaldehyde/styrene copolymers -----	695
of furfuryl alcohol resins -----	471
of gutta percha -----	236, 247
of isotactic polybutene-1 -----	189
of oxetane copolymers -----	677
of oxine-formaldehyde polymers -----	579
of phenol-formaldehyde -----	265
of phenolics -----	437, 459
of polyamides -----	333, 485, 492, 500
of polyamides containing phosphorus -----	485
of polybenzimidazoles -----	507

Subject

Reference No.

D - Continued

Differential thermal analysis - Continued

of polybutadiene -----	48
of polybutene-1 -----	174, 188, 191, 192, 194, 195, 196
of poly(1,4-cyclohexylenedimethylene terephthalate)-	352
of poly(dihydroxyarylenephosphonitrilates) -----	599
of poly(dimethylstyrene) -----	87
of polyesters -----	333, 341
of polyester/styrene copolymers -----	694
of polyethylene -----	19, 80, 100, 104, 108, 136, 137, 138, 140, 141, 316
of poly(ethylene terephthalate) -----	352, 356, 360, 362, 363
of poly(p-fluorostyrene) -----	87
of polyformaldehyde -----	389
of polyimides -----	269, 522
of poly(3-methylbutene-1) -----	203
of poly(methyl methacrylate) -----	20
of poly(4-methylpentene-1) -----	104-201
of poly(methylstyrene) -----	87
of poly(methyl vinylphthalate) -----	386
of poly(oxymethylene) -----	205, 695
of polypropylene -----	19, 20, 143, 144, 151, 174, 182, 184, 333, 500, 681
of polysiloxanes -----	614
of polystyrene -----	74, 681, 695
of polystyrene containing metals -----	85
of polytetrafluoroethylene -----	265, 269, 316, 333
of poly-s-triazinyleneimides -----	562
of polyurethanes -----	539
of poly(vinyl fluoride) -----	316
of poly(vinylidene fluoride) -----	316
of poly(vinylphthalic acid) -----	386
of poly(2-vinylpyridine) -----	553
of rubber -----	224, 225, 247
of tin containing polymers -----	614, 655
of titanium containing polymers -----	614
of trans-polyisoprene -----	247
of trans-1,4-polyisoprene -----	236
of 2,4,6-triallyloxypyrimidine polymerization -----	555
of urea-formaldehyde resin -----	665
of vinyl chloride/vinylidene chloride copolymers ---	693
of vinylidene fluoride/perfluoropropene copolymer --	316
phase transitions by, of polybutene-1 -----	190
review of -----	6
study of melting by, of polypropylene -----	148
theory -----	20
transition by -----	48
transition from -----	47

SubjectReference No.

D - Continued

Dilatometry -----	236
4,4-Dimethyl-1,6-heptadiene-3,5-dione, cyclo- polymerization of -----	473
Dimethyl-methylphenyl silicones -----	636
Dimethyl silicones -----	636
Dimethylvinylethynylcarbinol/isoprene copolymers -----	663
Distribution of molecular weight, and processing of polypropylene -----	187
Distribution of molecular weights in polystyrene oxidation -----	82
Distribution of polyethylene degradation products -----	110
p-Divinylbenzene/p-ethylstyrene copolymers -----	659
Double chain polymers -----	638
Dynamic electrothermal analysis -----	269
Dynamic mechanical properties -----	49

E

Egg albumin -----	139
Elasticity and thermal stability -----	18
Electrical aging of polytetrafluoroethylene -----	260
Electrical conductivity of chlorinated poly(vinyl chloride) degradation products -----	301
of ion-exchange resin degradation products -----	646
of poly(vinyl chloride) degradation products -----	301
Electrical properties of epoxide polymers -----	423
Electrical properties of heated polyacrylonitrile -----	479
Electron paramagnetic resonance of polyenes -----	200
Electron spin resonance in rubber degradation -----	226
of degradation residues -----	297
of natural rubber on heating -----	214
of pyrolysis products -----	290
Electron spin resonance spectra of chlorinated poly(vinyl chloride) degradation products -----	301
of ion-exchange resin degradation products -----	646
of poly(vinyl chloride) degradation products -----	301
Epoxide/polyethylene block copolymers -----	686
Epoxide resins -----	28, 337, 421, 422, 423, 426, 430
Epoxide resins, bromine containing -----	427
Epoxide resins, halogenated -----	318, 428
Epoxides -----	131, 419, 424, 425, 431, 432, 436, 450, 630, 682
Epoxides, brominated -----	433
Epoxide/styrene-acrylonitrile block copolymers -----	686
Epoxy-phenolic preparations -----	447
Epoxy-phenolic resins -----	434
Epoxy resin/glass cloth -----	589

Subject

Reference No.

E - Continued

Ethyl cellulose -----	83
Ethyl cellulose phthalate -----	691
Ethyl cellulose succinate -----	691
Ethylene bis(N-phenylcarbamate) degradation of -----	561
Ethylene/ethyl acetate copolymers -----	678
Ethylene/ethyl acrylate copolymers -----	673, 699
Ethylene/methyl acrylate copolymers -----	673, 699
Ethylene/methyl methacrylate copolymers -----	673, 699
Ethylene/octafluorocyclohexa-1,3-diene copolymers -----	321, 322
Ethylene/propylene copolymers -----	119, 124, 174, 183, 233, 633, 685
Ethylene-propylene-diene terpolymer -----	248
Ethylene terephthalate/ethylene isophthalate copolymers -	358
Ethylene/vinyl acetate copolymers -----	673, 678, 699

F

Ferrocene polymers -----	591
Fiberglas-reinforced phenolic resin -----	590
Films, degradation of poly(methyl methacrylate) -----	368
Fireproofness -----	437
Fire-resistance, testing for -----	63
Fire-resistant polyesters -----	596
Fire-retardant polyesters -----	346
Fire-retardants, polyesters containing phosphorus as ----	594
Fire-retarding epoxides -----	425
Flame-resistance -----	40
Flame-resistance in polyurethane foams -----	543
Flame-resistant polyurethanes -----	543
Flame-retardant polyesters -----	542
Flame-retardant polyurethanes -----	542, 550
Flame spraying, polyethylene -----	118
Flammability -----	437
of sealing materials -----	56
testing thermoset plastics for -----	41
tests -----	71
Flash pyrolysis -----	382
Fluorinated polymers, differential thermal analysis of --	316
Fluorinated polymers, thermal degradation of -----	316
Fluorinated silicone polymer -----	321, 322
Fluorine containing polymers -----	317
Fluorine containing polymers, thermal degradation of ----	321
Fluorine containing polymers, thermal oxidation of -----	322
Foams, thermal degradation of -----	662
Formaldehyde-salicylaldehyde polymers -----	580
Formaldehyde/styrene copolymer -----	695
Formaldehyde/sulfamide, melamine polymers -----	640
Formaldehyde/sulfamide polymers -----	647
Fraction -----	2
Fractionation, column elution -----	547
Furfuryl alcohol resins -----	470, 471

<u>Subject</u>	<u>Reference No.</u>
G	
Gamma radiation, effect on polytrifluoroethylene degradation -----	273
Gas Analysis	
in poly(methyl methacrylate) degradation -----	75
in polystyrene degradation -----	75
in polysulfide degradation -----	639
of Kel-F degradation products -----	670
Gas Chromatography -----	7, 51, 59, 70, 72, 84, 106, 116, 139, 216, 217, 218, 231, 233, 330, 347, 350, 351, 382, 410, 420, 428, 443, 678, 680, 699
analysis of evolved gases by -----	470
in copolymer analysis -----	682
of degradation products -----	50
of phenol-formaldehyde oxidation products -----	458
of poly(ethylene terephthalate) degradation products -----	353
of polymer degradation products -----	83
of polypropylene peroxide decomposition -----	155
of silicone degradation products -----	620
of thermal degradation products -----	55
Glass fiber containing laminates -----	606
Glass fiber containing systems -----	588
Glass-fiber-reinforced polyesters -----	334
Glass-reinforced organic-resin laminates -----	586
Glass-reinforced plastics -----	630
Glass-reinforced resins -----	585
Glass-resin laminates -----	587
Glass transition	
by differential thermal analysis -----	192
of epoxides -----	343
of polyacrylonitrile -----	377
of polyesters -----	343
of poly(methyl methacrylate) -----	20, 377
of polyolefins by differential thermal analysis ----	174
of polypropylene by differential thermal analysis --	20
theory of, from differential thermal analysis -----	20
Glyoxal polymers -----	407
Graphite fiber, from polyacrylonitrile -----	476
Graphitization of polymer carbons -----	66
Gutta percha -----	236, 247, 312

H

Halogenated epoxide resins -----	318
Heat aging	
of aromatic polyimide films -----	521
of hexafluoropropylene/vinylidene fluoride copolymers -----	696
of polyester-urethane block terpolymers -----	540

Subject

Reference No.

H - Continued

Heat aging - Continued	
of polyester-urethanes -----	518
Heat capacity of glass-resin laminates -----	587
Heat Distortion	
of glass-fiber-reinforced polyesters -----	334
of poly(ester acrylates) -----	387
of poly(4-methylpentene-1) -----	201
Heat combustion	
of poly(vinyl chloride) -----	56
of sealing materials -----	56
Heat of decomposition -----	259
Heat of fusion, of polypropylene by differential thermal analysis -----	182
Heats of melting of polyamides -----	500
Heats of melting of polypropylene -----	500
Hexafluoropropylene/perfluoroheptene-1 copolymers -----	268
Hexafluoropropylene/tetrafluoroethylene copolymers -----	268, 321, 322
Hexafluoropropylene/vinylidene fluoride copolymers -----	321, 322, 696
Hexamethylene sulfone polymers -----	653
Hydrolysis of polycarbonates -----	326
Hydrolytic stability of poly(acylhydrazones) -----	559
8-Hydroxyquinoline-formaldehyde polymers -----	584

I

Ignition, spontaneous, of polymeric dusts -----	126
Incombustible rubber -----	657
Indices of thermal stability -- -----	22, 540, 565
Infrared spectra of polyesters -----	341
Infrared studies -----	32, 202, 295, 428
of chlorinated polypropylene before and after thermal degradation -----	253
of chlorotrifluoroethylene/vinylidene fluoride degradation -----	271
of copolymer degradation -----	671
of copolymer thermal oxidation -----	666
of degradation of phenolics -----	438
of degraded polyethylene -----	159, 163
of degraded polypropylene -----	159, 172
of epoxide degradation -----	419
of ion-exchange resin degradation products -----	646
of phenol-formaldehyde coloration -----	455
of phenol-formaldehyde oxidation -----	444-445-458
of polyacrylonitrile heat treatment -----	478
of polyacrylonitrile oxidation -----	351, 475, 481
of polybutene oxidation -----	193
of polycaprolactam oxidation -----	488
of polycarbonate degradation -----	329, 330
of polychlorotrifluoroethylene degradation -----	271
of poly(ethyl acrylate) oxidation -----	350, 351
of polyethylene degradation -----	99, 125
of polyethylene oxidation -----	136

Subject

Reference No.

I - Continued

Infrared studies - Continued	
of poly(ethylene terephthalate) degradation ----- products	353
of poly(methyl vinyl ketone) degradation -----	469
of poly(oxymethylene) degradation -----	412
of polypropylene oxidation -----	145, 164, 186
of polypyromellitimide degradation -----	527
of poly(vinyl alcohol) degradation -----	462
of poly(vinyl chloride) pyrolysis products -----	283
of residues on carbonization -----	278
cf resol-butyril degradation -----	690
of silicone degradation products -----	617
of 2,4,6-triallyloxypyrimidine polymerization -----	555
Inhibitors	
of polypropylene oxidation -----	156, 178
of poly(vinyl chloride) thermal degradation -----	285
of thermal dehydrochlorination, of poly(vinyl chloride) -----	300
Initiation, mechanism of, in thermal degradation -----	16
Instrumentation	
for determination of mechanical stability at elevated temperatures -----	57
for thermal degradation studies -----	372
for thermal stability determination -----	69
thermal degradation -----	115
thermogravimetric analysis -----	54, 399
Ion-exchange resins -----	643, 646
Ion-exchange resins, thermal stability of -----	644
Ionizing radiation, effect on thermal stability of polyethylene -----	135
Iron chelate polymers -----	583
Iron chelates of 8-hydroxyquinoline-formaldehyde polymers -----	584
Iron containing chelate polymers -----	576
Iron coordination polymers -----	575
Irradiation, and degradation of polypropylene -----	161
Irradiation, effect on thermal degradation rate	
of polytetrafluoroethylene -----	264
of polytrifluoroethylene -----	264
of poly(vinyl fluoride) -----	264
of poly(vinylidene fluoride) -----	264
Irradiation of polyethylene -----	121
Irradiation of poly(oxymethylene) -----	415
Isobutylene/isoprene vulcanizates -----	660
Isotactic	
polybutene-1 -----	189
poly(butene-1), oxidation of, in solution -----	105
poly(dimethylstyrene) -----	87
poly(p-fluorostyrene) -----	87
poly(methylstyrene) -----	87
polypropylene -----	123, 132, 145, 149, 164, 169, 170, 172, 174, 178, 179, 182, 367

<u>Subject</u>	<u>Reference No.</u>
I - Continued	
Isotactic - Continued	
polypropylene, oxidation of, in solution -----	105
Isoteniscope -----	571
K	
Kel-F -----	670
Kel-F elastomer -----	254
Kinetics, of chain-end-initiated degradation -----	369
Kinetics of decomposition of polypropylene peroxides ----	155
Kinetics of degradation	
from thermogravimetric analysis curves -----	14
from thermogravimetric analysis data -----	13
of cellulose -----	702
of poly(2,2'-(m-phenylene)-5,5'-bibenzimidazole) ---	513
of poly(methyl methacrylate) -----	24
of poly(oxymethylene) -----	413
of polystyrene -----	24
of polytetrafluoroethylene -----	14, 24
theory of -----	24, 25, 28
Kinetics of dehydrochlorination	
of poly(vinyl chloride) -----	309
of vinyl chloride/vinylidene chloride copolymers ---	309
Kinetics of epoxide degradation -----	28
Kinetics of hydroperoxide decomposition in oxidized polypropylene -----	150
Kinetics of oxidation	
of p-divinylbenzene/ethylstyrene copolymers -----	659
of polybutadiene -----	210
of vinyl polymers -----	60
Kinetics of oxidative degradation	
of polyethylene -----	132
of polyisobutylene -----	132
of polypropylene -----	132
Kinetics of poly(methyl methacrylate) -----	369
Kinetics of thermal degradation -----	1, 17, 30, 42, 258
of acetylated polyformaldehyde -----	400
of block copolymers -----	545
of chlorinated polypropylene -----	252
of chlorosulfonated polyethylene -----	320
of cis,cis-1,5-cyclooctadiene/sulfur dioxide copolymer -----	652
of epoxides -----	424
of epoxy-phenolic resins -----	434
of octamethylcyclotetrasiloxane -----	466
of polyamides -----	494
of polycarbamates -----	564
of poly(4-chloroperfluoro-1,6-heptadiene -----	315
of polyethylene -----	137
of poly(ethylene oxide) -----	416
of poly(ethylene terephthalate) -----	338, 361
of polyformaldehyde -----	400, 402, 403

Subject

Reference No.

K - Continued

Kinetics of thermal degradation - Continued	
of poly(hexafluoropropylene) -----	315
of polyisobutylene -----	197
of polyisobutyraldehyde -----	395
of poly(methyl methacrylate) -----	365, 368, 370, 379
of poly(oxymethylene) -----	392, 393
of poly(perfluoroheptene) -----	315
of polypropylene -----	180
of polystyrene -----	76
of polyterephthalates containing branched glycerol units -----	338
of polytetrafluoroethylene -----	261, 263, 266, 267, 466
of poly(trifluorovinyl phenyl ether) -----	315
of polyurethanes -----	545
of poly(vinyl chloride) -----	283, 293, 294, 302, 303
of tetrafluoroethylene/trifluoronitrosomethane copolymers -----	667
of trifluorochloroethylene/vinylidene fluoride copolymers -----	669
theory -----	29
Kinetics of thermal oxidation	
of acetylated polyformaldehyde -----	400
of acrylonitrile/butadiene copolymers -----	666
of Kel-F elastomer -----	254
of melamine-formaldehyde resins -----	672
of phenolics -----	438
of polybutadiene -----	209
of polyethylene -----	122
of polyformaldehyde -----	389, 400, 404
of polypropylene -----	164, 170, 186
of rubber in solution -----	235

L

Ladder polymer, TGA of -----	473
Light, destruction of poly(vinyl chloride) by -----	9
Light scattering, study of polystyrene oxidation by -----	82

M

Magnetic susceptibility of degradation residues -----	297
Maleic anhydride resin -----	385
Manometric measurement of evolved gases -----	403
Mass spectrometry -----	383, 428, 668, 691
Mass spectrometry of poly(ethylene terephthalate) degradation products -----	353
Material balance for degradation products -----	45
Mechanical behavior and thermal treatment of siloxane polymers -----	622

<u>Subject</u>	<u>Reference No.</u>
M - Continued	
Mechanical properties	
and degradation of polyamides -----	486
and degradation of polyethylene -----	107
and degradation of rubber -----	237
and oxidation of nitrile rubber -----	251
Mechanical properties and thermal degradation	
of poly(methyl methacrylate) -----	367
of polypropylene -----	367
of polystyrene -----	367
of polytetrafluoroethylene -----	367
of poly(vinyl chloride) -----	277, 367
Mechanical properties as a function of temperature	
for epoxy resin/glass cloth -----	589
for phenolic resin/asbestos mat -----	589
for polyester resin/glass cloth -----	589
Mechanical properties at elevated temperatures	
of acrylic laminates -----	447
of alkyd molding resins -----	447
of carbon fiber composites -----	447
of epoxy-phenolic preparations -----	447
of isobutylene/isoprene vulcanizates -----	660
of phenolic laminates -----	447
of phenolics -----	451
of silicone laminates -----	447
of silicones -----	451
of silicone vulcanizates -----	660
of vinylidene fluoride/hexafluoropropylene vulcanizates -----	660
Mechanical properties of adhesive at high temperatures --	34
Mechanical properties of chelate polymers -----	573
Mechanical properties of compositions reinforced with pyrolyzed fiber -----	61
Mechanical properties of degraded polyacrylonitrile -----	476
Mechanical properties of glass-reinforced resins -----	585
Mechanical properties of heat treated silicone-asbestos laminates -----	608
Mechanical properties of laminates -----	606
Mechanical properties of paper epoxy -----	429
Mechanical properties of polycarbonates -----	324
Mechanical properties of poly(dimethylsiloxane) -----	603
Mechanical properties of polyesters -----	335
Mechanical properties of polyimides -----	523
Mechanical properties of poly(vinylmethylsiloxane) -----	603
Mechanical shear studies -----	295
Mechanical stability as a function of temperature -----	57
Mechanism of antioxidant action -----	234
Mechanism of degradation	
of ethylene bis(N-phenylcarbamate) -----	561
of phenol-formaldehyde -----	445
of polypyromellitimides -----	530
Mechanism of initiation of thermal degradation -----	16
Mechanism of oxidation of polyamides -----	493

<u>Subject</u>	<u>Reference No.</u>
M - Continued	
Mechanism of thermal degradation	
of copolymers -----	688
of epoxides -----	431
of Kel-F -----	670
of poly(alkyl methacrylate) -----	373
of polycaprolactam -----	489
of polyenanthamide -----	489
of polyethylene -----	120, 123
of poly(ethylene oxide) -----	123, 416
of polyformaldehyde -----	391
of polyisobutylene -----	123
of poly(isopropyl methacrylate) -----	364
of polypropylene -----	120, 123
of polystyrene -----	123
of poly(vinyl chloride) -----	303, 689
of silicones -----	617
of vinyl acetate/vinyl chloride copolymers -----	689
Mechanism of thermal oxidation -----	12
Mechanism of thermal oxidation of polyacrylonitrile -----	475
Mechanism of thermal oxidation of polyformaldehyde -----	409
Mechanothermal degradation of polyethylene -----	110
Melamine -----	443
Melamine-formaldehyde resins -----	672
Melamine, sulfamide, formaldehyde polymers -----	640
Melting point	
by DTA -----	19, 31, 46, 148, 192
of polyamides by DTA -----	492
of polyethylene by DTA -----	133
Melt rheology of polypropylene -----	187
Melt viscosity studies -----	295
Methacrylamide/methyl methacrylate copolymers -----	688
Methacrylic acid/methyl methacrylate copolymers -----	688
Methacrylic esters, phosphorus containing -----	597
Methyl acrylate/methyl methacrylate copolymers -----	682
Methylcellulose -----	691
Methyl α -cyanoacrylate/methyl methacrylate copolymers ---	700
Methyl α -cyanoacrylate/methylstyrene copolymers -----	700
Methyl α -cyanoacrylate/styrene copolymers -----	700
Methyl α -cyanoacrylate/vinyltoluene copolymers -----	700
Methyl methacrylate/norbornadiene copolymer -----	250
Methyl methacrylate/octafluorocyclohexa-1,3-diene copolymers -----	321, 322
Methyl methacrylate/stearyl methacrylate copolymer -----	691
Methyl methacrylate/styrene copolymer -----	683
Methyl methacrylate/vinyl chloride copolymers -----	298, 675
4-Methyl-1-pentene/1-pentene copolymers -----	668
α -Methylstyrene/styrene copolymer -----	78, 88
Mineral additives, effect on phenol-formaldehyde stability -----	448
Model compounds of poly(vinyl chloride) -----	304, 305
Moisture absorption of ion-exchange resin degradation products -----	646

Subject

Reference No.

M - Continued

Molecular weight and degradation -----	23
of acrylonitrile/styrene copolymer -----	679
of polycarbonates -----	327
of polypropylene -----	153, 154
Molecular weight and processing of polypropylene -----	187
Molecular weight distribution of degraded polymers -----	547
Molecular weight of degraded polyformaldehyde -----	396
Molecular weight of degraded poly(phenylene sulfide) ----	651
Molecular weight of degraded residues of poly(methyl acrylate) -----	381
Molecular weight of polyisobutylene during degradation --	197
Morphology and oxidation of polyethylene -----	90, 101

N

Nairit -----	312, 657
Neoprene -----	217, 233
Neoprene Rubber -----	221
Nickel chelate polymers -----	583
Nickel chelates of 8-hydroxyquinoline-formaldehyde polymers -----	584
Nickel containing chelate polymers -----	576
Nickel coordination polymers -----	575
Nitrile rubber -----	251
Nitrogen, degradation under -----	22, 563
of acrylonitrile/styrene copolymers -----	679
of anthracene-phenol-formaldehyde resins -----	449
of aromatic polysulfonates -----	649
of bis(imidazolato)-metal polymers -----	581
of chlorosulfonated polyethylene -----	320
of chlorotrifluoroethylene/vinylidene fluoride copolymers -----	271
of ethylene bis(N-phenylcarbamate) -----	561
of polyacrylonitrile -----	476
of polybenzoxazoles -----	516
of polychlorotrifluoroethylene -----	271
of polydimethylsiloxane -----	618, 619
of poly(M-diethynylene benzene) -----	202
of polyethylene -----	106, 115
of poly(hexamethyleneadipamide) -----	483
of polymers from sulfamide -----	648
of poly(methyl methacrylate) -----	75
of poly(α -methylstyrene) -----	88
of polypropylene -----	106
of polyquinoxalines -----	535, 537
of polystyrene -----	75
of poly-s-triazinylene imides -----	562
of polyurethanes -----	541
of poly(vinyl chloride) -----	303
of rubber -----	214
of sulfamide, melamine, formaldehyde polymers -----	640
Nitrogen dioxide, thermal degradation of polyethylene under -----	114

SubjectReference No.

N - Continued

NMR studies	
in oxidation of rubber -----	222, 245
in thermal degradation rubber -----	246
of polycarbonate degradation -----	329, 330
Norbornadiene/styrene copolymer -----	250
Norbornadiene/vinyl acetate copolymer -----	250

O

Octafluorobutylene/tetrafluoroethylene copolymers -----	268
Octafluorocyclohexa-1,3-diene/1,1,2-trifluorobutadiene copolymers -----	321, 322
Octafluorocyclohexa-1,3-diene/vinyl-n-butyl ether copolymers -----	321, 322
Octamethylcyclotetrasiloxane -----	446
Octamethylene sulfone polymers -----	653
Odor formation in polyethylene -----	130
Organometallic polymers -----	656
Osmometry of degraded fluorine containing polymers -----	317
Osmotic pressure in polyisobutylene degradation -----	197
Oxidation	
of butadiene/styrene copolymers -----	220
of p-divinylbenzene/p-ethylstyrene copolymers -----	659
of nitrile rubber -----	251
of polybutadiene -----	210, 211
of polyethylene -----	93, 96, 118, 142
of polyethylene by NO ₂ -----	113
of polypropylene -----	156
of poly(vinyl alcohol) -----	460
Oxidative crystallation	
of polyethylene -----	112
of polymethylene -----	112
Oxidative degradation	
instrumentation -----	64
of acetylated polyformaldehyde -----	400
of acrylonitrile/butadiene copolymers -----	666
of aluminum containing polymers -----	626
of anthracene-phenol-formaldehyde resins -----	449
of aromatic polyimides -----	521
of butadiene/neoprene copolymers -----	633
of butadiene/octafluorocyclohexa-1,3-diene copolymer -----	322
of butadiene/styrene copolymers -----	633, 687
of chelates -----	574
of chlorinated phenyl silicones -----	635
of chloroprene/octafluorocyclohexa-1,3-diene copolymers -----	322
of chlorotrifluoroethylene/vinylidene fluoride copolymers -----	271, 322
of epoxide resins -----	337, 426
of epoxides -----	436
of epoxy-phenolic resins -----	434

Subject

Reference No.

Q - Continued

Oxidative degradation - Continued

of ethylene/octafluorocyclohexa-1,3-diene copolymers -----	322
of ethylene/propylene copolymers -----	119, 183, 633
of fluorinated silicone polymers-----	322
of fluorine containing polymers -----	317
of formaldehyde-salicylaldehyde chelates -----	580
of formaldehyde-salicylaldehyde polymers -----	580
of hexafluoropropylene/tetrafluoroethylene copolymers -----	322
of hexafluoropropylene/vinylidene fluoride copolymers -----	322, 696
of irradiated polyethylene -----	135
of Kel-F elastomer -----	254
of melamine -----	443
of melamine-formaldehyde resins -----	672
of methyl methacrylate/octafluorocyclohexa-1,3-diene copolymers -----	322
of modified poly(dimethylsiloxane) -----	616
of octafluorocyclohexa-1,3-diene/1,1,2-trifluorobutadiene copolymers -----	322
of octafluorocyclohexa-1,3-diene/vinyl-n-butyl ether copolymers -----	322
of phenol-formaldehyde -----	445
of phenol-formaldehyde polymers -----	444, 458
of phenol-formaldehyde resin -----	442
of phenolic resins -----	49
of phenolics -----	436, 438, 443
of phosphonitrilic chlorides -----	49
of phthalocyanine-crosslinked poly(vinylphthalic acid) -----	658
of polyacetals -----	313
of polyacrylonitrile -----	313, 351, 475, 481
of poly(acylhydrazones) -----	559
of polyamides -----	313, 486, 487, 490, 493
of polyarylates -----	384
of polybenzoxazoles -----	516
of polybenzyl -----	443
of poly(α,α' -bis(chloromethyl)- β -propiolactone) -----	323
of polybutadiene -----	209
of polybutenes -----	105, 193
of polycaprolactam -----	487, 488
of polycaproamide -----	493
of polycarbonates -----	325, 328, 330, 332, 337, 443
of poly-1-chloro-1,2-difluoroethylene -----	322
of polychloroprene -----	255, 322
of polychlorotrifluoroethylene -----	271, 322
of poly(dimethylsiloxane) -----	618, 619, 623, 634
of polyenanthamide -----	495
of polyenes -----	260

Subject

Reference No.

U - Continued

Oxidative degradation - Continued

of polyesters -----	49
of polyester-urethane block terpolymers -----	540
of poly(ethyl acrylate) -----	183, 350, 351
of polyethylene -----	90, 97, 101, 105, 106, 111, 112, 115, 119, 122, 127, 128, 132, 134, 136, 137, 138, 159, 313
of poly(ethylene oxide) -----	417
of poly(ethylene terephthalate) -----	355
of polyformaldehyde -----	389, 396, 397, 400, 401, 404, 405, 409
of poly(hexafluoropentylene adipate) -----	322
of poly(hexafluoropentylene adipate/isophthalate) --	322
of poly(hexamethylenesbacamide) -----	487
of polyimides -----	520, 522, 523
of polyisoprene -----	212
of polymers based on bis(nitrosoacetyl) benzidine --	570
of poly(3-methylbutene-1) -----	203
of polymethylene -----	111
of poly(methyl methacrylate) -----	75
of poly(methylphenylsiloxanes) -----	625
of poly(octafluorohexylene fumarate) -----	322
of poly(octafluorohexylene terephthalate) -----	322
of polyorganosiloxanes -----	628
of poly(oxymethylene) -----	406
of polyphenylenebenzimidazoles -----	509
of poly(2,2'-(m-phenylene)-5,5'-bibenzimidazoles ---	513
of poly(p-phenylene sulfide) -----	645
of poly(phenylenimine) -----	524
of polyphenylsilsesquioxane double chain polymers --	638
of polypropylene -----	105, 106, 119, 128, 132, 145, 146, 147, 149, 150, 153, 157, 158, 159, 161, 163, 164, 169, 170, 176, 178, 179, 181, 183, 186, 313
of polypyromellitimides -----	519, 528, 529, 530
of polyquinoxalines -----	534, 535, 537
of polyspiroacetal resins -----	467
of polystyrene -----	75, 77, 82, 84, 313
of polytetrafluoroethylene -----	322
of poly(tetramethyl-p-silphenylene-siloxane) -----	634
of polythiosemicarbazides -----	574
of polyurethanes -----	541, 633
of poly(vinyl alcohol) -----	461
of poly(vinyl chloride) -----	277, 313
of poly(vinylidene fluoride) -----	322
of poly(4-vinylphthalic acid) -----	658
of rubber -----	159, 215, 222, 229

Subject

Reference No.

O - Continued

Oxidative degradation - Continued

of silicon containing polymers -----	627
of silicones -----	436, 633
of silicon-nitrogen polymers -----	609
of tetrafluoroethylene/trifluoronitrosomethane copolymers -----	322
of tin containing polymers -----	626, 655
of titanium containing polymers -----	626
of trifluoroethylene/trifluoronitrosomethane copolymer -----	322
of trifluorochloroethylene/vinylidene fluoride copolymers -----	684
of urea-formaldehyde -----	443
of vinyl polymers -----	60
of vulcanizates -----	230
review of -----	10, 12
test for polyethylene resistance to -----	97
Oxine-formaldehyde polymers -----	579
Oxygen absorption of rubber -----	244
Oxygen sorption	
by polyethylene -----	128
by polypropylene -----	128, 161
Oxyluminescence	
of polyamides -----	152
of polyethylene -----	152
of polypropylene -----	152

P

Paper epoxy -----	429
Penetration tests -----	57
Perfluoroheptene-1/tetrafluoroethylene copolymers -----	268
Peroxides, formation in polypropylene oxidation -----	158
Phenol-formaldehyde -----	456
Phenol-formaldehyde-novolak type resins -----	662
Phenol-formaldehyde polycondensates -----	444, 445, 458
Phenol-formaldehyde polymers -----	450
Phenol-formaldehyde resins -----	68, 139, 265, 380, 442, 448, 452, 453, 454, 457
Phenol-furfural-formaldehyde novolak-type resin -----	662
Phenol-furfural resins -----	439
Phenolic asbestos laminate -----	446
Phenolic/polyamide copolymers -----	439
Phenolic resin/asbestos mat -----	589
Phenolic resins -----	49
Phenolics -----	13, 421, 436, 438, 439, 440, 441, 443, 447, 451, 457, 459, 630
Phenolic/silane copolymers -----	439
Phenolphthalein condensation polymers -----	345

<u>Subject</u>	<u>Reference No.</u>
P - Continued	
Phenylsilanes -----	630
Phthalocyanine-crosslinked poly(vinylphthalic acid) -----	658
Phosphonitrilic chloride polymers -----	592
Phosphonitrilic chlorides -----	49
Phosphorus compounds for fireproofing plastics -----	602
Phosphorus containing polymers -----	353, 350, 593, 594, 596, 598, 601, 616, 656
Phosphorus flame retardants -----	551
Phosphorus methacrylic esters containing -----	597
Phosphorus polyamides containing -----	484, 485
Photoconductivity of thermally treated polyacrylonitrile- Photomicrography -----	477 191
Pipervlene rubber -----	219
Plasma arc tests on epoxides -----	422
Polyacenaphthylene -----	199
Polyacetaldehyde -----	394
Polyacetals -----	43, 313, 474
Poly(acetylene) -----	206
Polyacrylonitrile -----	43, 83, 278, 313, 351, 475, 476, 477, 478, 479, 480, 481, 482
Poly(acylhydrazones) -----	559
Poly(alkyl methacrylates) -----	373
Poly(allyl terephthalates) -----	691
Poly(aluminumphenylsiloxane) -----	423
Polyamides -----	43, 80, 152, 313, 333, 421, 484, 485, 486, 487, 490, 491, 492, 493, 494, 496, 498, 499, 500, 586
Polyamides containing phosphorus -----	484
Polyarylates -----	349, 384, 450
Polyazines -----	502
Polybenzimidazoles -----	503, 504, 505, 506, 507, 508, 510, 511, 512, 513, 514, 515
Polybenzothiazoles -----	525
Polybenzoxazoles -----	516
Polybenzyl -----	443
Poly(4,4'-biphenyleneoxamide) -----	494
Poly(α,α' -bis(chloromethyl)- β -propiolactone) -----	323
Polybutadiene -----	48, 86, 207, 208, 209, 210, 211, 219, 231, 233, 259
Polybutene-1 -----	105, 174, 188, 189, 191, 192, 193, 194, 195, 196
Poly(butyl acrylate) -----	83
Poly(n-butyl methacrylate) -----	373, 382
Polycaproamide -----	493
Poly(caprolactam) -----	487, 488, 489, 495, 517

SubjectReference No.

P - Continued

Polycarbamates -----	564
Polycarbonates -----	80, 324-332, 443, 691
Polychloral -----	319
Poly-1-chloro-1,2-difluoroethylene -----	321, 322
Poly(4-chloroperfluoro-1,6-heptadiene) -----	315
Polychloroprene -----	231, 255, 256
Polychlorotrifluoroethylene -----	268, 271, 321, 322
Polycyanamide -----	556
Poly(cyanic acid) -----	556
Poly(1,3-cyclohexadiene) -----	204
Polycyclohexyl methacrylate -----	364
Poly(1,4-cyclohexylenedimethylene terephthalate) -----	352
Poly(decamethyleneoxamide) -----	494, 501
Poly(dichlorostyrene) -----	78
Poly(1,2,5,6-diepoxihexane) -----	435
Poly(m-diethynylene benzene) -----	202
Poly(dihydroxyarylenephosphonitrilates) -----	599
Poly(2,6-methyl)-1,4-phenylene oxides -----	697
Poly(dimethylsiloxane) -----	603, 610, 616, 618, 619, 622, 623, 631, 634
Poly(dimethylstyrenes) -----	87
Polydiphenyldiacetylenes -----	205
Polydiphenylsiloxybiphenyl -----	637
Poly(divinylbenzene) -----	659
Polyenanthamide -----	489, 495
Polyenes -----	200, 282
Polyester resin/glass cloth -----	589
Polyesters. -----	43, 49, 313, 333-337, 339-342, 344-349, 436, 542, 598
Polyesters containing phosphorus -----	594
Polyester/styrene copolymers -----	694
Polyester-urethane block terpolymers -----	540
Polyester-urethanes -----	518
Poly(ethyl acrylate) -----	83, 183, 350, 351
Polyethylene -----	19, 43, 86, 89, 90-142, 152, 156, 166, 183, 257, 313, 316, 376, 378, 674
Poly(ethylene oxide) -----	123, 416, 417
Poly(ethylene terephthalates) -----	338, 352, 353, 354, 355, 356
Poly(p-fluorostyrene) -----	87
Polyformaldehyde -----	16, 389-391, 396, 397, 399-405, 409, 410
Poly(hexafluoropentylene adipate) -----	321, 322
Poly(hexafluoropentylene adipate/isophthalate) -----	321, 322
Polyhexafluoropropylene -----	268, 315
Poly(hexahydrobenzaldehyde) -----	394
Poly(hexamethylene adipamide) -----	483, 494, 495
Poly(hexamethyleneoxamide) -----	494, 501

SubjectReference No.P - Continued

Poly(hexamethylenesebacamide) -----	487
Poly(hexamethyleneterephthalamide) -----	494
Polyhydrazides, metal chelates of -----	582
Polyimides -----	269, 520-523, 525, 526, 586
Polyisobutylene -----	123, 132, 197, 198, 259
Polyisobutyraldehyde -----	395
Polyisoprene -----	212, 219, 226, 231, 236
Poly(isopropyl acrylate) -----	364
Poly(isopropyl methacrylate) -----	364
Poly(isopropyl vinyl ketone) -----	472
Poly(methacrylic acid) -----	388
Poly(methacrylic anhydride) -----	364
Poly(methyl acrylate) -----	383
Poly(3-methylbutene-1) -----	203
Poly(methyl α -cyanoacrylate) -----	700
Polymethylene -----	111, 112, 139
Poly(methyl methacrylate) -----	7, 20, 68, 75, 80, 83, 139, 259, 365-381
Poly(4-methylpentene-1) -----	104, 201
Poly(methylphenylsiloxane) -----	423, 588, 610, 625, 629
Poly(methylsiloxane) -----	629
Poly(α -methylstyrene) -----	88
Poly(m-methylstyrene) -----	87
Poly(o-methylstyrene) -----	87
Poly(methyl vinyl ketone) -----	464, 469
Poly(methyl vinylphthalate) -----	386
Poly(monochlorostyrene) -----	78
Poly(naphthenoaluminophenylsiloxanes) -----	615
Polynorbornadiene -----	250
Poly(octafluorohexylene fumarate) -----	321, 322
Poly(octafluorohexylene terephthalate) -----	321, 322
Poly(organoaluminiferrosiloxanes) -----	611
Poly(organoferrosiloxanes) -----	611
Polyorganosiloxanes -----	628
Poly(organostannoxanes) -----	654
Poly(1,3,4-oxadiazoles) -----	566, 567
Poly(2,2'-(4,4'-oxydiphenylene)-5,5'-bibenzimidazole) ---	515
Poly(2,2'-(4,4'-oxydiphenylene)oxy-5,5'-bibenzimidazole -	515
Poly(oxymethylene) -----	390, 392, 393, 398, 406, 409, 411-415, 495
Polyoxymethylene dihydrate -----	408
Polyoxypropylene glycol-toluene diisocyanate polymers ---	547
Poly(perfluoroheptene) -----	315
Poly(2,2'-(perfluorotrimethylene)-5,5'-dibenzimidazole) -	512
Poly(m-phenoxy) -----	446
Poly(phenylacetylene) -----	310
Polyphenylenebenzimidazoles -----	509

<u>Subject</u>	<u>Reference No.</u>
<u>P - Continued</u>	
Poly(2,2'-m-phenylene-5,5'-dibenzimidazole) -----	512, 513
Poly(phenylene-1,3,4-oxadiazole) -----	531
Poly(phenyleneoxamide) -----	494
Poly(phenylene oxides) -----	418
Poly(2,2'-(m-phenylene)oxy-5,5'-bibenzimidazole) -----	515
Poly(phenylene sulfide) -----	645, 651
Poly(phenylenimine) -----	524
Poly(phenylferrosiloxanes) -----	611
Polyphenylpyrazoles -----	532
Polypehnyls -----	204
Poly(phenylsiloxane) -----	629
Polyphenylsilsesquioxane double chain polymers -----	638
Polyphosphenates -----	595
Poly(phosphine oxides) -----	595
Polyphthalocyanines -----	533
Polypropylene -----	19, 20, 43, 105, 106, 119, 120, 123, 126, 128, 132, 139, 143- 154, 156-187, 313, 333, 367, 500, 681
Polypropylene peroxides -----	155
Polypyromellitimides -----	519, 527-530
Polyquinoxalines -----	525, 534-537
Poly(N-salicylidenevinylamine) chelates -----	583
Poly(sec-butyl methacrylate) -----	364
Poly-Schiff bases -----	558
Polysilanes, cyclic -----	613
Polysiloxanes -----	614
Polyspiroacetal resins -----	467
Polystyrene -----	68, 69, 74-84, 123, 139, 259, 313, 367, 378, 380, 681, 695
Polystyrene containing metals -----	85
Polysulfide polymers -----	639
Polysulfonates -----	649, 650, 653
Polysulfone of norbornene -----	650
Poly(sulfophenylenequinones) -----	642
Polyterephthalates containing branched glycerol units ---	338
Poly(tert butyl methacrylate) -----	373, 388
Polytetrafluoroethylene -----	14, 17, 29, 30, 257- 269, 316, 321, 322, 333, 367, 376, 378, 446, 604
Poly(tetramethyl-p-silphenylene-siloxane) -----	634
Polythiazoles -----	538
Polythiazolothiazoles -----	525
Poly-s-triazinyleneimides -----	562
Poly(trichloroacetaldehyde) -----	394
Poly(trifluorochloroethylene) -----	270
Poly(trifluoroethylene) -----	264, 268, 272, 273
Poly(trifluorovinyl phenyl ether) -----	315
Poly(2,2'-trimethylene-5,5'-dibenzimidazoles) -----	512

<u>Subject</u>	<u>Reference No.</u>
<u>P - Continued</u>	
Polyurethanes -----	80, 231, 539, 541-546, 548-552, 633
Polyurethane sulfides -----	560
Poly(vinyl acetate) -----	80, 83, 278, 289, 383
Poly(vinyl alcohol) -----	43, 80, 126, 278, 382, 460-463
Poly(vinylamine) derivatives -----	568
Poly(vinyl carbazole) -----	691
Poly(vinyl chloride) -----	9, 43, 56, 80, 126, 274-303, 306-311, 313, 314, 367, 383, 517, 661, 689
Poly(vinyl chloride), model compounds -----	304
Poly(vinyl cinnamate) -----	691
Poly(vinyl ethers) -----	465
Poly(vinyl fluoride) -----	264, 316
Poly(vinylidene fluoride) -----	264, 316, 321, 322
Poly(vinylmethylsiloxane) -----	603
Poly(vinyl-o-phthalate) -----	691
Poly(vinylphthalic acid) -----	386, 658
Poly(vinylpyridine) -----	553
Poly(m-xylyleneadipamide) -----	496
Poly(m-xylyleneisophthalamide) -----	496
Poly(p-xylylenesebacamide) -----	496
Products of thermal degradation	
of epoxide resins -----	337
of ethylene bis(N-phenylcarbamate) -----	561
of polycarbamates -----	564
of polycarbonates -----	337
of polyesters -----	337
of polysulfones -----	653
of polyurethanes -----	541
Propylene/styrene copolymers -----	681
Pyrolyzed fiber -----	61

R

Radiation degradation of polytetrafluoroethylene -----	262
Radiation degradation of tetrafluoroethylene/tri- fluoronitrosomethane copolymer -----	667
Radiation effects at elevated temperature	
for hexafluoropropylene/perfluoroheptene-1 copolymers -----	268
for hexafluoropropylene/tetrafluoroethylene copolymers -----	268
for octafluorobutylene/tetrafluoroethylene copolymers -----	268
for perfluoroheptene-1/tetrafluoroethylene copolymers -----	268
for polychlorotrifluoroethylene -----	268
for polyhexafluoropropylene -----	268
for polytetrafluoroethylene -----	268

Subject

Reference No.

R - Continued

Radiothermoluminescent studies of polybutadiene -----	207
Radiotracer methods in copolymer degradation -----	688
Rayon -----	61
Rebound, study of rubber degradation by -----	238
Reentry environments, materials stable to -----	36
Resol-butyrals polymers -----	690
Review of fireproofing -----	602
Reviews -----	1, 3-7, 11, 12, 35, 288
Rubber -----	7, 8, 131, 214, 215, 217-220, 222-229, 233, 235, 237-247
Rubber, butyl -----	232

S

SBR-polybutadiene vulcanizates -----	139
Seal materials, elastomeric -----	633
Self-extinguishing	
halogenated epoxide resins -----	318
polyesters -----	336, 348, 598
polystyrene -----	79
Semiconductor properties of heated ferrocene polymers ---	591
Semiconductors, from thermal degradation of	
polyacrylonitrile -----	480
Semiconductors, from thermally treated poly-	
acrylonitrile -----	477
Silicon containing polymers -----	621, 627
Silicene-asbestos laminates -----	608
Silicones -----	421, 436, 447, 451, 607, 617, 620, 630, 633, 636
Silicone vulcanizates -----	660
Silicon-nitrogen polymers -----	609
Silicon oil -----	83
Silicon resins -----	606
Silicon rubber -----	83, 217, 604, 632
Siloxanes -----	605
Solution, degradation in, of poly(methyl methacrylate) --	374
Solution, degradation of polyacrylonitrile in -----	481
Solution, degradation of poly(vinyl chloride) in -----	302
Solution, thermal degradation, of poly(vinyl chloride)	
under -----	303
Space environment, effect on plastics -----	35
Specific heat of poly(ethylene terephthalate) -----	360
Specific heat of vinyl chloride/vinylidene chloride	
copolymers -----	693
Spectrophotometric, analysis of Kel-F degradation	
products -----	670
Spherulites, in polyethylene -----	142
Stabilization	
of poly(dimethylsiloxane) to thermal oxidation ----	623
of poly(vinyl chloride) -----	281, 286

<u>Subject</u>	<u>Reference No.</u>
<u>S - Continued</u>	
Stabilizers	
for polyamides -----	486
for polysulfones -----	650
for poly(trifluorochloroethylene) -----	270
for poly(vinyl chloride) -----	279, 280, 284, 308
for vinyl polymers -----	58
thermal, for poly(vinyl chloride) -----	310
Stereoregular polymers	
of poly(methacrylic acid) -----	388
of poly(tert-butyl methacrylate) -----	388
Stress relaxation	
in rubber at elevated temperature -----	223
of hexafluoropropylene/vinylidene fluoride copolymers -----	696
of poly(dimethylsiloxane) -----	619
Styrene/acenaphthene copolymer -----	78
Styrene/vinylacetophenone copolymer -----	691
Styrene/ β -vinylnaphthalene copolymer -----	78
Sulfamide, melamine, formaldehyde polymers -----	640
Sulfamide polymers -----	647
Sulfamide, polymers from -----	648
Sulfonated polystyrene -----	641, 643
Syndiotactic polypropylene -----	174
<u>T</u>	
Terpolymers -----	248
Ternolymers, polyester-urethane block -----	540
Tetraazopyrene containing polymers -----	563
Tetrafluoroethylene/trifluoronitrosomethane copolymers --	321, 322
Tetramethylene sulfone polymers -----	653
Theory	
for TGA -----	17
kinetics of degradation -----	25, 28, 29
of degradation -----	3, 15
c. energy of chain rupture -----	21
of melting point determination by DTA -----	19
of oxidation inhibition -----	160
of random scission -----	23
of the cage effect -----	267
of thermal degradation of polymers -----	16
Thermal and radiation effects on elastomers -----	213
on polytetrafluoroethylene -----	604
on silicone rubbers -----	604
Thermal conductivity -----	33, 39, 73
of polyethylene -----	378
of poly(methyl methacrylate) -----	378
of polystyrene -----	378
of polytetrafluoroethylene -----	378
Thermal Degradation -----	2, 11, 32, 33, 40, 42, 44, 45, 50, 55, 59, 66, 72, 563

Subject

Reference No.

T - Continued

Thermal degradation - Continued

and gas chromatography -----	51
and mechanical properties of poly(methyl methacrylate) -----	367
and mechanical properties of polypropylene -----	367
and mechanical properties of polystyrene -----	367
and mechanical properties of polytetrafluoroethylene -----	367
and mechanical properties of poly(vinyl chloride) --	367
and structure of polymers -----	53
in molding poly(methyl methacrylate) -----	366
instrumentation -----	67
instrumentation for, of polyethylene -----	109
of acetaldehyde/formaldehyde copolymers -----	676
of acetal resins -----	80
of acetylated polyformaldehyde -----	400
of acetylated poly(oxymethylene) -----	411
of acrylic coating resins -----	70
of acrylonitrile/methyl vinyl ketone copolymers ----	469
of acrylonitrile/norbornadiene copolymers -----	250
of acrylonitrile/styrene copolymers -----	671, 679, 680, 682, 683
of aluminum chelates of 8-hydroxyquinoline-formaldehyde polymers -----	584
of aluminum containing polymers -----	614
of anthracene-phenol-formaldehyde resins -----	449
of aromatic polysulfonates -----	649
of asbestos felt reinforced plastics -----	630
of azulene containing polymers -----	565
of benzborimidazoline polymers -----	554
of benzyl cellulose -----	83
of 4,4'-bis(diazoniobiphenyl) difluoro polymers -----	5
of bis(2-hydroxy-3,5-dimethylbenzyl ether) -----	40
of bis(imidazolac)-metal polymers -----	581
of block copolymers -----	88, 545
of boron containing polymers -----	571
of boron-silicon polymers -----	621
of bovine serum albumin -----	139
of bromine containing epoxide resins -----	427
of butadiene/octafluorocyclohexa-1,3-diene copolymer -----	321
of butadiene/styrene copolymer -----	231, 233
of butyl rubber -----	216, 217, 231, 233
of cellulose -----	83, 702
of cellulose acetate -----	83, 701
of cellulose acetatebutyrate -----	83
of cellulose acetate glutarate -----	691
of cellulose acetate maleate -----	691
of cellulose acetate 3-nitrophthalate -----	691
of cellulose hexahydrophthalate -----	691
of cellulose nitrate -----	382
of cellulose phthalate -----	691

Subject

Reference No.

T - Continued

Thermal degradation - Continued

of chelate polymers -----	577, 584
of chelates of oxine-formaldehyde polymers -----	579
of chlorinated atactic polypropylene -----	295
of chlorinated phenolics -----	439
of chlorinated phenyl silicones -----	635
of chlorinated polypropylene -----	252, 253
of chloroprene/octafluorocyclohexa-1,3-diene copolymer -----	321
of chlorosulfonated polyethylene -----	315
of chlorotrifluoroethylene/vinylidene fluoride copolymers -----	271, 321
of cis,cis-1,5-cyclooctadiene/sulfur dioxide copolymer -----	652
of cobalt containing chelate polymers -----	576
of copolymers -----	557, 697
of coumerone/indene copolymer -----	691
of cyclopolymers of 1,6-heptadiene -----	249
of cyclopolymers of 1,5-hexadiene -----	249
of cyclopolymers of methyl-1,5-hexadiene -----	249
of epoxide resins -----	28, 337, 427
of epoxides -----	419-422, 424, 431, 432, 437, 450, 630
of epoxy-phenolic resins -----	434
of ethyl cellulose -----	83
of ethylcellulose phthalate -----	691
of ethylcellulose succinate -----	691
of ethylene bis(N-phenylcarbamate) -----	561
of ethylene/ethyl acetate copolymers -----	678
of ethylene/ethyl acrylate copolymers -----	673, 699
of ethylene/methyl acrylate copolymers -----	673, 699
of ethylene/methyl methacrylate copolymers -----	673, 699
of ethylene/octafluorocyclohexa-1,3-diene copolymer-	321
of ethylene oxide/styrene block copolymers -----	692
of ethylene terephthalate/ethylene isophthalate copolymer -----	358
of ethylene/vinyl acetate copolymers -----	673, 678, 699
of fluorinated silicone polymers -----	321
of formaldehyde/styrene copolymers -----	695
of formaldehyde/sulfamide polymers -----	647
of furfuryl alcohol resins -----	470, 471
of glass reinforced plastics -----	630
of glyoxal polymers -----	407
of halogenated poly(phenylene oxide) -----	418
of hexafluoropropylene/tetrafluoroethylene copolymers -----	258
of hexafluoropropylene/vinylidene fluoride copolymers -----	321
of 8-hydroxyquinoline-formaldehyde polymers -----	584
of ion-exchange resins -----	643, 646
of iron chelates of 8-hydroxyquinoline-formaldehyde polymers -----	584

Subject

Reference No.

T - Continued

Thermal degradation - Continued

of iron containing chelate polymers -----	576
of isobutylene/isoprene vulcanizates -----	660
of Kel-F type elastomers -----	670
of maleic anhydride resin -----	385
of metal chelates -----	578, 582
of methacrylamide/methyl methacrylate copolymers ---	688
of methacrylic acid/methyl methacrylate copolymers -	688
of methyl acrylate/methyl methacrylate copolymers --	682
of methyl cellulose -----	83, 691
of methyl α -cyanoacrylate/methyl methacrylate -----	700
of methyl α -cyanoacrylate/methylstyrene copolymers -	700
of methyl α -cyanoacrylate/styrene copolymers -----	700
of methyl α -cyanoacrylate/vinyltoluene copolymers --	700
of methyl methacrylate/norbornadiene copolymer -----	250
of methyl methacrylate/octafluorocyclohexa-1,3- diene copolymer -----	321
of methyl methacrylate/styrene block copolymers ----	692
of methyl methacrylate/vinyl chloride copolymers ---	675
of 4-methyl-1-pentene/1-pentene copolymers -----	668
of α -methylstyrene/styrene block copolymers -----	692
of α -methylstyrene/styrene copolymer -----	78, 88
of methyl methacrylate/styrene copolymer -----	683
of model compounds -----	304, 305
of natural rubber -----	214, 238
of neoprene -----	217, 233
of neoprene rubber -----	221
of nickel chelates of 8-hydroxyquinoline- formaldehyde polymers -----	584
of nickel containing chelate polymers -----	576
of norbornadiene/styrene copolymer -----	250
of norbornadiene/vinyl acetate copolymer -----	250
of octamethylcyclotetrasiloxane -----	466
of octafluorocyclohexa-1,3-diene/1,1,2-trifluoro- butadiene copolymer -----	321
of octafluorocyclohexa-1,3-diene/vinyl n-butyl ether copolymer -----	321
of oxine-formaldehyde polymers -----	579
of partial ladder polymer -----	473
of (2,2'-(perfluorotrimethylene)-5,5'-dibenzi- midazole) -----	512
of phenol-formaldehyde-novolak type resin -----	662
of phenol-formaldehyde polymers -----	450
of phenol-formaldehyde resins -----	68, 139, 380, 448, 452, 453, 454
of phenol-furfural-formaldehyde novolak-type resin -	662
of phenol-furfural resins -----	439
of phenolic/polyamide copolymers -----	439
of phenolic resins -----	49
of phenolics -----	421, 437, 439-441, 457, 630
of phenolic/silane copolymers -----	439

Subject

Reference No.

T - Continued

Thermal degradation - Continued

of phenolphthalein condensation polymers -----	345
of phenylsilanes -----	630
of phosphonitrilic chloride polymers -----	592
of phosphonitrilic chlorides -----	49
of polyacetaldehyde -----	394
of polyacetals -----	474
of poly(acetylene) -----	206
of polyacrylonitrile -----	83, 278, 476-480, 482
of poly(acylhydrazones) -----	559
of poly(alkyl methacrylate) -----	373
of poly(allyl terephthalate) -----	691
of polyamides -----	80, 333, 421, 486, 490, 491, 494, 496, 499
of polyarylates -----	450
of polyazines -----	502
of polybenzimidazoles -----	505-508, 512, 514
of polybenzoxazoles -----	516
of poly(α,α' -bis(chloromethyl)- β -propiolactone) ----	323
of polybutadiene -----	86, 231, 233, 259
of poly(butyl acrylate) -----	83, 373
of poly(n-butyl methacrylate) -----	382
of polycarbamates -----	564
of polycarbonates -----	80, 325-327, 329-332, 691
of polycaprolactam -----	489
of polychloral -----	315
of poly-1-chloro-1,2-difluoroethylene -----	321
of poly(4-chloroperfluoro-1,6-heptadiene) -----	315
of polychloroprene -----	255, 256
of polychlorotrifluoroethylene -----	271, 321
of polycyanamide -----	556
of poly(cyanoic acid) -----	556
of poly(cyclohexyl methacrylate) -----	364
of poly(decamethyleneoxamide) -----	501
of poly(dichlorostyrene) -----	78
of poly(m-diethynylene benzenes) -----	202
of poly(2,6-dimethyl)-1,4-phenylene oxides -----	697
of poly(dimethylsiloxane) -----	610, 618, 619
of poly(dimethylstyrenes) -----	87
of polydiphenyldiacetylenes -----	205
of polydiphenylsiloxybiphenyl -----	637
of polyenanthamide -----	489-495
of polyesters -----	49, 333, 335, 337, 339, 340, 342, 345, 347, 349
of polyester-urethanes -----	518
of poly(ethyl acrylate) -----	83
of polyethylene -----	86, 94, 95, 98, 99, 106, 110, 114-116, 120, 121, 124, 125, 129, 137, 138, 316, 376

Subject

Reference No.

T - Continued

<u>Subject</u>	<u>Reference No.</u>
Thermal degradation - Continued	
of poly(ethylene oxide) -----	123, 416
of poly(ethylene terephthalate) -----	338, 353, 354, 361-363
of poly(p-fluorostyrene) -----	87
of polyformaldehyde -----	16, 389, 390, 391, 399, 400, 402, 403, 405, 410, 411
of poly(hexafluoropentylene adipate) -----	321
of poly(hexafluoropentylene adipate/isophthalate) --	321
of poly(hexafluoropropylene) -----	315
of poly(hexahydrobenzaldehyde) -----	394
of poly(hexamethylene adipamide) -----	483
of poly(hexamethylene oxamide) -----	501
of polyimides -----	522
of polyisobutylene -----	123, 197, 259
of polyisobutyraldehyde -----	395
of polyisoprene -----	226, 231
of poly(isopropyl acrylate) -----	364
of poly(isopropyl methacrylate) -----	364
of poly(isopropyl vinyl ketone) -----	472
of polymers from sulfamide -----	648
of poly(methacrylic anhydride) -----	364
of poly(methyl acrylate) -----	383
of poly(3-methylbutene-1) -----	203
of poly(methyl α -cyanoacrylate) -----	700
of polymethylene -----	139
of poly(methyl methacrylate) -----	7, 24, 68, 75, 80, 83, 139, 259, 365, 368, 370-376, 379-381
of poly(methylphenylsiloxane) -----	629
of poly(methylsiloxane) -----	629
of poly(methylstyrenes) -----	87
of poly(α -methylstyrene) -----	88
of poly(methyl vinyl ketone) -----	469
of poly(methyl vinylphthalate) -----	386
of poly(methylvinylsiloxane) -----	610
of poly(monochlorostyrene) -----	78
of poly(octafluorohexylene fumarate) -----	321
of poly(octafluorohexylene terephthalate) -----	321
of poly(organostannoxanes) -----	654
of poly(1,3,4-oxadiazoles) -----	566, 567
of poly(oxymethylene) -----	392, 393, 398, 408, 411-413, 695
of polyoxypropylene glycol-toluene diisocyanate polymers -----	547
of poly(perfluoroheptene) -----	315
of poly(m-phenoxy) -----	466
of poly(2,2'-m-phenylene-5,5'-dibenzimidazole) -----	512, 513
of poly(p-phenylene-1,3,4-oxadiazole) -----	531
of poly(phenylene sulfide) -----	651
of poly(p-phenylene sulfide) -----	645

Subject

Reference No.

T - Continued

Thermal degradation - Continued

of poly(phenylenimine) -----	524
of polyphenylpyrazoles -----	532
of poly(phenylsiloxane) -----	629
of polyphenylsilsesquioxane double chain polymers --	638
of polyphthalocyanines -----	533
of polypropylene -----	106, 120, 123, 139, 149, 153, 154, 163, 172, 173, 176, 177, 180, 333, 681
of polypyromellitimides -----	519-527-530
of polyquinoxalines -----	534-537
of poly-Schiff bases -----	558
of poly(sec-butyl methacrylate) -----	364
of polysiloxanes -----	614
of polystyrene -----	24, 68, 75, 76, 78, 80, 81, 83, 86, 123, 139, 259, 380, 454, 681, 695
of polystyrene containing metals -----	85
of polysulfide polymers -----	639
of polysulfones -----	653
of poly(sulfophenylenequinones) -----	642
of polyterephthalates containing branched glycerol units -----	338
of poly(tert-butyl methacrylate) -----	373
of polytetrafluoroethylene -----	14, 24, 29, 30, 258, 259, 261, 264, 267, 316, 321, 333, 376, 466
of polythiazoles -----	538
of poly-s-triazinyleneimides -----	562
of poly(trichloroacetaldehyde) -----	394
of polytrifluoroethylene -----	264, 272, 273
of poly(trifluorovinyl phenyl ether) -----	315
of poly(2,2'-trimethylene-5,5'-dibenzimidazole) ----	512
of polyurethanes -----	80, 231, 539, 541, 545, 546, 548, 549, 552
of polyurethane sulfides -----	560
of poly(vinyl acetate) -----	80, 83, 278, 383
of poly(vinyl alcohol) -----	80, 83, 382, 462
of poly(vinyl carbazole) -----	691
of poly(vinyl chloride) -----	9, 80, 275, 276, 278, 281, 283, 284, 285, 287, 289, 291-295, 297, 299, 301, 302, 303, 306, 367, 309, 310, 363, 661, 662
of poly(vinyl cinnamate) -----	691
of poly(vinyl fluoride) -----	264, 316
of poly(vinylidene chloride) -----	297

Subject

Reference No.

T- Continued

Thermal degradation - Continued

of poly(vinylidene fluoride) -----	264, 316, 321
of poly(vinyl-o-phthalate) -----	691
of poly(vinylphthalic acid) -----	386
of poly(vinyl propionate) -----	83
of poly(m-xyleneisophthalamide) -----	496
of poly(p-xylenesebacamide) -----	496
of propylene/styrene copolymers -----	681
of resol-butyril polymers -----	690
of rubber -----	7, 216-218, 226, 227, 233, 239, 241, 246
of rubber in solution -----	235
of SBR-polybutadiene vulcanizates -----	139
of silicon containing polymers -----	622, 627
of silicone oil -----	83
of silicone rubber -----	83, 217, 632
of silicones -----	421, 607, 617, 620, 630
of silicone vulcanizates -----	660
of silicon-nitrogen polymers -----	609
of siloxanes -----	624
of styrene/acenaphthene copolymer -----	78
of styrene/vinylacetophenone copolymer -----	691
of styrene/ β -vinylanthralene copolymer -----	78
of sulfamide, melamine, formaldehyde polymers -----	640
of tetrafluoroethylene/trifluoronitrosomethane copolymer -----	321, 667
of tin containing polymers -----	614
of titanium containing polymers -----	614
of trifluorochloroethylene/vinylidene fluoride copolymer -----	669, 684
of trifluoroethylene/trifluoronitrosomethane copolymer -----	321
of urethan foams -----	551
of vinyl acetate/vinyl chloride copolymers -----	661, 689
of vinyl chloride/vinylidene chloride copolymers ---	309
of vinylidene fluoride/hexafluoropropylene vulcanizates -----	660
of vinylidene fluoride/perfluoropropene copolymer --	315
of zinc chelates of 8-hydroxyquinoline- formaldehyde polymers -----	584
review of -----	10
Thermal diffusivity -----	62
of polyethylene -----	378
of poly(methyl methacrylate) -----	378
of polystyrene -----	378
of polytetrafluoroethylene -----	378
Thermal expansion of poly(ethylene terephthalate) -----	360
Thermal oxidation -----	563
in solution of poly(butene-1) -----	105
in solution of polyethylene -----	105
in solution of polypropylene -----	105

Subject

Reference No.

T - Continued

Thermal oxidation - Continued

of acetylated polyformaldehyde -----	400
of acrylonitrile/butadiene copolymers -----	666
of aluminum containing polymers -----	626
of anthracene-phenol-formaldehyde resins -----	449
of aromatic polyimides -----	521
of butadiene/neoprene copolymers -----	633
of butadiene/octafluorocyclohexa-1,3-diene copolymer -----	322
of butadiene/styrene copolymers -----	633, 687
of chlorinated phenyl silicones -----	635
of chloroprene/octafluorocyclohexa-1,3-diene copolymer -----	372
of chlorotrifluoroethylene/vinylidene fluoride copolymers -----	271, 322
of epoxide resins -----	337, 426
of epoxides -----	436
of epoxy-phenolic resins -----	434
of ethylene/octafluorocyclohexa-1,3-diene copolymer-	322
of ethylene/propylene copolymers -----	119, 183, 633
of fluorine containing polymers -----	317
of fluorinated silicone polymer -----	322
of formaldehyde-salicylaldehyde chelates -----	580
of formaldehyde-salicylaldehyde polymer; -----	580
of hexafluoropropylene/tetrafluoroethylene copolymers -----	322
of hexafluoropropylene/vinylidene fluoride co- polymers -----	322, 696
of irradiated polyethylene -----	135
of Kel-F elastomer -----	254
of melamine -----	443
of melamine-formaldehyde resins -----	672
of methyl methacrylate/octafluorocyclohexa-1,3-diene copolymer -----	322
of modified poly(dimethylsiloxane) -----	616
of octafluorocyclohexa-1,3-diene/1,1,2- trifluorobutadiene copolymer -----	322
of octafluorocyclohexa-1,3-diene/vinyl n-butyl ether copolymer -----	322
of phenol-formaldehyde -----	445
of phenol-formaldehyde polymers -----	444, 458
of phenol-formaldehyde resin -----	442
of phenolics -----	436, 438
of phthalocyanine-crosslinked poly(vinylphthalic acid) -----	658
of polyacrylonitrile -----	351, 475, 481
of poly(acylhydrazones) -----	559
of polyamides -----	486, 487, 493
of polyarylates -----	384
of polybenzoxazoles -----	516
of polybenzyl -----	443
of poly(α,α' -bis(chloromethyl)- β -propiolactone -----	323

Subject

Reference No.

T - Continued

Thermal oxidation - Continued

of polybutadiene -----	209
of polybutene -----	193
of polycaproamide -----	493
of polycaprolactam -----	487, 488
of polycarbonates -----	328, 330, 332, 337, 443
of poly-1-chloro-1,2-difluoroethylene -----	322
of polychloroprene -----	256
of polychlorotrifluoroethylene -----	271, 322
of poly(dihydroxyarylenephosphonitrilates) -----	599
of poly(dimethylsiloxane) -----	618, 6, 623, 634
of polyenanthamide -----	495
of polyesters -----	337, 436
of polyester-urethane block terpolymers -----	540
of poly(ethyl acrylate) -----	183, 351
of polyethylene -----	90, 97, 101, 115, 119, 127, 128, 136, 137, 138, 159
of poly(ethylene oxide) -----	417
of poly(ethylene terephthalate) -----	355
of polyformaldehyde -----	389, 396, 397, 400, 401, 404, 405, 409
of poly(hexafluoropentylene adipate) -----	322
of poly(hexafluoropentylene adipate/isophthalate) --	322
of poly(hexamethylenesbacamide) -----	487
of polyimides -----	520, 522, 523
of polyisoprene -----	212
of polymer based on bis(nitrosoacetyl)benzidine ----	570
of poly(3-methylbutene-1)-----	203
of poly(methyl methacrylate) -----	75
of poly(methylphenylsiloxanes)-----	625
of poly(octafluorohexylene fumarate) -----	322
of poly(octafluorohexylene terephthalate) -----	322
of polyorganosiloxanes -----	628
of poly(oxymethylene) -----	406
of polyphenylenetenzimidazoles -----	509
of poly(2,2'-(m-phenylene)-5,5'-bibenzimidazoles) --	513
of poly(p-phenylene sulfide) -----	645
of poly(phenylenimine) -----	524
of polyphenylsilsesquioxane double chain polymers --	638
of polypropylene -----	119, 128, 145, 146, 149, 153, 157-159, 161, 163, 164, 169, 170, 176, 178, 179, 181, 183, 186
of polypyromellitimides -----	519, 528, 529, 530
of polyquinoxalines -----	534, 535, 537
of polyspiroacetal resins -----	467
of polystyrene -----	75, 77, 82, 84
of polytetrafluoroethylene -----	332
of poly(tetramethyl-p-silphenylene-siloxane) -----	634

Subject

Reference No.

T - Continued

Thermal oxidation - Continued	
of polythiosemicarbazides -----	574
of polyurethanes -----	541, 633
of poly(vinyl alcohol) -----	461
of poly(vinyl chloride) -----	277
of poly(vinylidene fluoride) -----	322
of poly(4-vinylphthalic acid) -----	658
of rubber -----	159, 215, 222, 229
of silicon containing polymers -----	627
of silicon-nitrogen polymers -----	609
of silicones -----	436, 633, 636
of tetrafluoroethylene/trifluoronitrosomethane copolymer -----	322
of tin containing polymers -----	626, 655
of titanium containing polymers -----	626
of trifluorochloroethylene, vinylidene fluoride copolymers -----	684
of trifluoroethylene/trifluoronitrosomethane copolymers -----	322
of urea-formaldehyde -----	443
of vulcanizates -----	230
review of -----	10
Thermal stability -----	18, 63, 59
and elasticity -----	18
indices of -----	22
of adhesives -----	312
of aluminum containing polymers -----	613, 626
of aluminum coordination polymers -----	575
of antimony containing polymers -----	601
of arsenic containing polymers -----	613
of arylene modified siloxanes -----	605
of boron containing polymers -----	572
of brominated epoxides -----	433
of butadiene/dimethylvinylethynylcarbinol co- polymers -----	663
of cellulose nitrate -----	312
of chelates -----	583
of chlorinated poly(vinyl chloride) -----	312
of cyclic polysilanes -----	613
of dimethylvinylethynylcarbinol/isoprene copolymers -----	663
of epoxides -----	432
of filler-rubber systems -----	243
of glass-reinforced organic-resin laminates -----	586
of gutta percha -----	312
of ion-exchange resins -----	644
of iron coordination polymers -----	575
of irradiated poly(dimethylsiloxane) -----	603
of irradiated poly(vinylmethylsiloxane) -----	603
of methyl methacrylate/vinyl chloride copolymers ---	298
of nairit -----	312
of nickel coordination polymers -----	575

Subject

Reference No.

T - Continued

Thermal stability - Continued	
of paper-epoxy	429
of phosphorus containing polymers	601
of polyacetaldehyde	394
of polyamides containing phosphorus	484
of polybenzimidazoles	503, 510, 511, 515
of polyesters	344
of poly(ethylene terephthalate)	357
of poly(ethylene terephthalate) containing phosphorous acid esters	359
of poly(hexahydrobenzaldehyde)	394
of polyimides	526
of poly(2,2'-(4,4'-oxydiphenylene)5,5'-bibenzi- midazole	515
of polyoxymethylene	415
of polyethylene	91
of poly(2,2'-(m-phenylene)oxy-5,5'-bibenzimidazole ..	515
of poly(phenylferrosiloxanes)	611
of polyphosphinates	595
of poly(phosphine oxides)	595
of poly(trichloroacetaldehyde)	394
of poly(vinyl alcohol)	463
of poly(vinylamine) derivatives	568
of poly(vinyl chloride)	274, 288, 298, 300, 311
of rubbers	657
of sulfonated polystyrene	641
of thorium coordination polymers	575
of tin containing polymers	601, 626
of titanium containing polymers	613, 626
of uranium coordination polymers	575
of zinc coordination polymers	575
Thermal stabilization of polyoxymethylene	414
Thermographic studies	
of cellulose acetate	131
of epoxides	131
of polyethylene	131
of rubber	131, 240
Thermogravimetric analysis	32, 139, 525, 563
and thermal stability indices	22
fast technique	44
instrumentation	54, 399
kinetics of degradation by	14
kinetics of degradation from	13
of acetal resins	80
of acetylated poly(oxymethylene)	411
of acrylonitrile/styrene copolymers	679
of aromatic polysulfonates	649
of asbestos felt reinforced plastics	630
of azulene containing polymers	565
of benzborimidazoline polymers	554
of bis(imidazolato)-metal polymers	581

Subject

Reference No.

T - Continued

Thermogravimetric analysis - Continued

of boron containing polymers -----	571
of bromine containing epoxide resins -----	427
of cellulose -----	702
of chelates of oxine-formaldehyde polymers -----	579
of chlorinated phenolics -----	439
of chlorosulfonated polyethylene -----	320
of epoxides -----	419, 424, 436, 437, 630
of ethylene oxide/styrene block copolymers -----	692
of formaldehyde-salicylaldehyde chelates -----	580
of formaldehyde-salicylaldehyde polymers -----	580
of formaldehyde/styrene copolymers -----	695
of furfuryl alcohol resins -----	471
of glass reinforced plastics -----	630
of hexafluoropropylene/tetrafluoroethylene copolymers -----	258
of irradiated polyethylene -----	135
of melamine-formaldehyde resins -----	672
of methyl methacrylate/styrene block copolymers -----	692
of α -methylstyrene/styrene block copolymers -----	692
of octamethylcyclotetrasiloxane -----	466
of oxine-formaldehyde polymers -----	579
of partial ladder polymer -----	473
of phenol-formaldehyde resins -----	448, 458
of phenol-furfural resins -----	439
of phenolic/polyamide copolymers -----	439
of phenolics -----	13, 36, 437, 439, 440, 441, 630
of phenolic/silane copolymers -----	439
of phenylsilanes -----	630
of poly(acetylene) -----	206
of polyamides -----	80, 333
of polybenzimidazoles -----	514
of polybenzoxazoles -----	516
of polycarbonates -----	80, 331
of poly(m-diethynylene benzene) -----	202
of polydiphenyldiacetylenes -----	205
of polyesters -----	333, 436
of polyester-urethane block terpolymers -----	540
of polyester-urethanes -----	518
of polyethylene -----	137
of poly(ethylene terephthalate) -----	362
of polyformaldehyde -----	389, 399
of poly(methyl methacrylate) -----	24, 80
of poly(methyl vinylphthalate) -----	386
of poly(1,3,4-oxadiazoles) -----	566
of polyoxymethylene -----	411, 695
of poly(m-phenoxy) -----	466
of polyphenylenebenzimidazoles -----	509
of poly(phenylenes-1,3,4-oxadiazoles) -----	531
of polyphenylpyrazoles -----	532

Subject

Reference No.

T - Continued

Thermogravimetric analysis - Continued	
of polypropylene -----	176, 333
of polypyromellitimides -----	519, 527-529
of polyquinoxalines -----	535-537
of polystyrene -----	24, 80
of polytetrafluoroethylene -----	14, 17, 24, 258, 261, 263, 333, 466
of poly- <i>s</i> -triazinyleneimides -----	562
of polyurethanes -----	80, 530
of polyurethane sulfides -----	560
of poly(vinyl acetate) -----	80
of poly(vinyl alcohol) -----	80
of poly(vinyl chloride) -----	80, 283
of poly(vinylphthalic acid) -----	386
of silicones -----	436, 630
of siloxanes -----	624
of tin containing polymers -----	655
theory -----	17, 24
Thermomechanical curves -----	37, 38, 517
for copolymers -----	664
for polyarylates -----	384
of epoxide resins -----	430
of poly(naphthenoaluminumphosphosiloxanes) -----	615
Thermomechanical properties	
of epoxide polymers -----	423
of poly(phosphonitrile chloride) -----	300
of rubber -----	229
of silicon containing polymers -----	612
Thermomechanical study	
of epoxides -----	343
of piperylene rubber -----	219
of polybutadiene -----	219
of polyesters -----	343
of polyisobutylene -----	198
of polyisoprene -----	219
of rubber -----	219, 228
Thermoparticulate analysis -----	68
Thermo-volatilimetric analysis (TVA)	
of poly(cyclohexyl methacrylate) -----	364
of poly(isopropyl acrylate) -----	364
of poly(isopropyl methacrylate) -----	364
of poly(methacrylic anhydride) -----	364
of poly(sec-butyl methacrylate) -----	364
Thorium coordination polymers -----	575
Tin containing polymers -----	601, 514, 626, 654, 655
Titanium containing polymers -----	573, 613, 614, 616, 626
Torsional braid analysis -----	32
Torsional braid technique -----	49, 504
Tracer study of epoxide degradation -----	420
Tracer study of polyurethane degradation by -----	546

Subject

Reference No.

T - Continued

Trans-isoprene	247
Transitions	
instrumentation for measurement of	67
2,4,6-trialkylloxypyrimidine polymers	555
trifluoroethylene/trifluoronitrosomethane copolymer	321, 322

U

Ultraviolet absorption spectra	464
Ultraviolet studies	
of phenol-formaldehyde coloration	455
of polyacrylonitrile heat treatment	478
of poly(vinyl chloride) pyrolysis products	283
Uranium coordination polymers	575
Urea-formaldehyde	43
Urea-formaldehyde resin	665

V

Vacuum degradation	
of anthracene-phenol-formaldehyde resins	449
of azulene containing polymers	565
of block copolymers	545
of butadiene/octafluorocyclohexa-1,3-diene copolymer	321
of chlorinated phenolics	439
of chloroprene/octafluorocyclohexa-1,3-diene copolymer	321
of chlorotrifluoroethylene/vinylidene fluoride copolymer	321
of epoxides	421
of ethylene/octafluorocyclohexa-1,3-diene copolymer	321
of fluorinated silicone polymer	321
of halogenated poly(phenylene oxides)	418
of hexafluoropropylene/tetrafluoroethylene copolymer	321
of hexafluoropropylene/vinylidene fluoride copolymer	321
of ion-exchange resins	646
of Kel-F under	670
of methacrylamide/methyl methacrylate copolymers ---	688
of methyl methacrylate/octafluorocyclohexa-1,3- diene copolymer	321
of methacrylic acid/methyl methacrylate copolymers -	688
of octafluorocyclohexa-1,3-diene/1,1,2- trifluorobutadiene copolymer	321
of octafluorocyclohexa-1,3-diene/vinyl n-butyl ether copolymer	321
of phenol-formaldehyde resins	448
of phenol-furfural resins	439

Subject

Reference No.

V - Continued

Vacuum degradation - Continued

of phenolic/polyamide copolymers -----	439
of phenolics -----	421, 439, 440, 441
of phenolic/silane copolymers -----	439
of poly(acetylene) under -----	206
of polyacrylonitrile -----	477
of polyamides -----	421
of polycarbonates -----	327
of polychloral -----	519
of poly-1-chloro-1,2-difluoroethylene -----	321
of poly(4-chloroperfluoro-1,6-heptadiene) -----	315
of polychlorotrifluoroethylene -----	321
of poly(decamethyleneoxamide) -----	501
of polyesters -----	347
of polyethylene -----	125
of poly(ethylene terephthalate) under -----	353, 361
of poly(hexafluoropentylene adipate) -----	321
of poly(hexafluoropentylene adipate/isophthalate) --	321
of poly(hexafluoropropylene) -----	315
of poly(hexamethyleneoxamide) -----	501
of polyisobutyraldehyde -----	395
of poly(methyl acrylate) -----	381, 383
of poly(methylphenylsiloxane) -----	629
of poly(methylsiloxane) -----	629
of poly(octafluorohexylene fumarate) -----	321
of poly(octafluorohexylene terphthalate) -----	321
of poly(oxymethylene) -----	413
of poly(perfluoroheptene) -----	315
of poly(phenylene sulfide) -----	651
of poly(phenylsiloxane) -----	629
of polypropylene -----	153, 163, 172, 180
of polypyromellitimides -----	528, 529
of polysulfones -----	653
of polytetrafluoroethylene -----	261, 263, 266, 321
of poly(trifluorovinyl phenyl ether) -----	315
of polyurethanes -----	545
of poly(vinyl acetate) -----	383
of poly(vinyl chloride) -----	383
of poly(vinylidene fluoride) -----	321
of silicones -----	421, 607, 636
of tetrafluoroethylene/trifluoronitrosomethane copolymer -----	321
of trifluoroethylene/trifluoronitrosomethane copolymer -----	321
of trifluorochloroethylene/vinylidene fluoride copolymers -----	669, 684
Vinyl acetate/vinyl chloride copolymers -----	661, 689
Vinyl chloride/vinylidene chloride copolymers -----	309, 693
Vinylidene fluoride/hexafluoropropylene vulcanizates ----	660
Vinylidene fluoride/perfluoropropene copolymers -----	316
Viscosity	
and degradation of acetylated polyformaldehyde -----	400

Subject

Reference No.

V - Continued

Viscosity - Continued

and degradation of polycarbonates -----	327, 331
and degradation of poly(ethylene terephthalate) ----	358
and degradation of ethylene terephthalate/ethylene isophthalate copolymer -----	358
and degradation of molten polypropylene -----	168
and degradation of polyformaldehyde -----	400
and degradation of polypropylene -----	163
in polyisobutylene degradation -----	197
melt, of degraded poly(vinyl chloride) -----	299
of degraded poly(dimethylsiloxane) -----	610
of degraded poly(methylvinylsiloxane) -----	610
of degraded residues of poly(methyl acrylate) ----	381
study of polyurethane degradation by -----	546

Vulcanizates

degradation of rubber -----	241
oxidation of -----	215
oxygen absorption of rubber -----	244
thermal oxidation of -----	229, 230
thermal stability of neoprene -----	221

W

Wetting angle, and oxidation of polyethylene -----	96
--	----

X

X-ray diffraction studies -----	202
X-ray diffraction studies of polyesters -----	341
X-ray studies -----	191
of chlorinated poly(vinyl chloride) degradation products -----	301
of copolymers -----	674
of phenol-formaldehyde oxidation products -----	458
of poly(vinyl chloride) degradation products -----	301
X-ray study of oxidation crystallization of poly- ethylene and polymethylene -----	112

Z

Zinc chelate polymers -----	583
Zinc chelates of 8-hydroxyquinoline-formaldehyde poly- mers -----	584
Zinc coordination polymers -----	575

PART 3 - AUTHOR INDEX

<u>Author</u>	<u>Ref. No.</u>	<u>Author</u>	<u>Ref. No.</u>
A		B	
Abasov, S. A. -----	367	Baba, H. -----	383
Adrova, N. A. -----	572, 601	Baba, T. -----	218
Afanas'ev, A. M. -----	56	Baccaredda, M. -----	392
Afinogenov, M. P. -----	587	Backus, J. K. -----	551
Aftergut, S. -----	581	Bader, H. G. -----	41
Agayants, L. A. -----	405	Baer, M. -----	692
Airapetyants, R. M. -----	479, 480	Bagdasar'yan Kh. S. -----	209, 210, 242
Akimova, N. I. -----	496	Bakh, N. A. -----	121, 125
Aksenova, T. A. -----	317	Balaban, L. -----	149
Akutin, M. S. -----	328, 349, 384	Balabanov, E. M. -----	533
	686	Balandina, V. A. -----	119
Alfimov, M. V. -----	207	Balas, A. -----	287
Alfred, I. -----	578	Banerjee, D. -----	224, 225
Aliev, D. A. -----	81	Barlow, A. -----	51, 368
Alieva, S. G. -----	81	Barrall II, E. M. -----	678
Alikberova, G. I. -----	663	Barth-Wehrenalp, G. -----	640, 648
Alishoev, V. R. -----	389, 397	Bartlett, J. S. -----	700
Aloisio, C. J. -----	101, 111, 112	Bartolot, V. J., Jr. -----	67
Al'shits, I. M. -----	348	Baum, G. A. -----	655
Amemiya, A. -----	15	Bazov, V. P. -----	512
Anderson, H. C. -----	14, 25, 258	Beacham, H. H. -----	344
	419, 424, 439,	Beachell, H. C. -----	82, 186, 541,
	440, 441		548, 561
Anderson, J. J. -----	544	Beati, E. -----	193
Anderson, W. H. -----	11	Beck, D. L. -----	186, 192
Anderson, W. S. -----	249	Beck, T. M. -----	542
Andreeva, M. A. -----	593	Benas, J. -----	175
Andrianov, K. A. -----	423, 588, 611,	Benesh, I. -----	161
	612, 613, 614,	Bengough, W. I. -----	302, 303
	615, 616, 625,	Berarducci, E. -----	163
	626	Beregovskaya, M. G. -----	219
Andronova, G. I. -----	229	Berek, D. -----	158
Angert, L. C. -----	227	Berger, J. -----	390
Anikeenko, V. M. -----	277	Bergstrom, E. W. -----	605, 660
Anoshina, N. P. -----	240	Berlin, A. A. -----	96, 200, 300,
Antropova, N. I. -----	486		301, 310, 481,
Arai, K. -----	474		533, 569, 570,
Arakelyan, V. Ts. -----	255		642
Ard, J. S. -----	58	Bertram, J. L. -----	532
Arzhakov, S. A. -----	366, 375	Bettelheim, F. A. -----	635
Asahina, M. -----	304, 305	Bevilacqua, E. M. -----	215
Aseev, Yu. G. -----	533	Bevza, T. I. -----	203
Aseeva, R. M. -----	200, 301	Beznoska, J. -----	71
Askadskii, A. -----	432	Bezrukova, V. I. -----	274
Asnovich, E. Z. -----	615	Bhatnagar, H. L. -----	235
Astrakhantseva, N. I. -----	221, 657	Bhaumik, M. L. -----	224, 225
Aulova, N. V. -----	599	Bidnaya, D. S. -----	462
Aver'yanov, S. V. -----	603	Bieron, J. F. -----	438
Awata, Y. -----	560	Biswas, A. B. -----	235

<u>Author</u>	<u>Ref. No.</u>
B - Continued	
Rityukov, V. D. -----	121
Blakey, P. R. -----	363
Blatz, P. J. -----	11
Blayden, H. E. -----	297
Blenkin, J. -----	216
Bloomfield, J. J. -----	554
Blyumenfel'd, A. B. -----	410
Bobear, W. J. -----	632
Bodily, D. M. -----	74
Bogdanov, I. F. -----	75, 86, 453
Boldi, L. -----	174
Bolger, J. -----	422
Boller, K. H. -----	608
Bolondaeva, N. I. -----	625
Bombaugh, K. J. -----	673, 699
Bondarenko, V. M. -----	568, 583
Bondi, E. -----	64
Bonnot, L. -----	4
Boncmi, G. -----	233
Boor, J. -----	194, 196
Boquist, C. W. -----	470, 471
Borchert, R. C. -----	623
Borodina, O. O. -----	463
Bcwer, G. M. -----	520, 521
Bowers, G. H. -----	268
Boy, Jr., R. E. -----	352
Boyer, N. E. -----	40, 596, 602
Brady, W. T. -----	407
Brasch, J. W. -----	295
Brauer, G. M. -----	139
Braun, D. -----	55, 88
Braz, G. I. -----	512
Bremner, B. J. -----	427, 433
Brenner, N. -----	67
Bro, M. I. -----	262, 268
Brown, G. P. -----	466
Brown, Jr., J. F. -----	638
Brown, R. -----	624
Bruck, S. D. -----	528, 529
Bulacheva, S. F. -----	96
Buravchenko, K. K. -----	355
Buravleva, M. G. -----	462
Buryagina, A. S. -----	246
Butta, E. -----	392
Bykova, L. V. -----	598
Byrd, J. D. -----	637
Bywater, S. -----	374
C	
Caldwell, J. R. -----	650
Cameron, G. G. -----	381

<u>Author</u>	<u>Ref. No.</u>
C - Continued	
Campbell, T. W. -----	574
Carhart, R. O. -----	77
Carlson, R. K. -----	36
Carpenter, W. G. -----	484
Casey, K. -----	65, 133
Castille, Y. P. -----	695
Castronguay, T. T. -----	62
Chadovich, T. Z. -----	378
Chai, Wen-Hui -----	385
Chang, Sung Vong -----	106
Chang, Yu-Chen -----	430
Charles, R. G. -----	577
Chebysheva, L. M. -----	622
Chelnokova, C. N. -----	483, 489, 495
Chen, C. S. Hsia -----	199, 491
Cherkashina, L. G. -----	533
Chernetsov, S. M. -----	91
Chernyakova, A. M. -----	588
Chevychelov, A. D. -----	21
Ch'i, Yun-Shih -----	8
Chiu, J. -----	184, 269
Cinque, G. -----	311
Clampitt, P. H. -----	100, 140, 188, 555, 673, 699
Clark, J. E. -----	371, 372
Clerici, G. -----	193
Cohen, S. M. -----	467
Collins, C. G. -----	213, 604
Compton, D. L. -----	257
Conley, R. T. -----	350, 351, 438, 442, 443, 444, 445, 458, 475
Considine, W. J. -----	655
Cooper, W. -----	236, 247
Cornilescu, D. -----	292
Cosgarea, Jr. A. -----	251
Cox, B. C. -----	50
Cox, J. M. -----	321, 322, 418
Cox, R. H. -----	352
Craven, J. M. -----	538
Crompton, T. R. -----	92
Cross, H. -----	659
Culbertson, B. M. -----	435
Curry, J. E. -----	637
Cusano, C. M. -----	540
D	
Daniels, W. E. -----	206
Dannis, M. L. -----	48
Danusso, F. -----	87
Darr, W. C. -----	551

<u>Author</u>	<u>Ref. No.</u>
D - Continued	
Davis, A. -----	327, 331
Davis, D. A. -----	77
Davydov, A. B. -----	621, 629
Davydov, B. E. -----	478, 479, 480, 502, 558
Dawans, F. -----	563
Deanin, R. D. -----	543
DeBenedictis, T. -----	146, 181
de Gaudemaris, G. -----	534, 536
Degeiso, R. C. -----	584
Degteva, T. G. -----	254, 669, 670, 684
Denney, M. A. -----	589
DeWinter, W. -----	473
Dianov, M. P. -----	219
Dine-Hart, R. A. -----	490
Dmitrienko, S. S. -----	455
Dobinson, F. -----	492
Dobrokhotova, M. L. -----	486
Dobrokhotova, M. K. -----	487
Dogadkin, B. A. -----	229
Dole, M. -----	26
Dolezel, B. -----	9, 293
Dolgoplosk, S. B. -----	622
Donald, H. J. -----	143
Donaldson, W. E. -----	62
Donaruna, L. G. -----	584
Donnelly, E. -----	672
Poyle, C. D. -----	17, 466
Doyle, H. J. -----	446
Drabkin, I. A. -----	477, 478
Dralyuk, G. V. -----	493
Drienovskii, P. -----	173
Druyan, I. S. -----	239, 457
Dubinskaya, A. M. -----	481
Dubrovko, R. V. -----	81
Dudek, B. -----	287
Dudikova, E. D. -----	654
Dudina, L. A. -----	16, 400, 401, 402, 403, 404, 405, 409
Dudorov, V. V. -----	150
Dulog, L. -----	105
Dulov, A. A. -----	591
Dunigan, E. P. -----	540
Dunnavant, W. R. -----	295
Dushin, Yu. A. -----	259
Dvork, J. -----	256
D'vachenko, T. D. -----	323
Dyer, E. -----	564
Dynako, A. -----	470
Dzhenchel'skaya, S. I. --	625

<u>Author</u>	<u>Ref. No.</u>
E	
Edwards, T. E. -----	472
Ehlers, G. F. L. -----	562, 649
Eiermann, K. -----	33
Eitingon, I. I. -----	229
Ellis, B. -----	50
Ellison, T. M. -----	461
Elston, C. T. -----	133
Engel, J. H. -----	518
English, E. S. -----	215
Enikolopyan, N. S. -----	16, 400, 401, 402, 403, 404, 405, 409
Ermakova, M. N. -----	612
Ershou, B. G. -----	125
Esposito, G. G. -----	70
Ettre, K. -----	382
Ezhkova, E. S. -----	387
F	
Fabricant, A. -----	241
Farberov, I. L. -----	75, 86, 131, 380, 453, 454
Farmer, R. W. -----	630
Farshyan, G. S. -----	255
Fedorov, B. P. -----	162
Fedoneev, B. I. -----	298
Fein, M. M. -----	571
Feist, W. C. -----	201
Feldshtein, L. S. -----	223
Feuerberg, H. -----	83
Finkel, E. E. -----	91, 98
Finkel'shtein, S. B. -----	301
Fiorenza, A. -----	233
Fischer, Jr., T. M. -----	538
Florentine, R. A. -----	640, 648
Flynn, J. H. -----	5
Fomenko, B. A. -----	198
Fomin, V. A. -----	260
Fomina, L. P. -----	622
Forcht, B. A. -----	36
Foster, R. T. -----	515
Frait, Z. -----	214, 226
Frank, H. P. -----	395
Frankevich, E. L. -----	200, 533
Fratkina, G. P. -----	78
Frazer, A. H. -----	566, 567, 582, 652
Fredericks, R. J. -----	206
Freeman, J. H. -----	586
Freeman, R. R. -----	339
Frenkel, M. D. -----	57

<u>Author</u>	<u>Ref. No.</u>
F - Continued	
Frey, D. A. -----	204
Frick, N. H. -----	183
Fridman, A. S. -----	91
Friedman, H. L. -----	13
Frost, L. W. -----	520, 521
Frunze, T. M. -----	505, 506, 507, 508
Fukami, A. -----	522, 527
Fukui, M. -----	511
Fukumori, T. -----	244
Fulk, M. M. -----	421
Fuoss, R. M. -----	24
Fuqua, S. A. -----	607
Furukawa, J. -----	230

G

Ganina, T. N. -----	611
Gardenina, A. P. -----	488
Garzo, G. -----	620
Geacintov, C. -----	190, 191
Gefter, E. I. -----	594
Geiderikh, M. A. -----	478, 479
Geiseler, G. -----	132
Gel'fman, A. Ya. -----	462
Gemeinhardt, P. G. -----	551
Gerasimenko, L. T. -----	599
Gershman, N. E. -----	658
Giesen, M. -----	159
Gilbert, J. B. -----	45, 278, 289
Gillham, J. K. -----	32, 49, 504
Gil'man, I. S. -----	317
Gipstein, E. -----	655
Giuffria, R. -----	77
Giusti, P. -----	392
Gladkaya, L. A. -----	348
Glagoleva, Yu. A. -----	78
Glorioso, S. V. -----	585
Glukhov, N. A. -----	323
Golden, J. H. -----	327, 331
Goldenberg, A. L. -----	118
Goldey, R. N. -----	93, 243
Goldfarb, I. J. -----	267
Gol'dfarb, Ya. L. -----	162
Goldman, A. -----	466
Goldovskii, E. A. -----	618, 519
Golubkov, G. E. -----	423, 625
Goncharov, G. S. -----	398
Gordon, G. Ya. -----	309
Gordonova, R. D. -----	274
Grant, D. H. -----	374
Grad, N. M. -----	348

<u>Author</u>	<u>Ref. No.</u>
Graham, R. K. -----	700
Grassie, N. -----	53, 370, 373, 469
Gray, A. P. -----	65
Grebenshchikov, G. V. ---	131, 380
Green, J. -----	571
Gribova, I. A. -----	593
Gridunov, I. T. -----	221, 657
Griz, V. E. -----	499
Grode, G. A. -----	295
Gromov, B. A. -----	169, 179
Grotten, B. -----	72, 182
Gubanov, A. I. -----	21
Gubanov, E. F. -----	228
Gur'yanova, V. V. -----	420
Gvozdev, Yu. M. -----	312

H

Haigh, D. H. -----	346
Halpern, B. D. -----	243, 697
Haly, A. R. -----	26
Hamada, F. -----	153
Hammond, R. J. -----	564
Hansen, R. H. -----	146, 181
Hanson, A. C. -----	605
Hansen, D. -----	73
Happ, G. P. -----	691
Hara, S. -----	531
Hardy, J. -----	546
Hartung, H. A. -----	623
Hasegawa, M. -----	204
Hauck, J. E. -----	447
Hawkins, W. L. -----	10, 90, 101, 102, 103, 111, 112, 165
Hay, A. S. -----	202
Hay, J. N. -----	464, 469
Hayashi, I. -----	681
Hediard, M. -----	606
Heinrich, H. J. -----	126
Hergenrother, P. M. -----	525
Hess, P. H. -----	694
Heufer, G. -----	88
Hickam, W. M. -----	530
Hill, E. H. -----	650
Hindersinn, R. -----	596
Ho, C. C. -----	73
Holden, H. W. -----	89, 189
Homma, M. -----	639
Horodniceanu, N. -----	211
Horr, K. S. -----	421
Horrocks, R. H. -----	579
Hosokawa, K. -----	306

<u>Author</u>	<u>Ref. No.</u>
H - Continued	
Howell, S. G. -----	110
Hoyt, H. E. -----	697
Hughes, M. A. -----	362
Hughes, R. H. -----	188
Humes, E. S. -----	143
Hunt, C. F. -----	467
Hunter, J. J. -----	58

I

Igarashi, S. -----	115, 135, 136, 137, 138, 411, 679
Igonin, L. A. -----	456
Il'ina, D. E. -----	252, 253, 319
Imai, Y. -----	509, 510, 511
Imanishi, I. -----	138
Imoto, T. -----	393
Ingham, J. D. -----	545, 546, 547
Inokuti, M. -----	23
Inoue, M. -----	46, 408
Inui, T. -----	306
Ipoly, K. -----	127
Isaacson, R. B. -----	201
Ishida, A. -----	388
Ishidawa, T. -----	283
Ishizuka, M. -----	617
Istrate, I. -----	232
Ivanova, Z. G. -----	621
Iwakura, Y. -----	509, 510, 511, 531, 560
Iwamatsu, I. -----	617
Iwamoto, T. -----	671
Iwasa, Y. -----	393
Izyneeva, A. A. -----	505, 506

J

Jackson, W. M. -----	442, 458
Jahn, A. K. -----	79
Janeckova, L. -----	396
Jasching, W. -----	281
Jellinek, H. H. G. -----	263, 371, 372
Jenkins, L. T. -----	539
Johnson, J. F. -----	678
Johnston, C. W. -----	344
Jones, J. I. -----	519
Jones, S. L. -----	436
Jubb, Jr., E. C. -----	429

K

Kachi, H. -----	263, 338
-----------------	----------

<u>Author</u>	<u>Ref. No.</u>
K - Continued	
Kaesche-Krischer, B. ----	126
Kaghan, W. S. -----	168
Kajiura, A. -----	355
Kakugo, M. -----	682
Kalinushkin, B. M. -----	688
Kalyaev, G. I. -----	200
Kamath, P. M. -----	110
Kambe, H. -----	84, 115, 116, 135, 136, 137, 138, 411, 671, 679, 680
Kamenov, I. -----	241
Kamenskii, I. V. -----	432, 468
Kan'kovskaya, E. N. -----	455
Kao, San-nan -----	425
Kapacauskiene, J. -----	122
Kaplan, G. -----	161
Kardash, I. E. -----	361
Kargin, V. A. -----	124, 172
Karmilova, L. V. -----	400, 404, 405, 409
Karpov, V. L. -----	54, 91, 98
Karpovich, I. K. -----	54
Kasatochkin, V. I. -----	301
Kashevarova, E. I. -----	597
Kass, R. E. -----	467
Katyshev, V. N. -----	54
Kawasaki, E. H. -----	639
Kawazumi, K. -----	617
Kazanowska, V. M. -----	593
Ke, Bacon -----	47, 104, 356
Kelleher, P. G. -----	164
Kelley, J. J. -----	117
Kello, V. -----	212
Kelso, R. L. -----	700
Kern, W. -----	105
Kessenikh, R. M. -----	277
Keul, M. -----	690
Kevroleva, K. M. -----	277
Khanin, S. E. -----	227
Kharitinich, N. E. -----	85
Khimchenko, Yu. I. -----	85
Khin'kis, S. S. -----	119
Khoroshaya, E. S. -----	274
Khusainova, N. G. -----	597
Kilian, H. G. -----	108
Kim, Jung Yup -----	106
Kinsinger, J. B. -----	700
Kipling, J. J. -----	45, 66, 278, 289, 307
Kireev, V. V. -----	599, 600
Kirichenko, Yu. A. -----	378
Kirilova, E. I. -----	78

<u>Author</u>	<u>Ref. No.</u>
K - Continued	
Kirilovich, V. I. -----	594
Kirpichnikov, P. A. -----	355
Kirshenbaum, I. -----	182, 201
Klebanskii, A. L. -----	622
Knappe, W. -----	39
Knox, J. R. -----	192
Koba, " S. -----	462
Kobzova, R. I. -----	631
Kocharyan, N. U. -----	255
Kohman, Z. -----	343
Kohn, S. -----	44, 448
Koikov, S. N. -----	260
Kolganova, V. A. -----	625
Kondrat'eva, V. A. -----	662
Konovalova, B. E. -----	686
Korbanova, Z. N. -----	246
Kornev, K. A. -----	499
Korn-Cirard, A. C. -----	205
Kerolev, A. Ya. -----	628
Korshak, V. V. -----	347, 384, 432, 505, 506, 507, 508, 557, 593, 664
Korshak, Yu. V. -----	502
Kotani, T. -----	230
Kotliar, A. M. -----	187
Koton, M. M. -----	323, 572, 601
Kotorlenko, S. A. -----	488
Kovarskaya, D. M. -----	328, 329, 330, 337, 389, 397, 410, 420, 434, 450, 493, 497, 686
Kovrigina, G. I. -----	274
Kralik, P. -----	237, 238
Krasnov, E. P. -----	494, 501
Krasovskaya, T. A. -----	627
Krasnyanskaya, E. A. -----	162
Krause, Jr. H. -----	656
Krentsel, B. A. -----	252, 253, 319, 480, 502, 558
Krichmar, G. Ya. -----	399
Krinitzskaya, L. A. -----	157
Krumin, Zh. K. -----	54
Kubota, T. -----	516
Kuchinskii, V. N. -----	499
Kugel, R. L. -----	250
Kulyai, Z. T. -----	662
Kurashev, V. V. -----	505, 506, 507, 508
Kuratani, K. -----	114
Kuriyama, I. -----	360

<u>Author</u>	<u>Ref. No.</u>
K - Continued	
Kusakawa, H. -----	646
Kushlina, G. I. -----	416
Kuvshinskii, E. V. -----	198
Kysel, O. -----	173
Kuz'minskii, A. S. -----	229, 223, 227, 254, 618, 619, 669, 670, 684
L	
LaLickoff, A. Kh. -----	606
Lajiness, W. G. -----	316
Lakonskaya, G. V. -----	454
Lalau-Keraly, F. X. -----	7
Lambert, P. M. -----	543
Lanceley, H. A. -----	142
Landrook, A. H. -----	35
Lane, Sister K. -----	314
Larsen, H. A. -----	266
Lazar, M. -----	158
Lazzari, P. -----	163
Learmonth, G. S. -----	437
Lebedeva, A. S. -----	384
Lee, Hseuh-Ting -----	30, 261
Lee, Lieng-Huang -----	325, 332, 431
Lefebvre, G. -----	4
Leghissa, S. -----	64
Lehrle, R. S. -----	51, 368
Lenk, C. T. -----	316
Leshchenko, S. S. -----	54, 98
Levantovskaya, I. I. -----	493, 497
Levi, D. W. -----	22, 29, 30, 261
Levin, A. N. -----	398
Levin, P. I. -----	150, 162, 365
Levin, S. Z. -----	499
Levine, H. H. -----	525
Levkina, N. K. -----	631
Lewis, A. F. -----	32, 49
Lezhnev, N. N. -----	220
Leznov, N. S. -----	621, 628
Li, Fen-Yu. -----	425
Li, P. Z. -----	598
Likhtenshtein, G. I. -----	160
Line, Tung-Po -----	266
Liogon'kii, B. I. -----	569, 570, 642
Lisy, M. -----	294
Litwin, J. -----	344
Lopatiza, G. P. -----	508
Loprest, F. J. -----	571
Lotkova, L. M. -----	81
Lovejoy, E. R. -----	262, 268

<u>Author</u>	<u>Ref. No.</u>
L - Continued	
Lukovnikov, A. F. -----	150, 162
Lum, A. -----	571
Lunin, A. F. -----	556
Lunn, R. H. -----	586
Lykova, A. N. -----	274
Lynch, D. G. -----	206
Lyubchanskaya, L. I. ----	223
Luzh'kov, Yu. M. -----	399

M

Madorsky, S. L. -----	42, 76
McCallum, J. R. -----	369, 370
Magrupov, M. A. -----	99, 124, 172
Maier, D. P. -----	691
Maiorova, V. E. -----	685
Mair, A. D. -----	526
Majer, J. -----	412
Makarov, K. A. -----	583
Maklakov, A. I. -----	524
Makower, S. J. -----	243
Malinskii, Yu. M. -----	91
Manaresi, P. -----	174
Manasek, Z. -----	158
Manley, T. R. -----	52
Manning, A. A. -----	580
Manucharova, I. F. -----	507, 614
Marcus, R. -----	250
Mark, H. F. -----	676
Markhart, A. H. -----	467
Markova, Z. A. -----	125
Marriott, J. A. -----	386
Martin, H. -----	31
Martin, W. M. -----	146, 181
Martindale, J. C. -----	509
Martynyuk, M. M. -----	18
Marvel, C. S. -----	204, 473, 514, 515, 554, 563
Matreyek, W. -----	90, 101, 111, 112
Matsumoto, M. -----	460
Matsuoka, S. -----	101, 111, 112
Matsuzaki, K. -----	176, 388
Mattison, L. E. -----	578
Matveeva, E. N. -----	78, 119
Matyska, B. -----	256
Maselli, J. M. -----	609
Mayes, N. -----	571
McAilister, L. -----	422
McCaffery, E. -----	422
McDonald, R. S. -----	202
McEnaney, B. -----	307

<u>Author</u>	<u>Ref. No.</u>
M - Continued	
McIntyre, D. -----	76, 197
McKay, G. R. -----	262
McKinney, A. R. -----	36
McQuiston, F. C. -----	36
Medford, J. A. -----	36
Medvedev, S. S. -----	361
Mejzlik, J. -----	330, 391, 396
Melitzer, T. H. -----	93
Meltzer, T. R. -----	97, 117, 134
Merker, P. L. -----	634
Michel, R. H. -----	559
Micko, M. -----	158
Migliarese, J. -----	585
Mikhailov, L. -----	286
Mikhailov, M. -----	357
Mikhailov, N. V. -----	355, 359
Mikhailova, Z. V. -----	598
Miles, R. B. -----	190, 191
Militskova, E. A. -----	387
Millane, J. J. -----	6
Miller, V. B. -----	147, 155, 171, 178, 179
Milyutinskaya, K. I. ----	209, 210
Mindlin, Ya. I. -----	621
Miron, R. R. -----	694
Mishchenko, M. L. -----	86, 453
Mita, I. -----	125, 411
Mitchell, J. C. -----	194
Nitrofanova, L. V. -----	91, 98
Mockrin, I. -----	640, 648
Moiseev, V. D. -----	120, 123, 180, 416, 420, 450
Molzon, A. E. -----	2
Monaci, A. -----	163
Monini, A. -----	130
Moore, B. J. C. -----	490
Moore, R. E. -----	633
Moore, W. R. -----	672
Morgan, P. W. -----	345
Morgan, W. McG. -----	185
Morneau, G. A. -----	667
Moshkevich, S. A. -----	496
Moshinskaya, N. K. -----	447
Moshkovskii, Yu. Sh. ----	481
Morozo, Yu. L. -----	96
Morozova, S. A. -----	349
Mudrov, O. A. -----	348
Muecke, H. -----	276
Mueller, A. P. -----	555
Mueller, F. H. -----	51, 108
Mulvzney, J. E. -----	554
Murai, K. -----	95

<u>Author</u>	<u>Ref. No.</u>
M - Continued	
Murakami, S. -----	244
Murata, N. -----	244
Murphy, C. B. -----	68
Murphy, C. M. -----	636
Murphey, W. A. -----	559
Muss, L. T. -----	266

N

Nagatomi, R. -----	279
Nagibina, T. D. -----	663
Nagler, R. G. -----	94, 376
Nakamura, Y. -----	291, 665
Nakanishi, R. -----	516
Nakazima, I. -----	610
Nalbandyan, N. A. -----	255
Nametz, R. C. -----	543
Natanson, E. M. -----	85
Nechitailo, N. A. -----	151, 203
Neiman, M. R. -----	12, 123, 155, 156, 169, 170, 171, 178, 179, 180, 328, 329, 389, 397, 410, 416, 417, 420, 450, 493, 497
Newkirk, A. E. -----	202
Newland, G. C. -----	166
Ngoc Son, C. P. -----	541, 548, 561
Nielson, E. R. -----	471
Nikolaev, A. F. -----	568, 583
Nikol'skii, V. G. -----	207
Nishizaki, S. -----	522, 527, 646
Nitescu, E. -----	211
Noel, C. J. -----	354, 553
Noh, Icksam -----	106
Norling, P. M. -----	183
Novakov, N. -----	357
Notlev, N. T. -----	128

O

Obudovskaya, Yu. M. -----	274
Ochi, H. -----	406
Ochynski, F. W. -----	519
Ogata, N. -----	676
Ogihara, T. -----	113, 114
Ogii, M. S. -----	449
Okamoto, T. -----	388
Okamura, S. -----	406, 677
Okhrimenko, I. S. -----	687
Okuda, K. -----	693

<u>Author</u>	<u>Ref. No.</u>
O - Continued	
Oleinik, B. N. -----	378
Oleinik, V. G. -----	468
O'Mara, J. H. -----	76, 197
Ondris, M. -----	226
O'Neal, H. R. -----	407
Oneil, H. J. -----	470, 471
Onozuka, M. -----	304, 305
Oparina, E. M. -----	631
Organesyan, R. M. -----	664
Orlov, V. A. -----	549
Osawa, Z. -----	176
Otani, S. -----	283, 290
Ovenall, D. W. -----	426
Ozawa, S. -----	95, 107

P

Pac, J. -----	396
Paciorek, K. L. -----	316
Paima, G. -----	311
Paltin, E. -----	284
Panaitescu, M. -----	284
Panchak, J. R. -----	700
Parini, V. P. -----	569, 570
Parks, L. R. -----	701
Parlashkevich, N. Ya. ---	399
Pascale, J. V. -----	145, 146, 181
Patai, S. -----	659
Paterson, A. R. -----	271
Paukov, E. V. -----	312
Paulik, J. -----	342
Paushkin, Ya. M. -----	556
Pavletenko, L. V. -----	496
Paylinec, J. -----	158
Pechennikova, T. I. -----	455
Peilstocker, G. -----	324
Pellon, J. -----	250, 484, 485
Penczek, P. -----	335
Penski, E. C. -----	267
Perch, P. -----	438
Percivai, D. F. -----	694
Perepelkin, K. E. -----	463
Perry, N. L. -----	280
Peterka, M. -----	270
Petrasko, A. I. -----	626
Petropoulos, J. C. -----	491
Pfeil, R. W. -----	295
Phibbs, M. K. -----	133
Phillips R. -----	513
Phipps, M. S. -----	578
Piechota, H. -----	550
Pitsas, A. C. -----	68

<u>Author</u>	<u>Ref. No.</u>
P - Continued	
Pivnev, V. I. -----	222, 245, 246
Pizzigoni, G. -----	265
Plummer, L. -----	514
Poddubnyi, I. Ya. -----	603
Pokatilo, N. A. -----	203
Polak, L. S. -----	151
Poland, D. -----	674
Polizzotti, G. -----	87
Poller, D. -----	187
Polyakova, T. A. -----	501
Polyanski, N. G. -----	641, 643, 644
Ponomareva, T. I. -----	627
Popa, O. -----	292
Popoff, I. -----	640, 648
Popov, V. A. -----	239, 457, 662
Popov, Yu. A. -----	558
Popova, Z. V. -----	285, 298, 299, 300, 310
Porter, P. S. -----	678
Potocki, A. -----	287
Pravednikov, A. N. -----	361
Preston, J. -----	492
Preve, J. -----	534
Price, C. C. -----	651
Price, J. A. -----	192
Prokhorova, I. K. -----	572, 601
Pryakhina, S. F. -----	221
Pshenitsina, V. P. -----	349
Pudov, V. S. -----	155, 169, 170
Pudovik, A. N. -----	597
Putscher, R. E. -----	470, 471
Putti, G. -----	265, 377

R

Rabinowitz, R. -----	250
Rackley, F. A. -----	519
Radcliffe, A. T. -----	472
Radlmar, E. -----	105
Rado, R. -----	154
Rădulescu, O. -----	698
Refikov, M. N. -----	299
Rafikov, S. R. -----	347, 483, 489, 495, 496
Rogimov, A. V. -----	642
Ranzaitsev, V. D. -----	399
Rapp, N. S. -----	545, 546, 547
Rasidescu, S. -----	211
Rathsack, R. J. -----	346
R....., H. -----	636
J. D. -----	562
uskaya, I. N. -----	299

<u>Author</u>	<u>Ref. No.</u>
R - Continued	
Reegen, S. L. -----	518
Reich, L. -----	22, 28, 29, 30, 164, 261, 565
Reichel, B. -----	563
Renard, T. L. -----	468
Reznikov, V. S. -----	246
Rieche, A. -----	313
Riordan, R. -----	640, 648
Riser, C. R. -----	58
Ritchie, P. D. -----	340
Robb, J. C. -----	51, 368
Roberts, C. W. -----	346
Rode, V. V. -----	347, 495
Rodivilova, L. A. -----	349, 384
Rogailin, M. I. -----	454
Rogovin, Z. A. -----	317
Rosensweig, R. E. -----	590
Roy, P. -----	422
Rozantsev, E. G. -----	157, 497
Rozenshtein, L. D. -----	477, 478
Rozynov, B. V. -----	157
Rubin, I. D. -----	195
Rubinshtein, A. M. -----	591
Rubtsova, E. K. -----	594
Rukhadze, E. G. -----	576
Russell, C. A. -----	145, 146, 152
Rust, J. B. -----	573
Rust, T. F. -----	459
Ryabov, A. V. -----	688
Rylov, E. E. -----	366, 375
Ryshavy, D. -----	149
Ryvkin, G. A. -----	398

S

Sacco, G. R. -----	565
Sadchikov, I. Ya. -----	498
Saeki, Y. -----	279
Saito, M. -----	291
Sakamoto, M. -----	560
Salazkin, S. N. -----	347, 384
Salzer, I. O. -----	24
Sander, M. -----	595
Sanin, P. I. -----	151, 203
Sarbach, D. V. -----	208
Sarfare, P. S. -----	235
Sarzhenskaya, V. P. -----	499
Saul, E. -----	578
Saunders, J. H. -----	551
Sautter, H. -----	102
Savarenskii, V. V. -----	517

<u>Author</u>	<u>Ref. No.</u>
S - Continued	
Sazanov, Yu. N. -----	323
Scala, L. C. -----	530
Schaefer, J. P. -----	532
Schaffhauser, R. J. -----	698
Schard, M. P. -----	152
Schlimper, R. -----	308, 661
Schirmer, H. -----	334
Schotland, R. S. -----	190, 191
Schott, H. -----	168
Schreiber, H. P. -----	129
Schulken, Jr. R. M. -----	352
Schwarz, K. H. -----	63
Schwenker, Jr. R. F. -----	333
Scott, F. L. -----	647
Scott, M. J. -----	634
Scott, R. O. -----	36
Sedova, I. M. -----	669, 670
Semenchenko, V. K. -----	18
Semenido, G. E. -----	252, 253, 319
Senatorskaya, L. G. -----	229
Serebryanikov, V. S. -----	480
Severini, F. -----	193
Shabadash, A. N. -----	686
Shagov, V. S. -----	394
Sharpe, H. M. -----	302, 303
Shelton, J. R. -----	234
Sheldon, R. P. -----	314, 362, 363
Shen, Kung-Hsin -----	425
Shen, M. C. -----	526, 698
Sherwood, J. N. -----	66
Shestakova, O. G. -----	246
Shibalovich, V. S. -----	687
Shibazaki, Y. -----	84, 116, 671, 680, 683
Shiller, A. M. -----	491
Shindo, A. -----	476
Shiraishi, M. -----	460
Shirakashi, K. -----	360
Shishkina, M. V. -----	253, 558
Shlenskii, O. F. -----	587
Shlyapnikov, Yu. A. -----	122, 147, 156, 171, 178
Shooter, P. V. -----	66
Shtarkman, B. P. -----	299, 366, 375
Shtein, A. S. -----	379
Shtekker, O. A. -----	285
Shultz, A. R. -----	667
Shuvalova, L. S. -----	274
Sibilia, J. P. -----	271
Sidnev, A. I. -----	328
Siegel, J. C. -----	266
Sieron, J. K. -----	61, 248

<u>Author</u>	<u>Ref. No.</u>
S - Continued	
Sigalova, L. V. -----	462
Sillion, B. -----	534, 536
Silverman, M. S. -----	592
Silverstein, R. M. -----	607
Simakov, Yu. S. -----	312
Simha, R. -----	3
SinitSYna, Z. A. -----	209, 242
Sircar, A. K. -----	224, 225
Sklyarova, E. G. -----	169
Slade, Jr., P. E. -----	539
Slinkin, A. A. -----	591
Slobodin Ya. M. -----	685
Slobodzinski, A. E. -----	34
Slonim, I. Ya. -----	329
Slonimskii, G. L. -----	38, 366, 375
Slovokhetova, N. A. -----	99, 124, 172
Smilek, P. -----	500
Smirnov, R. N. -----	662
Smirnova, A. M. -----	685
Smirnova-Zamkova, S. E. -	69, 499
Smith, D. A. -----	320
Smith, H. A. -----	645
Smith, H. Q. -----	647
Smith, R. K. -----	247
Smushkovich, B. L. -----	57
Sobolevskii, M. V. -----	627
Sobue, H. -----	176
Sogolova, T. I. -----	38
Sokolov, A. D. -----	387
Sokolov, L. B. -----	494, 500
Sokolov, N. N. -----	611
Sokolova, N. A. -----	379
Sokolova, Z. V. -----	274
Solodovnik, V. D. -----	621
Solov'eva, L. K. -----	432
Sonnarskog, S. -----	275
Sorokina, R. A. -----	483, 495
Sosin, S. L. -----	557
Sotnikov, V. G. -----	277
Soulen, J. R. -----	592
Spain, R. G. -----	316
Spencer, H. G. -----	461
Sperling, L. H. -----	701
Spliethoff, W. S. -----	552
Spitsbergen, J. C. -----	82, 666
Stafford, Bill B. -----	141
Stanescu, G. -----	690
Stannett, V. -----	695
Steininger, E. -----	595
Stepanek, J. -----	9
Stepek, J. -----	293, 689
Stille, J. K. -----	435, 535, 537

<u>Author</u>	<u>Ref. No.</u>
S - Continued	
Stivala, S. S. -----	164, 565
Straus, S. -----	76, 197, 264, 273, 315
Strella, S. -----	19, 20, 27
Strugaru, C. -----	232
Sturrock, A. T. -----	208
Sung, Chwa-Kyung -----	59, 80, 106, 231
Suskina, V. I. -----	180, 416
Suzuki, K. -----	177, 474
Sweeny, W. -----	341, 566
Sweeting, O. J. -----	653
Szekely, T. -----	620

T

Tabar, W. J. -----	109
Taguet, G. -----	44
Takahashi, R. -----	107
Takahashi, T. -----	177, 474
Takeuchi, T. -----	682
Talamini, G. -----	311
Tamblyn, J. W. -----	166
Tamura, K. -----	291
Tang, W. K. -----	702
Tarakanov, O. G. -----	549
Tarasova, Z. N. -----	229
Tatevos'yan, G. O. -----	285
Taylor, S. -----	578
Teitel'baum, B. Ya. -----	37, 38, 219, 228, 240
Terekhova, G. M. -----	355, 359
Terent'ev, A. P. -----	576
Teysse, PH. -----	205
Thinius, K. -----	308, 661
Tholstrup, C. E. -----	167
Thomas, D. K. -----	696
Thomas, P. R. -----	472
Thompson, J. -----	578
Thompson, N. R. -----	66
Thomson, D. W. -----	649
Throne, R. I. -----	428
Ting, K'ai-Shuang -----	425
Tirskii, G. A. -----	452
T'kac, A. -----	212, 214, 226
Tobolsky, A. V. -----	183, 526, 698
Tokareva, L. G. -----	355, 359
Tokarzewska, M. -----	282
Tokarzewski, L. -----	282
Tokumar, S. -----	218
Tolstoguzov, V. B. -----	599, 600
Tomic, E. A. -----	574, 575, 584

<u>Author</u>	<u>Ref. No.</u>
T - Continued	
Tomikawa, M. -----	326
Tomita, K. -----	360
Topchiev, A. V. -----	502
Torikai, S. -----	413
Torossian, K. A. -----	436
Torsueva, E. S. -----	147, 156, 171, 178, 179
Traynor, E. J. -----	586
Trementozzi, Q. A. -----	144
Trimble, L. E. -----	251
Tseitlin, G. M. -----	468
Tsikin, A. N. -----	260
Tsou, K. C. -----	243, 697
Tsuchiya, S. -----	114
Tsunawaki, S. -----	651
Tsurugi, J. -----	244
Tsvetkova, A. I. -----	119
Tubyanskaya, G. S. -----	631
Tulupov, P. E. -----	641, 643, 644
Turchaninova, K. I. -----	456
Tyler, G. J. -----	472

U

Uhing, E. N. -----	542
Ul'berg, Z. R. -----	85
Uno, K. -----	509, 510, 511, 531
Urbanski, J. -----	288
Urman, Ya. G. -----	160, 329
Usmanova, N. F. -----	78

V

Vajda, A. E. -----	602
Valetsii, P. M. -----	384
Valint, P. L. -----	350
Valovoi, V. A. -----	629
Van Beek, L. K. H. -----	482
Vancso-Szmercsanyi, I. --	342
Vandenberg, E. J. -----	465
Vanderhoff, J. W. -----	79
Van Luik, F. W., Jr. ----	63
Vannikov, A. V. -----	121
Varadi, P. F. -----	382
Varshal, B. G. -----	239, 457
Va,il'eva, A. G. -----	162
Vasnev, V. A. -----	557
Vaughn, G. -----	236
Velea, I. -----	292
Vesely, K. -----	391
Vinogradova, S. V. -----	347, 384

<u>Author</u>	<u>Ref. No.</u>
V - Continued	
Vishnyak, Yu. I. -----	399
Vlasova, K. N. -----	486, 487
Vlasova, R. M. -----	479
Vogel, H. -----	503
Voitenko, R. M. -----	480
Volchek, I. S. -----	399
Vygodskii, Ya. S. -----	468
Vymazal, Z. -----	293, 689
W	
Wada, I. -----	617
Wajnryb, M. -----	296, 343
Wakefield, R. N. -----	257
Walker, A. C., Jr. -----	472
Wall, L. A. -----	1, 5, 264, 273, 315
Wallenberger, F. T. -----	566, 567, 582
Walsh, E. N. -----	542
Wanless, G. G. -----	668
Wang, Chih-Lu -----	425
Ward, F. -----	422
Watanabe, H. -----	677
Weichert, D. -----	308
Weigel, H. -----	83, 217
Weiss, P. -----	518, 540
Welch, F. J. -----	675
Wellisch, E. -----	653
Wergin, H. -----	132
Westcott, D. T. -----	297
Wexler, T. -----	292
White, C. C. -----	117
White, L. W. -----	143
White, R. H. -----	459
Wilchinsky, Z. W. -----	182
Wild, W. -----	110
Williamson, J. R. -----	535, 537
Wilson, H. S. -----	24
Winovich, W. -----	257
Winslow, E. C. -----	386, 579, 580, 658
Winslow, F. H. -----	90, 101, 111, 112
Witnauer, L. P. -----	58
Wittbecker, E. L. -----	552
Woodbrey, J. C. -----	144
Worthington, M. A. -----	103
Wrasidlo, W. J. -----	525
Wright, B. A. -----	321, 322, 418
Wright, W. W. -----	321, 322, 418, 490, 513
Wu, Shih-K'ang -----	385, 430

<u>Author</u>	<u>Ref. No.</u>
W - Continued	
Wunderlich, B. -----	74, 674
Wyckoff, H. W. -----	148
Y	
Yagfarova, T. A. -----	219
Yakobson, F. I. -----	599
Yakubchik, A. I. -----	394
Yamamoto, A. -----	43
Yamamoto, O. -----	136, 138
Yamashita, S. -----	230
Yanovskii, D. M. -----	285, 298, 300, 316
Yaserkova, I. S. -----	663
Yas'ko, L. V. -----	663
Yazvil'ova, M. P. -----	328, 487, 497
Young, M. -----	451
Youngman, E. A. -----	196
Yu, Hyuk -----	60, 183
Z	
Zabyrina, K. I. -----	625
Zaitseva, V. D. -----	220
Zalukajevs, L. -----	222, 245, 246
Zamorsky, Z. -----	358
Zamyatina, V. A. -----	664
Zannetti, R. -----	174
Zehr, J. -----	126
Zenova, I. E. -----	420
Zgadza, E. A. -----	524
Zhdanov, A. A. -----	613
Zherdev, Yu. V. -----	628
Zhigunova, I. E. -----	329, 434
Zhivakhin, S. M. -----	599, 600, 654
Zhubanov, B. A. -----	496, 498
Zhuravleva, I. P. -----	524
Zhuravleva, I. V. -----	347, 495
Zhurkov, S. N. -----	367
Zimmermann, H. -----	354
Zuccarello, R. K. -----	333
Zutty, N. L. -----	675
Zvonar, V. -----	336

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R&D		
<i>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified.)</i>		
1 ORIGINATING ACTIVITY (Corporate author)	2a REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
Plastic Technical Evaluation Center	2b GROUP n/a	
3 REPORT TITLE Literature Survey on Thermal Degradation, Thermal Oxidation, and Thermal Analysis of High Polymers. II		
4 DESCRIPTIVE NOTES (Type of report and inclusive dates) Annotated Bibliography; 1 October 1962 to 1 March 1965		
5 AUTHOR(S) (Last name, first name, initial) Teetsel, Dorothy A. Levi, David W.		
6 REPORT DATE January 1966	7a TOTAL NO OF PAGES 150	7b NO OF REFS 702
8a CONTRACT OR GRANT NO n/a	9a ORIGINATOR'S REPORT NUMBER(S) PLASTEC Note 10	
b PROJECT NO n/a	9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report) none	
c		
d		
10 AVAILABILITY/LIMITATION NOTICES Qualified requesters may obtain copies of this report from DDC. Public sale through Clearinghouse for Federal Scientific and Technical Information.		
11 SUPPLEMENTARY NOTES n/a	12 SPONSORING MILITARY ACTIVITY Office of Defense Research and Engineering	
13 ABSTRACT <p>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.</p>		

DD FORM 1473
1 JAN 64

UNCLASSIFIED

Security Classification

UNCLASSIFIED

Security Classification

KEY WORDS	LINK A		LINK B		LINK C	
	PO	WT	AC	WT	MO	WT
Bibliography Polymer Thermal degradation Thermal oxidation Thermal analysis Polystyrene Polyethylene Polybenzyl Polyphenyl Polyxylene Hydrocarbon polymers Halogen-substituted materials Synthetic polymers Inorganic polymer systems Organic polymer systems						
INSTRUCTIONS						
<p>1. ORIGINATING ACTIVITY Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization (corporate author) issuing the report.</p> <p>2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.</p> <p>2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.</p> <p>3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.</p> <p>4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.</p> <p>5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.</p> <p>6. REPORT DATE: Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication.</p> <p>7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.</p> <p>7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.</p> <p>8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.</p> <p>8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.</p> <p>9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.</p> <p>9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers (either by the originator or by the sponsor), also enter this number(s).</p>			<p>10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:</p> <p>(1) "Qualified requesters may obtain copies of this report from DDC."</p> <p>(2) "Foreign announcement and dissemination of this report by DDC is not authorized."</p> <p>(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."</p> <p>(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."</p> <p>(5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."</p> <p>If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.</p> <p>11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.</p> <p>12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring (paying for) the research and development. Include address.</p> <p>13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.</p> <p>It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as (TS), (S), (C), or (U).</p> <p>There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.</p> <p>14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.</p>			

UNCLASSIFIED

Security Classification