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Initially published "to bridge the gap between theory and practice in extrusion," this 5th edition of Polymer Extrusion continues to serve the practicing polymer engineer and chemist, providing the theoretical and the practical tools for successful extrusion operations. In its revised and expanded form, it also incorporates the many new developments in extrusion theory and machinery over the last years. Contents · Different Types of Extruders · Extruder Hardware · Instrumentation and Control · Fundamental Principles · Important Polymer Properties · Functional Process Analysis · Extruder Screw Design · Die Design · Twin Screw Extruders · Troubleshooting Extruders · Modeling and Simulation of the Extrusion Process This book contains nine chapters covering advanced processing applications and technologies. It provides descriptions of industry developments for unique products and fabrication methods. Contributors include professionals from industry and academia. Processing Technology for Bio-Based Polymers: Advanced Strategies and Practical Aspects brings together the latest advances and novel technologies surrounding the synthesis and manufacture of biopolymers, ranging from bio-based polymers to synthetic polymers from bio-derived monomers. Sections examine bio-based polymer chemistry, discuss polymerization process and emerging design technologies, cover manufacturing and processing approaches, explain cutting-edge approaches and innovative applications, and focus on biomedical and other key application areas. Final chapters provide detailed discussion and an analysis of economic and environmental concerns, practical considerations, challenges, opportunities and future trends. This is a valuable resource for researchers, scientists and advanced students in polymer science, bio-based materials, nanomaterials, plastics engineering, biomaterials, chemistry, biotechnology, and materials science and engineering, as well as R&D professionals, engineers and industrialists interested in the development of biopolymers for advanced products and applications. Focuses on the processing of bio-based polymers, covering both traditional methods and innovative new approaches Offers novel opportunities and ideas for developing or improving technologies for biopolymer research, preparation and application Examines other key considerations, including reliability and end product, economic concerns, and environmental and lifecycle aspects Fundamental concepts coupled with practical, step-by-step guidance With its emphasis on core principles, this text equips readers with the skills and knowledge to design the many processes needed to safely and successfully manufacture thermoplastic parts. The first half of the text sets forth the general theory and concepts underlying polymer processing, such as the viscoelastic response of polymeric fluids and diffusion and mass transfer. Next, the text explores specific practical aspects of polymer processing, including mixing, extrusion dies, and post-die processing. By addressing a broad range of design issues and methods, the authors demonstrate how to solve most common processing problems. This Second Edition of the highly acclaimed Polymer Processing has been thoroughly updated to reflect current polymer processing issues and practices. New areas of coverage include: Micro-injection molding to produce objects weighing a fraction of a gram, such as miniature gears and biomedical devices New chapter dedicated to the recycling of thermoplastics and the processing of renewable polymers Life-cycle assessment, a systematic method for determining whether recycling is appropriate and which form of recycling is optimal Rheology of polymers containing

fibers Chapters feature problem sets, enabling readers to assess and reinforce their knowledge as they progress through the text. There are also special design problems throughout the text that reflect real-world polymer processing issues. A companion website features numerical subroutines as well as guidance for using MATLAB®, IMSL®, and Excel to solve the sample problems from the text. By providing both underlying theory and practical step-by-step guidance, Polymer Processing is recommended for students in chemical, mechanical, materials, and polymer engineering. Polymer usage is widespread with applications in many areas and its growth has been rapid in recent years. The aim of the Concise Encyclopedia of Polymer Processing & Applications is to cover the mainstream areas of application and their associated processing techniques. This is achieved by using a combination of new articles and ones drawn from the acclaimed Encyclopedia of Materials Science and Engineering, its supplements, and related Concise Encyclopedias. The emphasis is placed on the practical handling and production aspects of polymers, with a varied selection of topics examined including overviews on elastomers, fibers and textiles, composites and adhesive joining. Overall the book provides a comprehensive and up-to-date account of polymer processing and applications. Polymers are substances made of macromolecules formed by thousands of atoms organized in one (homopolymers) or more (copolymers) groups that repeat themselves to form linear or branched chains, or lattice structures. The concept of polymer traces back to the years 1920's and is one of the most significant ideas of last century. It has given great impulse to industry but also to fundamental research, including life sciences. Macromolecules are made of small molecules known as monomers. The process that brings monomers into polymers is known as polymerization. A fundamental contribution to the industrial production of polymers, particularly polypropylene and polyethylene, is due to the Nobel prize winners Giulio Natta and Karl Ziegler. The ideas of Ziegler and Natta date back to 1954, and the process has been improved continuously over the years, particularly concerning the design and shaping of the catalysts. Chapter 1 (due to A. Fasano) is devoted to a review of some results concerning the modelling of the Ziegler-Natta polymerization. The specific example is the production of polypropylene. The process is extremely complex and all studies with relevant mathematical contents are fairly recent, and several problems are still open. Polymer science is fundamentally interdisciplinary, yet specialists in one aspect, such as chemistry or processing, frequently encounter difficulties in understanding the effects of other disciplines on their own. This book describes clearly how polymer chemistry and polymer processing interact to affect polymer properties. As such, specialists in both disciplines can gain a deeper understanding of how these subjects underpin each other. Coverage includes step-by-step introductions to polymer processing technologies; details of fluid flow and heat transfer behaviour; shaping methods and physical processes during cooking and curing, and analyses of moulding and extrusion processes. An Introduction to Polymer Rheology and Processing is a practical desk reference providing an overview of operating principles, data interpretation, and qualitative explanation of the importance and relationship of rheology to polymer processing operations. It covers full-scale processing operations, relating industrial processing operations and design methodology to laboratory-scale testing. Hundreds of design formulas applicable to scaling up the processing behavior of polymeric melts are

presented. The book also provides a "working knowledge" description of major rheological test methods useful in product development and includes a useful glossary of polymer and test method/instrumentation definitions. Lavishly illustrated and featuring numerous sample calculations and modeling approaches, *An Introduction to Polymer Rheology and Processing* is a "must have" book for polymer engineers and rheologists. Volume 7 deals with specialty polymers and polymer processing, with eight chapters reviewing generic polymer systems and applications and seven chapters describing unit operations of polymer processing. A large amount of relevant mathematical problems arise from the polymer industry with respect to the quality of manufactured polymer parts. This book provides the first unified presentation of the mathematical modeling of polymerization, crystallization and extrusion of polymer melts, by means of advanced methods, presented in an accessible way for applied scientists and engineers. Thoroughly revised edition of the classic text on polymer processing *The Second Edition* brings the classic text on polymer processing thoroughly up to date with the latest fundamental developments in polymer processing, while retaining the critically acclaimed approach of the First Edition. Readers are provided with the complete panorama of polymer processing, starting with fundamental concepts through the latest current industry practices and future directions. All the chapters have been revised and updated, and four new chapters have been added to introduce the latest developments. Readers familiar with the First Edition will discover a host of new material, including: * Blend and alloy microstructuring * Twin screw-based melting and chaotic mixing mechanisms * Reactive processing * Devolatilization--theory, mechanisms, and industrial practice * Compounding--theory and industrial practice * The increasingly important role of computational fluid mechanics * A systematic approach to machine configuration design *The Second Edition* expands on the unique approach that distinguishes it from comparative texts. Rather than focus on specific processing methods, the authors assert that polymers have a similar experience in any processing machine and that these experiences can be described by a set of elementary processing steps that prepare the polymer for any of the shaping methods. On the other hand, the authors do emphasize the unique features of particular polymer processing methods and machines, including the particular elementary step and shaping mechanisms and geometrical solutions. Replete with problem sets and a solutions manual for instructors, this textbook is recommended for undergraduate and graduate students in chemical engineering and polymer and materials engineering and science. It will also prove invaluable for industry professionals as a fundamental polymer processing analysis and synthesis reference. Polymers are used in everything from nylon stockings to commercial aircraft to artificial heart valves, and they have a key role in addressing international competitiveness and other national issues. *Polymer Science and Engineering* explores the universe of polymers, describing their properties and wide-ranging potential, and presents the state of the science, with a hard look at downward trends in research support. Leading experts offer findings, recommendations, and research directions. Lively vignettes provide snapshots of polymers in everyday applications. The volume includes an overview of the use of polymers in such fields as medicine and biotechnology, information and communication, housing and construction, energy and transportation, national defense, and environmental protection. The committee

looks at the various classes of polymers—plastics, fibers, composites, and other materials, as well as polymers used as membranes and coatings—and how their composition and specific methods of processing result in unparalleled usefulness. The reader can also learn the science behind the technology, including efforts to model polymer synthesis after nature's methods, and breakthroughs in characterizing polymer properties needed for twenty-first-century applications. This informative volume will be important to chemists, engineers, materials scientists, researchers, industrialists, and policymakers interested in the role of polymers, as well as to science and engineering educators and students. A comprehensive reference on the processing of polymer materials to finished products, dealing with all categories of materials including rubbers and composites as well as thermoplastics. The emphasis is on practical processing methods, and Morton-Jones (polymer research, U. of Lancaster) draws on his direct experience in many of the processing fields described. Acidic paper. Annotation copyrighted by Book News, Inc., Portland, OR This book provides the background needed to understand not only the wide field of polymer processing, but also the emerging technologies associated with the plastics industry in the 21st Century. It combines practical engineering concepts with modeling of realistic polymer processes. Divided into three sections, it provides the reader with a solid knowledge base in polymer materials, polymer processing, and modeling. "Understanding Polymer Processing" is intended for the person who is entering the plastics manufacturing industry and as a textbook for students taking an introductory course in polymer processing. It also serves as a guide to the practicing engineer when choosing a process, determining important parameters and factors during the early stages of process design, and when optimizing such a process. Practical examples illustrating basic concepts are presented throughout the book. New in the second edition is a chapter on additive manufacturing, together with associated examples, as well as improvements and corrections throughout the book. Contents: o Part I - Polymeric Materials This section gives a general introduction to polymers, including mechanical behavior of polymers and melt rheology o Part II Polymer Processing The major polymer processes are introduced in this section, including extrusion, mixing, injection molding, thermoforming, blow molding, film blowing, and many others. o Part III Modeling This last section delivers the tools to allow the engineer to solve back-of-the-envelope polymer processing models. It includes dimensional analysis and scaling, transport phenomena in polymer processing, and modeling polymer processes Polymers are ubiquitous and pervasive in industry, science, and technology. These giant molecules have great significance not only in terms of products such as plastics, films, elastomers, fibers, adhesives, and coatings but also less obviously though none the less importantly in many leading industries (aerospace, electronics, automotive, biomedical, etc.). Well over half the chemists and chemical engineers who graduate in the United States will at some time work in the polymer industries. If the professionals working with polymers in the other industries are taken into account, the overall number swells to a much greater total. It is obvious that knowledge and understanding of polymers is essential for any engineer or scientist whose professional activities involve them with these macromolecules. Not too long ago, formal education relating to polymers was very limited, indeed, almost nonexistent. Speaking from a personal viewpoint, I can recall my first job after completing my Ph.D. The

job with E.I. Du Pont de Nemours dealt with polymers, an area in which I had no university training. There were no courses in polymers offered at my alma mater. My experience, incidentally, was the rule and not the exception. Addressing the two major unit operations—mixing and extrusion—fundamental to processing elastomers and plastic materials, this reference summarizes design equations that can be employed effectively in scaling up product performance parameters, and contains a thorough survey of rheological principles. In addition, the book provides a wealth of practical information, relating molecular and compositional properties of polymers to processing characteristics and end-use properties so that engineers can select polymers suitable for specific equipment as well as products. *Polymer Mixing and Extrusion Technology* examines viscometric techniques and demonstrates their importance to product quality assurance ... reviews design-related literature/correlations and calculation procedures for mixing and extrusion ... defines needs and precision standards for setting up a polymer processing laboratory so that product quality control can be implemented in physical testing and processing research... plus more. Illustrated with over 200 diagrams, tables, and photographs that facilitate readers' understanding of the processes, *Polymer Mixing and Extrusion Technology* is an authoritative source for plastics, polymer, and chemical engineers, manufacturers of plastics processing equipment, and advanced undergraduate and graduate students in these disciplines. "Offers detailed coverage of applied polymer processing—presenting a wide range of technologies and furnishing state-of-the-art data on polymer components, properties, and processibility. Reviews fundamental rheological concepts. Contains over 1600 bibliographic citations, some 450 equations, and over 400 tables, drawings, and photographs." *Polymer Processing Instabilities: Control and Understanding* offers a practical understanding of the various flows that occur during the processing of polymer melts. The book pays particular attention to flow instabilities that affect the rate of production and the methods used to prevent and eliminate flow instabilities in order to increase production rates and enhance manufacturing efficiency. *Polymer Processing Instabilities: Control and Understanding* summarizes experimental observations of flow instabilities that occur in numerous processing operations such as extrusion, injection molding, fiber spinning, film casting, and film blowing for a wide range of materials, including most commodity polymers that are processed as melts at temperatures above their melting point or as concentrated solutions at lower temperatures. The book first presents the fundamental principles in rheology and flow instabilities. It relates the operating conditions with flow curves, the critical wall shear stress for the onset of the instabilities, and new visualization techniques with numerical modeling and molecular structure. It reviews one-dimensional phenomenological relaxation/oscillation models describing the experimental pressure and flow rate oscillations, analyzes the gross melt fracture (GMF) instability, and examines how traditional and non-traditional processing aids eliminate melt fracture and improve polymer processability. It supplies a numerical approach for the investigation of the linear viscoelastic stability behavior of simplified injection molding flows and examines a newly discovered family of instabilities that occur in co-extrusion. *Polymer Processing Instabilities: Control and Understanding* is unique in that it fills a gap in the polymer processing literature where polymer flow instabilities are not treated in-depth in any book. It summarizes state-of-the-art developments in the

field, particularly those of the last ten years, and contains significant data based on this research. Large, fast, digital computers have been widely used in engineering practice and their use has had a large impact in many fields. Polymer processing is no exception, and there is already a substantial amount of literature describing ways in which processes can be analysed, designed or controlled using the potentialities of modern computers. The emphasis given varies with the application, and most authors tend to quote the results of their calculations rather than describing in any detail the way the calculations were undertaken or the difficulties experienced in carrying them out. We aim to give here as useful and connected an account as we can of a wide class of applications, for the benefit of scientists and engineers who find themselves working on polymer processing problems and feel the need to undertake such calculations. The major application we have in mind is the simulation of the dynamics of the various physical phenomena which arise in a polymer process treated as a complex engineering system. This requires that the system be reasonably well represented by a limited number of relatively simple subprocesses whose connections can be clearly identified, that the dominant physical effects relevant to each subprocess can be well defined in a suitable mathematical form and that the sets of equations and boundary conditions developed to describe the whole system can be successfully discretised and solved numerically. It can be stated with some justification that polymers, because of their mainly synthetic origins, are important because of their applications, perhaps more than in the case of more familiar and conventional materials such as metals and wood, which would exist apart from their use in human activities. The majority of polymers have been synthesized under the impetus of requirements for new and improved properties. The preparative routes to new polymers and blends, and the exploration of their structures and properties constitute absorbing subjects for study, but it is the final application of these materials in real, commercial products that provides the driving force for such developments. In recent years a number of excellent books have appeared which deal with the chemistry, structure, properties and engineering aspects of polymers. The processing of polymers, as products of the chemical industry, into engineering and consumer goods has received much less attention. There are some valuable texts for individual processes, especially the extrusion and injection moulding of thermoplastics, but others are less well served. This book provides a review of all the important processing routes for transforming polymers into products. *Multiphase Flow in Polymer Processing* focuses on dispersed and stratified multiphase flow in polymer processing. This book explores the rheological behavior of multiphase (or multicomponent) polymeric systems as they are involved in various fabrication operations. It also outlines the importance of the morphological states of multiphase polymeric systems to explain the systems, rheological behavior in the fluid state, and mechanical behavior in the solid state. This monograph consists of eight chapters divided into two parts. After discussing dispersed and stratified multiphase flow in polymer processing, it introduces the reader to the fundamentals of rheology. The following chapters focus on the rheological behavior of particulate-filled polymeric systems and heterogeneous polymeric systems; the phenomenon of droplet breakup in dispersed flow; and gas-charged polymeric systems. The role of the discrete phase (that is, solid particles, liquid droplets, gas bubbles) in determining the bulk rheological

properties of the multiphase system is highlighted, along with some representative polymer processing operations (namely, fiber spinning and injection molding) of the multiphase (or multicomponent) polymeric systems. Coextrusion in cylindrical, rectangular, and annular dies is also considered. The final chapter is devoted to the phenomenon of interfacial instability in coextrusion. This text will be a useful resource for chemists, chemical engineers, and those in the polymer processing industry. The Effect of Radiation on Properties of Polymers examines the effects of radiation on plastics and elastomers. Polymers are required in products or parts for a range of cutting-edge applications that are exposed to radiation, in areas such as space, medicine, and radiation processing. This book focuses on the effects of radiation exposure within that environment, providing in-depth data coverage organized by category of polymer. Aspects such as radiation impact on mechanical and thermal properties, including glass transition and heat deflection temperatures, are described, demonstrating how changes in these properties affect the performance of plastic or elastomer parts. The effect of radiation on electrical properties is also included. Supporting introductory chapters explain the key concepts of radiation, including the physical, mechanical, and thermal properties of plastics and elastomers. This is a vital resource for plastics engineers, product designers, and R&D professionals, working on products or parts for radioactive environments, as well as engineers and scientists in the medical, nuclear, and radiation processing industries. The book also supports researchers and scientists in plastics engineering, polymer processing and properties, polymer and coatings chemistry, materials science, and radiation. Brings together highly valuable data on the effect of radiation on the properties of polymers and elastomers Enables the reader to compare properties and to select the best possible materials for specific applications Supported by detailed explanations and analysis, ensuring that the reader understands how to interpret and utilize the data Exploring the chemistry of synthesis, mechanisms of polymerization, reaction engineering of step-growth and chain-growth polymerization, polymer characterization, thermodynamics and structural, mechanical, thermal and transport behavior of polymers as melts, solutions and solids, Fundamentals of Polymer Engineering, Third Edition covers essential concepts and breakthroughs in reactor design and polymer production and processing. It contains modern theories and real-world examples for a clear understanding of polymer function and development. This fully updated edition addresses new materials, applications, processing techniques, and interpretations of data in the field of polymer science. It discusses the conversion of biomass and coal to plastics and fuels, the use of porous polymers and membranes for water purification, and the use of polymeric membranes in fuel cells. Recent developments are brought to light in detail, and there are new sections on the improvement of barrier properties of polymers, constitutive equations for polymer melts, additive manufacturing and polymer recycling. This textbook is aimed at senior undergraduate students and first year graduate students in polymer engineering and science courses, as well as professional engineers, scientists, and chemists. Examples and problems are included at the end of each chapter for concept reinforcement. Recent years have witnessed the sheer growth of macromolecular concepts and nanotechnology-based innovations in polymer science. Processing and Characterization of Multicomponent Polymer Systems is a collection of contributions from materials science experts across the globe.

The fabrication and characterization of polymeric systems are still important in the study of materials science, and the quality measurements of newly designed polymeric stuffs demand systematic and new characterization protocols. The volume highlights some of the latest innovations and principles of nanostructured polymeric materials and polymer nanocomposites. It is devoted to novel architectures at the nano-level with an emphasis on new synthesis and characterization methods. Organized into several sections, the chapters cover a selection of topics on: Biocomposites and nanocomposites Interpenetrating polymeric networks and nanostructured materials Theoretical protocols for polymers and clusters Special topics in polymer processing and polymer coating. This survey will be an important resource for those involved in the field of polymer materials design for advanced technologies, including scientists, engineers, and budding researchers working in the area of polymer science and nanotechnology. This text examines the effect of radiation on polymers and the versatility of its industrial applications. By helping readers understand and solve problems associated with radiation processing of polymers, it serves as an important reference and fills a gap in the literature. Radiation processing can significantly improve important properties of polymers, however, there are still misconceptions about processing polymers by using ionizing radiation. This book explains the radiation processing of polymeric materials used in many industrial products including cars, airplanes, computers, and TVs. It even addresses emerging "green" issues like biomaterials and hydrogels. This three-part textbook is written for a two-semester polymer processing series in mechanical or chemical engineering. The first and second part are designed for a senior- to grad-level course introducing polymer processing, and the third part is for a graduate course on simulation in polymer processing. Throughout the book, many applications are presented in form of examples and illustrations. These will also serve the practicing engineer as a guide when determining important parameters and factors during the design process or when optimizing a process. This successful textbook undergoes a change of character in the third edition. Where earlier editions covered organic polymer chemistry, the third edition covers both physical and organic chemistry. Thus kinetics and thermodynamics of polymerization reactions are discussed. This edition is also distinct from all other polymer textbooks because of its coverage of such currently hot topics as photonic polymers, electricity conducting polymers, polymeric materials for immobilization of reagents and drug release, organic solar cells, organic light emitting diodes. This textbook contains review questions at the end of every chapter, references for further reading, and numerous examples of commercially important processes. This volume covers advanced polymer processing operations and is designed to provide a description of some of the latest industry developments for unique products and fabrication methods. Contributors for this volume are from both industry and academia from the international community. This book contains nine chapters covering advanced processing applications and technologies. Covering a broad range of polymer science topics, Handbook of Polymer Synthesis, Characterization, and Processing provides polymer industry professionals and researchers in polymer science and technology with a single, comprehensive handbook summarizing all aspects involved in the polymer production chain. The handbook focuses on industrially important polymers, analytical techniques, and formulation methods,

with chapters covering step-growth, radical, and co-polymerization, crosslinking and grafting, reaction engineering, advanced technology applications, including conjugated, dendritic, and nanomaterial polymers and emulsions, and characterization methods, including spectroscopy, light scattering, and microscopy. This book explores the ways in which melt flow behaviour can be exploited by the plastics engineer and technician for increased efficiency of processing operation, control of end product properties and selection and development of polymers for specific purposes. (reissued with minor corrections 1994) "Rheology in Polymer Processing" introduces the fundamentals of rheology and rheometry as the basis for modeling and computer-aided design in plastics processing. The logically structured content enables the reader to intelligently use the tools of computer-aided design and modeling of plastics processing, with correct interpretation of the results. The book presents difficult and complex issues of rheology and modeling in an accessible way, with particular emphasis on the practical engineering aspects. The software described in the book allows modeling all the important problems of plastics processing. Particular attention is paid to the extrusion process, which is fundamentally important as a processing technology in mass manufacture of plastic parts, and the basis of compounding processes (blending, filling, granulation, and reinforcement). This book is aimed equally at engineers, researchers, and scientists, as well as intermediate students, for whom it will serve as an ideal course book. Engineering of polymers is not an easy exercise: with evolving technology, it often involves complex concepts and processes. This book is intended to provide the theoretical essentials: understanding of processes, a basis for the use of design software, and much more. The necessary physical concepts such as continuum mechanics, rheological behavior and measurement methods, and thermal science with its application to heating-cooling problems and implications for flow behavior are analyzed in detail. This knowledge is then applied to key processing methods, including single-screw extrusion and extrusion die flow, twin-screw extrusion and its applications, injection molding, calendaring, and processes involving stretching. With many exercises with solutions offered throughout the book to reinforce the concepts presented, and extensive illustrations, this is an essential guide for mastering the art of plastics processing. Practical and didactic, Polymer Processing: Principles and Modeling is intended for engineers and technicians of the profession, as well as for advanced students in Polymer Science and Plastics Engineering. Materials Processing is the first textbook to bring the fundamental concepts of materials processing together in a unified approach that highlights the overlap in scientific and engineering principles. It teaches students the key principles involved in the processing of engineering materials, specifically metals, ceramics and polymers, from starting or raw materials through to the final functional forms. Its self-contained approach is based on the state of matter most central to the shaping of the material: melt, solid, powder, dispersion and solution, and vapor. With this approach, students learn processing fundamentals and appreciate the similarities and differences between the materials classes. The book uses a consistent nomenclature that allow for easier comparisons between various materials and processes. Emphasis is on fundamental principles that gives students a strong foundation for understanding processing and manufacturing methods. Development of connections between processing and structure builds on students' existing knowledge of

structure-property relationships. Examples of both standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers. This book is intended primarily for upper-level undergraduates and beginning graduate students in Materials Science and Engineering who are already schooled in the structure and properties of metals, ceramics and polymers, and are ready to apply their knowledge to materials processing. It will also appeal to students from other engineering disciplines who have completed an introductory materials science and engineering course. Coverage of metal, ceramic and polymer processing in a single text provides a self-contained approach and consistent nomenclature that allow for easier comparisons between various materials and processes. Emphasis on fundamental principles gives students a strong foundation for understanding processing and manufacturing methods. Development of connections between processing and structure builds on students' existing knowledge of structure - property relationships. Examples of both standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers. Polymer matrix composites are finding increasing number of applications due to their high weight-saving potential as well as unique characteristics, such as high strength-to-density ratio, fatigue resistance, high damping factor, and freedom from corrosion. While many textbooks are available on the mechanics of polymer matrix composites, few cover their processing. Processing of Polymer Matrix Composites fills this gap. The book focuses on the major manufacturing processes used for polymer matrix composites and describes process details, process parameters and their effects on properties and process-induced defects, and analytical and experimental methods used for understanding process conditions. The book describes fibers, thermosetting and thermoplastic polymers, and interface characteristics that are important from the standpoint of both design and processing. It also emphasizes the applications of process fundamentals for both continuous fiber and short fiber polymer matrix composites. In addition the book considers quality inspection methods, tooling, and manufacturing costs and environmental and safety issues. Processing techniques are critical to the performance of polymer products which are used in a wide range of industries. Advances in polymer processing: From macro- to nano- scales reviews the latest advances in polymer processing, techniques and materials. Part one reviews the fundamentals of polymer processing with chapters on rheology, materials and polymer extrusion. Part two then discusses advances in moulding technology with chapters on such topics as compression, rotational and blow moulding of polymers. Chapters in Part three review alternative processing technologies such as calendaring and coating, foam processing and radiation processing of polymers. Part four discusses micro and nano-technologies with coverage of themes such as processing of macro, micro and nanocomposites and processing of carbon nanotubes. The final section of the book addresses post-processing technologies with chapters on online monitoring and computer modelling as well as joining, machining, finishing and decorating of polymers. With distinguished editors and team of international contributors, Advances in polymer processing: From macro- to nano- scales is an invaluable reference for engineers and academics concerned with polymer processing. Reviews the latest advances in polymer processing, techniques and

materials analysing new challenges and opportunities Discusses the fundamentals of polymer processing considering the compounding and mixing of polymers as well as extrusion Assesses alternative processing technologies including calendaring and coating and thermoforming of polymers Based on lecture notes from a five-week polymer processing laboratory course taught at the University of Wisconsin-Madison, this text provides background on polymer processing for engineering students and practicing engineers. This book gathers the proceedings of the International Symposium on Plastics Technology, which was held on March 10, 2020 in Aachen, Germany, and was organised by the Institute for Plastics Processing (IKV) in Industry and Craft at RWTH Aachen University. Peer-reviewed by an international scientific committee, the conference proceedings comprise the papers presented by the international speakers. Topics covered include - circular economy- extrusion- lightweight technologies- simulation and digitisation - injection moulding- hybrid materials and additive manufacturing. In these fields, key themes for plastics technologies have been identified that will shape the face of research and industry for the next decade. In their contributions, the authors present the latest scientific findings, and discuss topical issues in plastics technologies. The symposium offered an inspiring forum for the exchange on research and innovation, for discussing urgent questions and providing impulses for the future of plastics technology. Most of the shaping in the manufacture of polymeric objects is carried out in the melt state, as it is a substantial part of the physical property development. Melt processing involves an interplay between fluid mechanics and heat transfer in rheologically complex liquids, and taken as a whole it is a nice example of the importance of coupled transport processes. This book is on the underlying foundations of polymer melt processing, which can be derived from relatively straightforward ideas in fluid mechanics and heat transfer; the level is that of an advanced undergraduate or beginning graduate course, and the material can serve as the text for a course in polymer processing or for a second course in transport processes.

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