Polymer Degradation And Stability Research Developments

Developments in Polymer Degradation—6

Thermal Degradation of Polymeric Materials, Second Edition offers a wealth of information for polymer researchers and processors who require a thorough understanding of the implications of thermal degradation on materials and product performance. Sections cover thermal degradation mechanisms and kinetics, as well as various techniques, such as thermogravimetry in combination with mass spectroscopy and infrared spectrometry to investigate thermal decomposition routes. Other chapters focus on polymers and copolymers, including polyolefins, styrene polymers, polyvinyl chloride, polyamides, polyurethanes, polyesters, polyacrylates, natural polymers, inorganic polymers, high temperature-resistant and conducting polymers, blends, organic-inorganic hybrid materials, nanocomposites, and biocomposites. Finally, other key considerations such as recycling of polymers by thermal degradation, thermal degradation during processing, and modelling, are discussed in detail. Explains mechanisms of polymer degradation, making it possible to understand and predict material behavior at elevated temperatures Offers systematic coverage of each polymer group that is supported by data detailed explanations and critical analysis Investigates thermal decomposition routes in new materials, such as organic-inorganic hybrid materials and polymer nanocomposites

Reactions and Mechanisms in Thermal Analysis of Advanced Materials

Minerals—Advances in Research and Application: 2012 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Minerals. The editors have built Minerals—Advances in Research and Application: 2012 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Minerals in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Minerals—Advances in Research and Application: 2012 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Alkenes: Advances in Research and Application: 2011 Edition

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Progress in Polymer Degradation and Stability Research

Polymer degradation is a change in the properties -- tensile strength, colour, shape, etc -- of a polymer or polymer based product under the influence of one or more environmental factors such as heat, light or chemicals. These changes may be undesirable, such as changes during use, or desirable, as in biodegradation or deliberately lowering the molecular weight of a polymer. Such changes occur primarily because of the effect of these factors on the chemical composition of the polymer. In a finished product such a change is to be prevented or delayed. However, the degradation process can be useful from the view points of understanding the structure of a polymer or recycling/reusing the polymer waste to prevent or reduce environmental pollution. Polymers molecules are very large on the molecular scale which derive their unique and useful properties from their size.

Thermal Stability of Polymers

New Developments in Polymer Research

New Developments in Polymer Research

Polymers are substances containing a large number of structural units joined by the same type of linkage. These substances often form into a chain-like structure. Starch, cellulose, and rubber all possess polymeric properties. Today, the polymer industry has grown to be larger than the aluminium, copper and steel industries combined. Polymers already have a range of applications that far exceeds that of any other class of material available to man. Current applications extend from adhesives, coatings, foams, and packaging materials to textile and

industrial fibres, elastomers, and structural plastics. Polymers are also used for most composites, electronic devices, biomedical devices, optical devices, and precursors for many newly developed high-tech ceramics. This book presents leading-edge research in this rapidly-changing and evolving field.

Polymer Degradation and Stabilization

Biodegradable Polymer Blends and Composites from Renewable Resources provides a comprehensive, current overview of biopolymeric blends and composites and their applications in various industries. The book is organized according to the type of blend or composite. For each topic, the relationship between the structure of the blends/composites and their respective properties is explored, with particular focus on interface, compatibility, mechanical, and thermal properties. Real-life applications and potential markets are discussed. This is a premier reference for graduate students and researchers in polymer science, chemical and bio engineering, and materials science.

Fundamentals of Polymer Degradation and Stabilization

During the past decade, the field of polymer degradation and stabilization has become a subject of central importance in polymer science and technology. This book provides a fundamental source of information designed for those with only a basic understanding of the background of the field.

Minerals—Advances in Research and Application: 2012 Edition

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Polyenes: Advances in Research and Application: 2011 Edition

Organophosphorus Compounds—Advances in Research and Application: 2012 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Organophosphorus Compounds. The editors have built Organophosphorus Compounds—Advances in Research and Application: 2012 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Organophosphorus Compounds in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Organophosphorus Compounds—Advances in Research and Application: 2012 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Thermal Degradation of Polymeric Materials

PVC Degradation and Stabilization, Fourth Edition, includes new developments in PVC production, new stabilization methods and mechanisms, new approaches to plasticization, methods of waste reprocessing, accelerated degradation due to electric breakdown, and much more. The book contains all the information necessary for the successful design of stabilization formulas in any PVC-based product. Other topics covered include degradation by thermal energy, UV, gamma and other forms of radiation, chemical degradation, and more. Analytical methods for studying degradative and stabilization processes aid readers in establishing a system for verifying results of stabilization with different stabilizing systems. Many new topics included in this edition are of particular interest today. These comprise new developments in PVC production yielding range of new grades, new stabilization methods and mechanisms (e.g. synergistic mixtures containing hydrotalcites and their synthetic equivalents, beta-diketones, functionalized fillers, Shiff bases), new approaches to plasticization, methods of waste reprocessing (life cycle assessment, reformulation, biodegradable materials, and energy recovery), accelerated degradation due to electric breakdown, and many more Revised to include cutting-edge research, patent updates and other information required to design successful stabilization in PVC-based products Covers chemical structure, PVC manufacturing technology, morphology, degradation by thermal energy, mechanodegradation, and more Includes a chapter on the analytical methods used in studying degradative and stabilization processes Discusses information on the effects of PVC and its additives on health, safety and the environment

PVC Degradation and Stabilization

The development of polymers as an important class of material was inhibited at the first by the premature failure of these versatile compounds in many applications. The deterioration of important properties of both natural and

synthetic polymers is the result of irreversible changes in composition and structure of polymers molecules. As a result of these reactions, mechanical, electrical and/or aesthetic properties are degraded beyond acceptable limits. It is now generally recognized that stabilization against degradation is necessary if the useful life of polymers is to be extended sufficiently to meet design requirements for long-term applications. Polymers degrade by a wide variety of mechanisms, several of which affect all polymers through to varying degree. This monograph will concentrate on those degradation mechanisms which result from reactions of polymers with oxygen in its various forms and which are accelerated by heat and/or radiation. Those stabilization mechanisms are discussed which are based on an understanding of degradation reaction mechanisms that are reasonably well established. The stabilization of polymers is still undergoing a transition from an art to a science as mechanisms of degradation become more fully developed. A scientific approach to stabilization can only be approached when there is an understanding of the reactions that lead to degradation. Stabilization against biodegradation and burning will not be discussed since there is not a clear understanding of how polymers degrade under these conditions.

Organophosphorus Compounds—Advances in Research and Application: 2012 Edition

Keeping up to date with advances in material science and applied engineering is essential for those working in the field if they are to understand and tackle the challenges they face in an efficient manner and adopt the best and most appropriate solutions available. This book presents the proceedings of MMSE 2022, the 8th International Conference on Advances in Machinery, Materials Science and Engineering Application, held as a hybrid event (both in-person and online) in Wuhan, China, on 23 and 24 July 2022. For the past 12 years, the MMSE international conferences have collated recent advances and experiences, identified emerging trends in technology and encouraged lively debate between students, specialists, engineers and associations from around

the world, all of which have had a positive impact in helping to address the world’s engineering challenges. The book contains 121 papers, selected by means of a rigorous international peer-review process by editors and reviewers from the 215 submissions received. Topics covered include the latest advancements in applied mechanics, intelligent manufacturing technology, mechanical and electromechanical engineering, heat transfer, combustion, advanced materials sciences, industrial applications, applied mathematics, simulation and interdisciplinary engineering. Presenting a wealth of exciting ideas for solving real problems in the real world and opening novel research directions, the book will be of interest to materials specialists and engineers from both academia and industry everywhere.

Biodegradable Polymer Blends and Composites from Renewable Resources

Organic photovoltaics (OPV) are a new generation of solar cells with the potential to offer very short energy pay back times, mechanical flexibility and significantly lower production costs compared to traditional crystalline photovoltaic systems. A weakness of OPV is their comparative instability during operation and this is a critical area of research towards the successful development and commercialization of these 3rd generation solar cells. Covering both small molecule and polymer solar cells, Stability and Degradation of Organic and Polymer Solar Cells summarizes the state of the art understanding of stability and provides a detailed analysis of the mechanisms by which degradation occurs. Following an introductory chapter which compares different photovoltaic technologies, the book focuses on OPV degradation, discussing the origin and characterization of the instability and describing measures for extending the duration of operation. Topics covered include: Chemical and physical probes for studying degradation Imaging techniques Photochemical stability of OPV materials Degradation mechanisms Testing methods Barrier technology and applications Stability and Degradation of Organic and Polymer Solar Cells is an essential reference source for researchers in academia and industry,

engineers and manufacturers working on OPV design, development and implementation.

Polyenes—Advances in Research and Application: 2012 Edition

This book presents some fascinating phenomena associated with the remarkable features of high performance polymers and also provides an update on applications of modern polymers. It offers new research on structure–property relationships, synthesis and purification, and potential applications of high performance polymers. The collection of topics in this book reflects the diversity of recent advances in modern polymers with a broad perspective that will be useful for scientists as well as for graduate students and engineers. The book opens with a presentation of classical models, moving on to increasingly more complex quantum mechanical and dynamical theories. Coverage and examples are drawn from modern polymers. Topics include high performance polymers and computer science integration in biochemical, green polymers, molecular nanotechnology, and industrial chemistry.

Recent Developments in Polymer Research

Strong bonds form stronger materials. For this reason, the investigation on thermal degradation of materials is a significantly important area in research and development activities. The analysis of thermal stability can be used to assess the behavior of materials in the aggressive environmental conditions, which in turn provides valuable information about the service life span of the materiel. Unlike other books published so far that have focused on either the fundamentals of thermal analysis or the degradation pattern of the materials, this book is specifically on the mechanism of degradation of materials. The mechanism of rapturing of chemical bonds as a result of exposure to high-temperature environment is difficult to study and resulting mechanistic pathway hard to

establish. Limited information is available on this subject in the published literatures and difficult to excavate. Chapters in this book are contributed by the experts working on thermal degradation and analysis of the wide variety of advanced and traditional materials. Each chapter discusses the material, its possible application, behavior of chemical entities when exposed to high-temperature environment and mode and the mechanistic route of its decomposition. Such information is crucial while selecting the chemical ingredients during the synthesis or development of new materials technology.

Polymer Degradation and Stability Research Developments

Polymer degradation is a change in the properties - tensile strength, colour, shape, etc - of a polymer or polymer based product under the influence of one or more environmental factors such as heat, light or chemicals. This book presents research in this field.

Foundations of High Performance Polymers

Polymers constitute a separate area on the environmental issues. Due to the generation of excessive amounts of polymers wastes by industries and householders, the world has confronted a serious crisis. Furthermore, due to the rising environmental awareness, economical and petroleum concerns an increasing attempt is being made to cope with the polymers wastes during the last few years. The traditional methods used to dispose polymer wastes such as combustion of polymers wastes or burying underground show a negative influence on the environment.From the existing studies, it seems that the recycling process is one of the best techniques to treat the waste polymer products. Recycling of polymers through advanced techniques is an important topic that is driven by both the commercial and environmental influences. Several new techniques have been developed

along with the means of reusing recycled polymers. Some of the commercially important technological processes for recycling of waste polymers include mechanical recycling, chemical or feedstock recycling and energy recovery. Keeping in mind the advantages of the recycled polymers, this book gives an overview of on properties and processing of different kinds of recycled polymers along with their composites for a range of applications. This book is unique in the sense that it deals exclusively with the properties and processing of different recycled polymers which are otherwise considered as waste.The book is the outcome of untiring efforts of the researchers from different parts of the world with extensive research experience in the field of recycled polymers across different disciplines. Some of the main features are:- Present state-of-the-art recycled polymers from different resources - Includes contributions from world renowned experts on recycled polymers - Discusses the properties and durability of recycled polymers based materials - Highlights new frontiers in the properties and applications of recycled polymers - Focus on recyclability and up-to date progress on recycled polymers - Effect of different parameters on properties of recycled polymers are presented - Solutions for widespread application are recommended - Current problems, recent developments and applications are discussed

Siloxanes: Advances in Research and Application: 2011 Edition

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Recent Developments in Polymer Research

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Advances in Escherichia Research and Application: 2012 Edition

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Recycled Polymers

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Stability and Degradation of Organic and Polymer Solar Cells

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authoritative, and comprehensive information about Lactates. The editors have built Lactates—Advances in Research and Application: 2012 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Lactates in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Lactates—Advances in Research and Application: 2012 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Photochemistry and Photophysics of Polymeric Materials

The purpose of the present series of publications is two-fold. In the first place it is intended to review progress in the development of practical stabilising systems for a wide range of polymers and applications. A complementary and ultimately more important objec tive is to accommodate these practical developments within the framework of antioxidant theory, since there can be little question that further major advances in the practice of stabilisation technology will only be possible on the basis of a firm mechanistic foundation. Research into the role of 'stable' free radicals as antioxidants and stabilisers for polymers has intensified in recent years. Nitroxyl radicals (nitroxides) were the earliest long-lived radicals to be investi gated in detail and Maslov and Zaikov review the developments that have taken place in understanding their reaction mechanisms from the time when they were first investigated in liquid hydrocarbon systems to the present day when their outstanding performance as light stabilisers has been the object of much scientific research. Although some features of their reactivity remain obscure, the authors approach the problem kinetically and indicate the factors limiting their

effectiveness.

Polymer Research Developments

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Lactates—Advances in Research and Application: 2012 Edition

Presents the state of the technology, from fundamentals to new materials and applications Today's electronic devices, computers, solar cells, printing, imaging, copying, and recording technology, to name a few, all owe a debt to our growing understanding of the photophysics and photochemistry of polymeric materials. This book draws together, analyzes, and presents our current understanding of polymer photochemistry and photophysics. In addition to exploring materials, mechanisms, processes, and properties, the handbook also highlights the latest applications in the field and points to new developments on the horizon. Photochemistry and Photophysics

of Polymer Materials is divided into seventeen chapters, including: Optical and luminescent properties and applications of metal complex-based polymers Photoinitiators for free radical polymerization reactions Photovoltaic polymer materials Photoimaging and lithographic processes in polymers Photostabilization of polymer materials Photodegradation processes in polymeric materials Each chapter, written by one or more leading experts and pioneers in the field, incorporates all the latest findings and developments as well as the authors' own personal insights and perspectives. References guide readers to the literature for further investigation of individual topics. Together, the contributions represent a series of major developments in the polymer world in which light and its energy have been put to valuable use. Not only does this reference capture our current state of knowledge, but it also provides the foundation for new research and the development of new materials and new applications.

Lanthanoid Series Elements—Advances in Research and Application: 2012 Edition

Biodegradable Polymers, Blends and Composites provides a comprehensive review on recent developments in this very important research field. The book's chapters cover the various types of biodegradable polymers currently available and their composites, with discussions on preparation, properties and applications. Sections cover natural rubber-based polymer blends, soy-protein, cellulose, chitin, starch-based, PLA, PHBV, PCL, PVA, PBAT-based blends, Poly (ethylene succinate), PHB and Poly (propylene carbonates). The book will be a valuable reference resource for academic and industrial researchers, technologists and engineers working on recent developments in the area of biodegradable polymers, their blends and composites. Discusses the various types of biodegradable polymers, blends and composites Covers natural rubber, cellulose, chitin, starch, PLA, PCL and PBAT Features modern processing technologies, properties, applications and biodegradability

Biodegradable Polymers, Blends and Composites

Advances in Silicic Acid Research and Application: 2012 Edition

18th Annual Meeting of the UK Polymer Degradation Discussion Group

A comprehensive overview of biodegradable polymers, covering everything from synthesis, characterization, and degradation mechanisms while also introducing useful applications, such as drug delivery systems and biomaterial-based regenerative therapies. An introductory section deals with such fundamentals as basic chemical reactions during degradation, the complexity of biological environments and experimental methods for monitoring degradation processes. The result is a reliable reference source for those wanting to learn more about this important class of polymer materials, as well as scientists in the field seeking a deeper insight.

Developments in Polymer Degradation—7

The purpose of this volume, like that of its predecessors in the series, is to present a selection of topics which are representative of the continually expanding area of polymer degradation. It will be obvious that some of these topics emanate from academic studies, others from more applied backgrounds, but it is anticipated that all will be seen to be of vital relevance to one or other of the currently advancing fields of polymer technology. The first two chapters deal with specific classes of polymers, and particularly with their mechanisms and products of thermal degrada\u00ad tion. Thus in Chapter 1 Dr McNeill discusses the reactions of the ammonium, alkali and alkaline earth metal salts of poly(methacrylic acid) and their copolymers with methyl methacrylate. These water\u00ad soluble 'ionomers' have valuable technological applications. In Chap\u00ad ter 2 Professor Montaudo and Dr Puglisi perform a valuable service by drawing together and critically reviewing, for the first

time to my knowledge, the mechanisms of thermal degradation of the various classes of condensation polymers which are of industrial significance. This includes, for example, the polyurethanes, polyureas, polyesters, polycarbonates, polyamides, polyimides, polyethers, polysulphides, polysulphones, polyschiff bases, polysiloxanes and polyphosphazenes.

Developments in Polymer Stabilisation—8

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Polymer Degradation and Stabilisation

The study of polymer degradation and stabilisation is of considerable practical importance as the industrial uses of polymeric materials continue to expand. In this book, the authors lucidly relate technological phenomena to the chemistry and physics of degradation and stabilisation processes. Degradation embraces a variety of

technologically important phenomena ranging from relatively low temperature processes such as 'weathering' of plastics, 'fatigue' of rubbers through the processing of polymers in shearing mixers to very high temperature processes such as flammability and ablation. All these technological phenomena have in common certain basic chemical reactions. Thus 'weathering' has its roots in photo-oxidation, 'fatigue' and melt-degradation in mechano-oxidation and flammability, and ablation in ablation in pyrolysis and vapour phase oxidation.

Developments in Polymer Stabilisation

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Developments in Polymer Degradation

In recent years numerous research papers have been published on the changes in chemical structure and in

physical properties of polymers when they are exposed to heat over a range of temperatures. For example, these changes can occur at any time during the injection moulding of the plastic, in the subsequent processing and in its end-use application when exposed to elevated temperatures. Thermal stability is a very important parameter which must be taken into account when selecting polymers whether for their use as constructional or engineering applications or in the packaging of food at high temperatures. The mechanisms by which such changes occur are many and it is important to know what these are and to be able to measure the rate of change of polymer structure and its dependence on temperature and time. Development of an understanding of the mechanisms of thermal degradation will help the chemist to develop materials with better thermal stability. This is particularly important in newer developments in engineering and aerospace. This book reviews in nine chapters the measurement of these properties in the main types of polymers in use today. Numerous techniques are discussed ranging from thermogravimetric analysis, differential scanning calorimetry, infrared and nuclear magnetic resonance based methods to pyrolytic techniques such as those based on pyrolysis, gas chromatography and mass spectrometry. The book is aimed at those engaged in the manufacture of polymers and the development of end-use applications. It is essential that students of polymer science should have a thorough understanding of polymer stability and an additional aim of the book is to help in the development of such an interest.

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