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### Introduction

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*Symposium on Polymers in Space Research: Part I, Recent Developments in the Synthesis, Characterization and Evaluation of Thermally Stable Polymers*

## Introduction

The papers included in this volume were originally presented as the first of three sessions of a symposium on "Polymers in Space Research." This symposium, jointly sponsored by the Polymer Group of the Southern California Section of the American Chemical Society and the Jet Propulsion Laboratory of the California Institute of Technology, was held in Pasadena, California on July 15-17, 1968. The Organizing Committee, headed by the Dr. Alan Rembaum, also included Dr. Frank N. Kelly, Dr. Robert F. Landel, Charles L. Segal, and Dr. Mitchell Shen. This first session, on "Recent Developments in the Synthesis, Characterization and Evaluation of Thermally Stable Polymers," was followed by sessions on "Properties of Polymers at Low Temperatures" and "Solid Propellants"; the last two sessions are included in a separate volume of this journal.

The Polymer Group had sponsored a symposium in 1965 on "High Temperature Polymers: Synthesis and Degradation" [1]. An emphasis has been directed in the present symposium toward selection of papers on entirely new polymer systems as well as on new techniques for evaluating thermal stability. Toward this end, Professor Stille's paper treats progress on: (1) cycloaddition reactions; and, (2) polymers containing quinoxaline rings. A related paper on the more practical utilization of polyquinoxalines, originally presented by H. H. Levine at this symposium, has been previously committed to publication in another journal [2].

In the introduction to the 1965 Symposium [1] attention was directed to the promising poly(bisbenzimidazobenzophenanthrolines), BBB, polymer systems because of their superior thermal stability. More recent results on the synthesis and thermal stability of BBB were presented at this symposium by Dr. W. E. Gibbs. The original paper appeared earlier in this journal [3]. In a related paper Berry and Fox discuss significant contributions made in the characterization of these BBB polymers.

Hodgkin and Heller have chosen the challenging area of spiropolymers. These workers treat also the related, continuing work of Professor Bailey at the University of Maryland. Professor D'Alelio, in a substitute article to his azomethine polymer work [4], presented at the symposium, introduces the 1,2-disulfonimide group as a bridge in thermally stable

polymers. Professor Volpe and his co-workers give excellent examples of isomeric and substituent effects in dibenzoylbenzene-diamine polymers.

Polyimidazopyrrolones (pyrrones) had just been identified by Pezdirtz and co-workers [5] at the time of the 1965 symposium. In an extension of this work, Jewell has carried out detailed thermal analysis of a series of these pyrrones. A single polyimide and its related model compounds have been degraded and analyzed by Johnson and Gaulin, with reference to the work of Friedman [6] and Schulman [7]. Professor Gilham, in cooperation with Pezdirtz and Epps, has further demonstrated the utility of torsional braid analysis in evaluating thermal behavior of polymers, using an aromatic polysulfone for testing.

A most valuable Panel Discussion followed, to supplement the discussions of the individual papers, thus concluding the first day of the symposium. The editors, working from a tape of the Panel Discussion, have attempted to identify the most salient points of discussion. Some extremely challenging ideas, such as on the effect of insertion of aliphatic bridges in aromatic polymers, deserve further consideration.

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