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### Introduction

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## Introduction

This publication contains the papers presented at the Symposium on Polymer Characterization by Thermal Methods of Analysis held during a joint meeting of the Polymer Chemistry and Rubber Chemistry Divisions of the American Chemical Society in Detroit, May 1-4, 1973. Several papers have been revised and expanded from the oral versions. One paper, "Thermal Studies of Solubility and Diffusion of Antioxidants," by H. E. Bair, R. J. Roe, and C. Gieniewski, is not included in this volume because it constitutes part of another work to be published elsewhere. The contents of this paper, however, can be found in Polymer Preprints, 14(1), 530 (1973).

In recent years we have seen an enormous growth in the use of dynamic thermal methods in various branches of chemistry, particularly in polymer chemistry, and this trend is expected to continue for years to come. All these techniques are based on the measurement of changes in certain physical or chemical properties of a material continuously and automatically as a function of temperature. These properties include temperature, enthalpy, mass, volume, light transmission, electrical conductivity, mechanical and dielectric relaxations, sonic velocity, and chemical composition. The future expansion of the thermal analysis family seems unlimited.

The emphasis of this symposium is to describe recent advances in technology and new applications of such dynamic thermal techniques to polymer systems. The program starts with a state-of-the-art review of the whole field to provide background information and general references to orient the audience. The following research contributions are grouped approximately into three sessions according to techniques. The first group consists of papers mainly concerned with differential thermal analysis and differential scanning calorimetry. The papers presented at the second session are based on thermogravimetry or thermogravimetry coupled with gas chromatography and mass spectrometry. The third session deals with a number of thermal techniques such as thermo-mechanical analysis, thermo-optical analysis, thermoacoustical analysis, and thermal evolution analysis combined with pyrolysis-mass

chromatography. Systems studied range from additives to plastics, fibers, elastomers, thermosetting resins, and aging skin. Applications of the techniques include study of phase transitions and morphology, evaluation and characterization of additives and polymers, and investigation of cross-linking and degradation reactions. Kinetics and mechanisms are discussed for several polymer systems.

I believe that the collection of papers in this volume is indicative of the current research efforts in dynamic thermal analysis, and should be a useful reference for those interested in polymer characterization by modern instrumental methods.

The editor wishes to express his gratitude to the authors for their contributions and for their active participation in the symposium. He also thanks Dr. J. J. Maurer for his help in presiding over the second session. It is a pleasure to acknowledge the support of the Instrument Products Division of the Du Pont Company to this symposium by sponsoring a banquet with the speakers.

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