

Preface

The performance of polymeric materials and the science of polymer degradation and materials reliability are of ever increasing importance for sustainable global economic development. Many of the challenges we face require better performing, cheaper and more specialized polymers ranging from composites and thermosets to thermoplastics and elastomers, and increasingly originating from biomass rather than fossil resources. Whether polymers find their way into consumer products, energy applications, microelectronics, defense areas, or space exploration, there is one commonality: a requirement for improved reliability and the ability to predict material behavior in a variety of environmental conditions. Polymer performance is governed by the polymer's ability to resist chemical and physical degradation processes under thermal, photo, radiation, hydrolytic, and biological conditions. The emerging high performance material needs in the near future will undoubtedly be related to energy and biomedical applications and will have to address concerns about sustainability and environmental impact.

The 24 chapters in this symposium series volume provide an overview of current research and development trends related to the performance, degradation, reliability, and optimization of novel polymeric materials. This book was developed from the 53 excellent papers (including four tutorials) presented at the symposium on *Polymer Performance Degradation and Materials Selection* at the American Chemical Society (ACS) spring meeting held in March 2007 in Chicago, Illinois. We discussed the progress in this interdisciplinary research field that relies on an exchange of creative ideas where the commonality is in analysis methods, characterization techniques, synthetic routes, processing improvements, similar degradation mechanisms, and the philosophy of what affects performance. The ongoing challenge remains to better understand materials performance under complex environmental exposures rather than idealistic single stress conditions. We have met about every seven years as part of the ACS conferences (Chicago 1993,

San Diego 2001, and Chicago 2007) and have witnessed well-attended and stimulating symposia. It is with great satisfaction that we continue to attract contributions from new talents entering this field. In fact, as this book demonstrates, our field is more complex and broader-ranging than ever before. Considering the success of the symposium, many presenters inquired about the possibility of contributing a chapter to a conference proceedings book. We hope that we were able to present here a selection and overview of the many research activities that were being addressed. Many of the contributing authors are recognized as experts in their respective fields and have contributed innovative concepts.

The authors and the editors sincerely hope that this overview will provide guidance and an improved understanding of the various issues connected with polymer materials performance and will assist our fellow scientists in their research and development of improved materials.

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