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Introduction

Charles L. Segal[a]
[a] Symposium on High-Temperature Polymers Polymer Group, Southern California Section American Chemical Society, Los Angeles, California

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Introduction

The papers included in this Symposium Issue are part of a continuing "experiment" that was initiated several years ago by the Polymer Group, Southern California Section of the American Chemical Society. In an effort to bring together the rapidly growing West Coast community of polymer chemists and plastics engineers, a series of symposia on specific polymer subjects was initiated. The first symposium, *Adhesives and Adhesion*, was held in November 1964; the second, recorded here, *High-Temperature Polymers: Synthesis and Degradation*, was presented in November 1965; and the third symposium, *Block Copolymers*, is scheduled for June 5, 1967, at the California Institute of Technology. These one-day symposia have been designed for maximum interplay between the participants. Several general introductory lectures were presented in the morning sessions, and a series of concise papers were given in the afternoons. An extensive discussion period was allowed for each paper and, in the case of the High-Temperature Polymers Symposium, an evening panel discussion was held. Although the quality of such meetings cannot be judged from attendance records, the presence of 250 persons at the first symposium and 400 at the second probably has some significance.

The reader of the literature in the polymer field will recognize that the papers in this issue contain information which has been outdated since the papers were given in 1965. Therefore, the authors and editors would like to consider this volume more as a progress report than as the final word on the subject of synthesis and degradation of high-temperature polymers. Several earlier "progress reports" may already be familiar to the reader (*1–6*). A later report (*7*), which has been amplified to include a "classification" of thermally stable polymers (*8*), has been given by Prof. Herman Mark. The present papers have been grouped in three categories,

although some overlap of subject matter does occur: organic polymers, inorganic polymers, and polymer degradation.

Professor Marvel's introductory paper describes his investigations of polyaromatic heterocyclic polymers. The poly(bis-benzimidazobenzophenanthrolines), poly(quinoxalines), and poly(imidazopyrrolones) exhibit unusual thermal stability, and several papers published since the symposium amplify this observation (*9,10*). The work of Delman, Stein, and Simms demonstrates a much-needed approach to the understanding of the stability of macromolecules; i.e., the synthesis and characterization of model compounds and low-molecular-weight oligomers. The favorable stability of poly(3-aminobenzaldehyde) would warrant further investigation. Bilow and Miller have demonstrated that the thermal stability inherent in polyphenylene can be obtained in a tractable polymer although not without some sacrifice to yield, and a decreasing thermal stability with decreasing molecular weight. The approach to a tractable polyphenylene has been further expanded by the recent report of Millward (*11*). Dobinson and Preston, in their abbreviated text recorded here, show quite conclusively the changes in thermal stability of copolyamides in going from aliphatic to single- and multiple-ring aromatics and finally to fused-ring aromatics.

Inorganic polymers have been the subject of several monographs in the past few years. These are included in the bibliography that accompanies the introductory lecture by J. R. Van Wazer. The study of inorganic polymers, as ably analyzed by Van Wazer, has changed from that of hypothesis and speculations to a field in which precise physical methods are used for measuring molecular structure and physical properties. An excellent example of such an approach is the paper by Eisenberg, wherein viscoelastic behavior of certain polyelectrolytes has been quantized. The polymers described by Green and Mayes appear to be more organic than inorganic; at least their synthesis follows an organic approach. The thermograms in this work should be examined carefully and compared with the earlier ones of Marvel.

The introductory paper on thermal decomposition of polymers by Friedman and the accompanying papers by Conley and Shulman are representative of the current studies in this field. As a result of this symposium, and the discussions of these latter papers, a continuing dialog has developed on the subject of standardization of

polymer samples and/or thermal analysis techniques. Two recent manuscripts might be mentioned in this regard (*12,13*).

As chairman of the symposium, I would also like to express my particular thanks to three additional invited participants on the panel who helped to enliven the discussions of these papers: Dr. A. J. Barry (Dow Corning), Dr. L. A. Wall (National Bureau of Standards), and Dr. E. E. Magat (Dupont).

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CHARLES L. SEGAL, *Chairman*
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