POLYIMIDES

Synthesis, Characterization, and Applications

Volume 1

Edited by

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PREFACE

This and its companion Volume 2 chronicle the proceedings of the First Technical Conference on Polyimides: Synthesis, Characterization and Applications held under the auspices of the Mid-Hudson Section of the Society of Plastics Engineers at Ellenville, New York, November 10-12, 1982.

In the last decade or so there has been an accelerated interest in the use of polyimides for a variety of applications in a number of widely differing technologies. The applications of polyimides range from aerospace to microelectronics to medical field, and this is attributed to the fact that polyimides offer certain desirable traits, inter alia, high temperature stability. Polyimides are used as organic insulators, as adhesives, as coatings, in composites, just to name a few of their uses. Even a casual search of the literature will underscore the importance of this class of materials and the high tempo of R&D activity taking place in the area of polyimides.

So it was deemed that a conference on polyimides was both timely and needed. This conference was designed to provide a forum for discussion of various ramifications of polyimides, to bring together scientists and technologists interested in all aspects of polyimides and thus to provide an opportunity for cross-pollination of ideas, and to highlight areas which needed further and intensified R&D efforts. If the comments from the attendees are a barometer of the success of a conference, then this event was highly successful and fulfilled amply its stated objectives.

The technical program consisted of 69 papers (45 oral presentations and 24 posters) by about 130 authors from many corners of the globe. The purpose of a conference or symposium is to present the state of knowledge of the topic under consideration and it can best be accomplished by a blend of invited overviews and original unpublished research contributions. This is exactly what was done in this conference. The program contained a number of invited overviews on certain subtopics, and these were augmented by contributed original research papers. The invited speakers were

selected so as to represent differing disciplines and interests and they hailed from academic, governmental and industrial research laboratories.

As for the present proceedings volumes, the papers have been rearranged (from the order they were presented) so as to fit them in a more logical fashion. Incidentally, these volumes also contain nine papers which were not included in the formal printed program. Also it should be recorded here that, for a variety of reasons, a few papers which were presented are not included in these volumes. It must be emphasized here that these proceedings volumes are not simply a collection of papers, but the peer review was an integral part of the total editing process. All papers were critically reviewed by qualified reviewers as the comments of peers are a desideratum to maintain high standard of publications. Also it should be recorded that although no formal discussion is included in these proceedings, but there were many enlightening, not exothermic, and lively discussions both formally in the auditorium and in more relaxed places. Particular mention should be made here regarding the poster presentations. The poster session was highly successful as can be gauged from the comments of those who participated in this format.

Coming back to the proceedings volumes, these contain a total of 71 papers (1182 pages) by 164 authors from nine countries. The text is divided into five sections as follows: Synthesis and Properties; Properties and Characterization; Mechanical Properties; Microelectronic Applications; and Aerospace and other Applications. Sections I and II constitute Volume 1, and Sections III-V grace the pages of Volume 2. The topics covered include: synthesis, properties and characterization of a variety of polyimides; metal-containing polyimides; cure kinetics of polyimides; structure-property relationships; polyimide adhesion; mechanical properties of polyimides both in bulk state as well as in thin film form; applications of polyimides in microelectronics; photosensitive polyimides; polyimides as adhesives; aerospace applications of polyimides; polyimide blends; electrophoretic deposition of polyimides; and applications of polyimides in electrochemical and medical fields.

Even a cursory glance at the Table of Contents will convince that there is a great deal of R&D activity in the area of this wonderful class of materials, and all signals indicate that this tempo is going to continue. It is hoped that these proceedings volumes which represent the repository of latest knowledge about polyimides will be useful to both the seasoned researcher (as a source of latest information) and to the neophyte as a fountain of new ideas. As we learn more about this unique class of materials, more pleasant applications will emerge.

Apropos, a comment should be made here regarding the nomenclature being used in the field of polyimides. Dr. Paul Frayer (Rogers Corp.) pointed out that there was a great deal of inconsistency in the nomenclature and different authors were using quite different terms for chemically identical species. He further suggested that a consistent method of nomenclature was needed and urged the attendees to come up with a consensus on this issue and to take the requisite action in this regard in a future conference on polyimides.

Acknowledgements. First of all I am thankful to the Mid-Hudson Section of the Society of Plastics Engineers for sponsoring this event, to Dr. H.R. Anderson, Jr. (IBM Corporation) for permitting me to organize the technical program and to Steve Milkovich (IBM Corporation) for his understanding and cooperation during the tenure of editing. My special thanks are due to the Organizing Committee members (C. Araps, P. Buchwalter, G. Czornyj, M. Gupta, J. Schiller and M. Turetzky) for their invaluable help, and in particular to the General Chairman (Julius Schiller) for his continued interest in and overall responsibility and organization of this conference. All members of the Organizing Committee worked hard in many capacities and unflinchingly devoted their time to make a conference of this magnitude a grand success. Special appreciation is extended to P. Hood, M. Htoo, R. Martinez, R. Nufer and B. Washo for their help and cooperation in more ways than one.

On a more personal note, I am thankful to my wife, Usha, for tolerating, without much complaint, the frequent privations of an editor's wife and for helping me in many ways. I am appreciative of my darling children (Anita, Rajesh, Nisha and Seema) for not only letting me use those hours which rightfully belonged to them but also for rendering home environment conducive to work. Special thanks are due to Phil Alvarez (Plenum Publishing Corporation) for his continued interest in this project, and to Barbara Mutino (Office Communications) for meeting promptly various typing deadlines. The time and effort of the unheralded heroes (reviewers) is gratefully acknowledged. Last, but not least, the enthusiasm, cooperation and contributions of the authors are certainly appreciated without which we could not have these volumes.

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