HANSER PLASTIC BOOKS

Forthcoming titles

2014/2015
With 588 images and associated analyses for avoidance of damage to plastics, this manual is aimed at both professionals and students. Many technical terms and colloquial descriptions, explanations, and interconnections with related areas, together with the images, facilitate the reader in determining and describing the exact type of damage of a given sample. The images, from microscopic quality and damage analysis of molding materials, semi-finished products, and molded parts, are divided into 74 subject areas of plastics processing and application, and contain over 2620 industry-standard technical terms. The analyses were performed with various light microscopes and a scanning electron microscope.

Rheology unites the seemingly unrelated fields of plasticity and non-Newtonian fluids by recognizing that both these types of materials are unable to support a shear stress in static equilibrium. In this sense, a plastic solid is a fluid. Granular rheology refers to the continuum mechanical description of granular materials.

One of the tasks of rheology is to empirically establish the relationships between deformations and stresses, respectively their derivatives by adequate measurements. These experimental techniques are known as rheometry and are concerned with the determination with well-defined rheological material functions. Such relationships are then amenable to mathematical treatment by the established methods of continuum mechanics.

In this book, rheology—the study of the deformation and flow of matter—deals primarily with the stresses generated during the flow of complex materials such as polymers, colloids, foams, and gels. A rapidly growing and industrially important field, it plays a significant role in polymer processing, food processing, coating and printing, and many other manufacturing processes.

Topics covered:
• Historical background
• Structure and properties of deforming polymers
• Generalized Newtonian fluid (GNF) models
• Transport phenomena in rheometric flows
• Linear viscoelasticity
• Non-linear viscoelasticity
• Rheometry
PVC differs in its stabilization compared to other commodity plastics. Various metal compounds are suitable for the stabilization of PVC: lead, tin, calcium, magnesium, zinc, rare earths, and also almost metal-free systems. These differences are described in the introductory part of the book, with their advantages, possibilities, and problems, from the perspective of the chemist but processed for merchants and technicians. The numerous tables and figures are useful for looking up structures and physico-chemical data. A special section for beginners is dedicated to guiding formulations and test methods. A relatively short section deals with the development trends in Europe. The author writes at some length about sustainability and shows that PVC has a strong potential to develop into a fully sustainable material. Another section deals with the everyday problems in the processing of PVC, such as the formation of specks, photo-effects and plate-out. Plate-out is a seemingly common problem in the processing of PVC. However, there are relatively few publications covering it. The causes, influencing factors, and mechanisms are still poorly understood. This section, characterized by its uniqueness in the literature, describes the extensive work that has been undertaken to provide assistance in the selection and dosage of raw materials to PVC processor, based on influencing factors during processing.

Content:
1. PVC Stabilizers
2. Additional PVC Additives
3. Uncharted Territory in PVC Processing: Plate-Out
4. Uncharted Territory in the Use of PVC Products: Photo Effects
5. PVC and Sustainability
"Textile Technology" presents a well-written and readable introduction into the field of textile engineering. It is based on an elementary level course focusing on the manufacture (processes and machines) of yarn, fabric, knitwear, nonwovens, braids, reinforcing fabrics, and technical textiles. The book also provides the technicians and engineers in the textile industry with an up-to-date review of processes and equipment for textile manufacturing.

The book covers all processing steps for the manufacturing of textiles, describing materials, processes and machines, finishing, making-up, and recycling. To provide a better understanding of the individual textile processes, each chapter ends with an example describing the respective processing steps for a specific textile product. In addition, current and future development trends are discussed.

The second edition is brought up to date with extensive coverage of new developments, such as in the fields of testing, measurement, and simulation.

Contents:
- Raw Materials
- Yarn Production
- Fabric Production
- Knitwear Production
- Nonwovens Production
- Braiding Processes and Machines
- Production of Two-dimensional Reinforcing Fabrics
- Textile Finishing
- Processes and Machines for Making-up
- Technical Textiles
- Disposal and Recycling of Textiles
The first book to shed light on the critical role the melt delivery system plays in successful injection molding. This book will give you an immediate leg up by reducing mold commissioning times, increasing productivity, improving customer satisfaction, and achieving quality goals such as Six Sigma.

How do you determine the optimum design of your runners and gates; what type of runner system (hot or cold variations) do you use for a specific application; how do you identify molding problems generated by the gate and runner vs. those stemming from other molding issues; what should you consider when selecting a gating location? The “Runner and Gate Design Handbook” will give you the means to get to the bottom of these issues as well as provide specific guidelines for process optimization and troubleshooting.

Contents:
- Plastic Melt Characteristics
- The Melt Delivery System (MDS)
- Understanding and Addressing Shear Induced Melt Variations
- The Runner as a Process Aid (Melt Management Technologies)
- The Process of Selecting Cold vs. Hot Runner Molds
- Cold Runner Molds
- Hot Runner Molds
- Gating Locations
- Gate and Runner Related Molding Problems
- Injection Molding Simulation
- Trouble Shooting Guide
- Engineering and Cost Formulas
Tooling, molding, secondary operations, material selection, evaluation and testing, design, project management, costing, value engineering, international supplier management and enhancement, and more: this book provides a broad insight of the author’s over 40 years of experience in the plastics industry. Through attention to fundamental engineering principles as an astute mechanical engineer and proven and recognized international hands-on experience as an individual contributor and manager of various teams in all aspects of plastics, and involving extremely robust mission critical products, the author has gained a one-of-a-kind depth and breadth of knowledge.

As a recognized long time international trainer, he has a deep understanding of the strengths and weakness of people working in all aspects of plastics as well as Six Sigma.

The book is therefore an essence of all the experience gained along the way: the good, the bad and the ugly.

This book is unique among the many other fine books available in the field in that it is the perspective of one who has been in the trenches – as opposed to an academician, scientist, or other professional in a field with very narrow scope, such as material science, tooling, or manufacturing.

Hence, the HOLISTIC APPROACH.
Many technical books about plastics are too theoretical and difficult to read. The intention of this book is to offer something completely different: it is easy to read with many examples taken from everyday life. It is suitable for readers at secondary school and university levels, and can be used for training activities in industry as well as for self-studies.

Included are nearly 600 color images to illustrate the wide variety of plastics and process workflows used today. The book also contains a number of computer-based tools that can be downloaded from the author's website. With comprehensive coverage, this is probably the most versatile plastics handbook ever written!

_Ulf Bruder_ has been active in the plastics industry for almost 50 years. He has held various senior technical positions both in Sweden and globally. In Sweden, he is well known for his series of articles in the Plastic Forum journal and his highly valued courses in the plastics industry as well as the technical universities. On the global market he is known for his information apps "Plastic Guide" and "Plastguiden" for mobile phones.

- Comprehensive introductory guide to plastics
- User friendly, with clear, simple explanations
- Almost 600 full-color illustrations make this book especially attractive for beginners
- Free associated app with extra content and videos
- By world-reknowned expert in training in the plastics industry
An increasing number of complex applications in the injection molding industry can no longer be achieved using known special procedures alone. Combination technologies can provide solutions to such problems.

Combination technologies refer to combinations of injection molding with other established independent technologies to create a new integrated production method that can satisfy the complex requirements of combinations of dedicated functionalities for high-quality molded parts. The book gives readers an insight into new and innovative technologies and encourages creative thinking beyond conventional methods.

- First ever book on combination technologies based on injection molding
- Provides an insight into the state of the art of development of the newest processes
- Allows the reader to compare his/her own production processes to combination technologies on an economic basis

Dr.-Ing. Erwin Bürkle and Dr.-Ing. Hans Wobbe have worked in the field of development of injection molding machines and processes for many years. Both hold positions on advisory boards at institutes of plastics technology.
This book is unique in its focus on market-relevant bio/renewable materials. It is based on comprehensive research projects, during which these materials were systematically analyzed and characterized. For the first time the interested reader will find comparable data not only for biogenic polymers and biological macromolecules such as proteins, but also for engineering materials.

The reader will also find valuable information regarding micro-structure, manufacturing, and processing-, application-, and recycling properties of biopolymers.

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The reader will also find valuable information regarding micro-structure, manufacturing, and processing, application, and recycling properties of commercially available biopolymers.

An invaluable source of information for researchers and engineers, but also for marketing and business development. Raw material manufacturers, plastic materials and additive providers, processors, machine manufacturers, and innovative packaging, textile, and automotive manufacturers will find systematically researched and evaluated material characteristics.

- A very current topic with much future potential
- Presentation of the best available knowledge of modern biopolymeric materials
- Information for decision-makers and operators in the industry, especially in consumer goods and packaging
- A basis for strategic decisions in materials
- Contains a database of current trade names and properties
The use of additive manufacturing for the direct production of finished products is becoming increasingly important. The method not only reduces the demands on industrial infrastructure, it also open up new perspectives in terms of decentralized production and customer inclusive individualized production (customization, cyberproduction). Oriented towards the practitioner, in this book the basics of additive manufacturing are presented the properties and special aspects of industrially available machines are discussed. From the generation of data to the forming method, the complete process chain is shown in a practical light. In particular, the following additive manufacturing technologies are discussed:

- Polymerization (e.g., stereolithography)
- Sintering and melting (e.g., laser sintering)
- Layer laminate method (e.g., laminated object manufacturing, LOM)
- Extrusion (e.g., fused deposition modeling, FDM)
- 3D printing

Applications for the production of models and prototypes (rapid prototyping), tools, tool inserts, and forms (rapid tooling) as well as end products (rapid manufacturing) are covered in detailed chapters with examples. Questions of efficiency are discussed from a strategic point of view, and also from an operational perspective.

- Essentially no comparable work on the market
- Highly understandable with extensive image material throughout
- Comprehensive presentation of the technologies on the market together with feasibility study

Dr. Andreas Gebhardt, born 1953, graduated in mechanical engineering from the RWTH Aachen, Germany, and received his doctorate in 1986. He is managing director of CP (Centrum für Prototypenbau GmbH), Erkelenz, Germany.

Since 2000, he has been professor of high-performance processing in manufacturing engineering and rapid prototyping at the FH (University of Applied Sciences) Aachen. He is also guest professor at the City University, New York.
Food, pharmaceutical, cosmetics, home-care materials, and many more essential products for modern life: all require appropriate packaging, and polymers very often provide the optimal solution. Based on the author’s popular course on polymer packaging at the University of Applied Sciences, Stuttgart, Technology of Polymer Packaging provides an essential, user-friendly introduction to the field of polymer packaging suitable for students, people in industry, and particularly all those who deal with packaging but have a background other than that of a polymer technologist or packaging specialist.

- Provides the important fundamentals for packaging engineers, as well as students and others with an interest in this field
- Covering all types of polymer packaging
- Highly oriented toward practical application
- Special coverage of critical criteria, e.g. sealing, that create problems in the packaging process
- Based on the author’s highly developed and acclaimed courses on polymer packaging technology

Dr.-Ing. Arabinda Ghosh has been Professor of Polymer Packaging at the University of Applied Sciences, Stuttgart, since 1991. He previously undertook research at the Fraunhofer Institute for Food- and Packaging Technology, Munich, and was Manager for Packaging System Development, Dixie Union, Kempten.

The book introduces the reader to the concept of Scientific Processing for Injection Molding. It explains the underlying principles of polymer science, the properties that are important to injection molding and their application to the molding process development. Scientific molding procedures to establish a robust process are provided. The concept of Design of Experiments for injection molding is explained providing an insight to the cosmetic and dimensional process windows. A plan to release qualified molds into production with trouble shooting tips is also provided. Topics that impact a robust process such as the use of regrind, mold cooling and venting are also described.

The book
- explains the underlying scientific principles of injection molding parameters.
- explains the theory and principles of polymers and their rheology in injection molding.
- provides procedures and worksheets for process development
- provides a special section on Design of Experiments for Injection Molding.
- enables Readers to apply the knowledge from the book into practice immediately
This book provides a vision and structure to finally synergize all the engineering disciplines that converge in the mold design process. The topics are presented in a top-down manner, beginning with introductory definitions and the "big picture" before proceeding to layout and detailed design of molds. The book provides very pragmatic analysis with worked examples that can be readily adapted to "real world" mold design applications. It should help students and practitioners to understand the inner workings of injection molds and encourage them to think "outside the box" in developing innovative and highly functional mold designs.

Contents:

- Introduction to mold functions, types, and components
- Review of design for injection molding
- Cost estimation and optimization
- Mold layout design including cavity layout, sizing, and materials selection
- Cavity, runner system, and gating analysis and design
- Cooling system analysis and design
- Venting, shrinkage, and warpage analysis and strategies
- Ejection force analysis and ejection system designs
- Stress and deflection analysis with structural system designs
- A survey of advanced mold designs

David O. Kazmer is Professor of Plastics Engineering at the University of Massachusetts Lowell, and also an Associate Research Professor in the Department of Mechanical & Industrial Engineering at the University of Massachusetts Amherst. He has also held engineering and management positions in industry with GE Research and Development, GE Plastics, and Synventive Molding Solutions.
As a major polymer processing technology, injection molding has received a lot of research interest. This book introduces the analysis of the molding process from a system technology point of view. The book is divided into four parts: the first part serves as the general background to introduce injection molding process, the second is on the control of injection molding process, the third is on the monitoring technology, and the fourth is on the optimization of the process. Most the results of this book are from the real engineering implementation and experimental test results.

- Evolution of control technology in injection molding.
- A complete introduction to the multivariate statistical process monitoring for injection molding.
- New process optimization technology for injection molding.
- The data and results are from real industrial application.

Dr. Furong Gao received his B.Eng. degree in Automation from the East China Institute of Petroleum in 1985 and M.Eng. and Ph.D. degrees in Chemical Engineering from McGill University, Canada, in 1989 and 1993, respectively. Currently, he is a Chair Professor of Chemical and Biomolecular Engineering at the Hong Kong University of Science and Technology (HKUST), and a “State Thousand Talents (B)” Professor at the Department of Control Science and Engineering, Zhejiang University, China. Concurrent to his professorial appointment, he serves HKUST also as the Associate Dean of Fok Ying Tung Graduate School, and the Director of the Division of Advanced Manufacturing and Automation.

Professional Affiliations:

Fellow, Society of Plastics Engineers
Consultant, Hong Kong Plastics Machinery Association
Funding Director, Society of Advanced Molding Technology
Member, International Federation of Automatic Control (IFAC) Technical Committee
Associate Editor, Journal of Process Control
Editorial Advisor, Industrial & Engineering Chemistry Research
Engineering Subject Editor, Arabian Journal of Engineering and Science
Editorial Member, China Plastics
Editorial Member, Control & Decision
Structure and morphology determine the properties of polymeric materials. This atlas provides with high quality micrographs a comprehensive overview of the structural/morphological diversity of all classes of plastics. All microscopic techniques from light microscopy through scanning and transmission electron microscopy to atomic force microscopy are covered. Another focus is on the changes in plastics morphology occurring under mechanical stress, i.e. the deformation and fracture structures. The extensive visual material will help professionals in research and application fields to determine structure-property correlations of polymeric materials and also improve training and teaching in universities.

- Up-to-date and comprehensive overview of the structure and morphology (microstructure) of polymeric materials
- Unique presentation of deformation structures formed under mechanical stress and resulting fracture patterns
- Excellent quality micrographs covering all microscopy techniques
- Supports understanding of structure-property relationships

Prof. Dr. habil. Goerg H. Michler worked for many years as a physicist and materials scientist in research institutes, in the chemical industry and at universities. He is professor of general materials science at the Martin-Luther-University Halle-Wittenberg and founded an Institute of Polymeric Materials. His research interests focus on structure-property correlations of polymeric materials, and the improvement of mechanical properties based on nanostructure and morphology.
This book is to provide a basic overview of sustainability testing and certification for materials and products. Topics covered range from the three R’s (Reduce, Reuse and Recycle) to recycled content to renewably sourced to end-of-life options. Additionally, this book provides guidelines on how to set up a sustainability testing and certification program within a company. The intended audience is the new practitioners learning what needs to be done in their company and the accomplished practitioner needing a good summary of sustainability options possible for materials and products.

Key features:
1. Decision Tree/Flowchart of sustainability testing
2. Review of ASTM biodegradation and biobased standards
3. Definition of terms
4. Compilation of organizations doing testing and certifications

*Kelvin T. Okamoto* is President of Green Bottom Line, Inc and consults with a focus on sustainable materials and packaging development, commercialization, testing and certification. Kelvin has worked with bioplastics for over twenty years through plastics formulation and packaging development. Kelvin has previously worked for Solo Cup, TaylorMade Golf, Trexel, Pactiv, Himont and GE Plastics with additional technical expertise in packaging, foams, polyolefins and engineering thermoplastics. Kelvin has been active in the Society of Plastics Engineers for 20 years, including being chairperson of the Thermoplastic Materials & Foams Division and chairing FOAMS TopCons in 2004, 2009 and 2010; Kelvin is presently on the board of the Bio-plastics SIG and has chaired the 2012 and co-chaired the 2014 Bioplastic Materials TopCons. Kelvin has a BS in Chemistry from Stanford University and a MS and PhD from Cornell University. Kelvin is also a Registered Patent Agent with the US Patent & Trademark Office.
The International Plastics Handbook provides everything there is to know about plastics - comprehensively compiled in a compact and well organized format. From material properties to machines, processing, and applications, the user will find detailed information that will allow the successful implementation of new materials and technologies.

This concise, competent, modern reference not only explains the basic facts and interrelationships, but it is also a practical guide for engineers helping them succeed in today’s challenging global industrial world.

Searching for specific materials, trade names, properties or any other information is particularly easy, because the reader also has free access to the electronic version of the book.

Contents:
Introduction to Plastics Materials and their Synthesis
Properties and Testing Methods
Plastics Processing
Design of Plastics Parts
Plastic Grades, Properties, Applications
Additives and Fillers
Comparison of Plastic Materials (Characteristic Values, Diagrams)
Trade Names and Suppliers
The increasing importance of plastic materials in packaging makes it mandatory for everyone in this industry to command a basic understanding of the properties of the common packaging plastics.

The third edition of this well received book provides just that to students and packaging professionals alike: Material properties and how they relate to the chemical structure of the polymers, common processing methods for packaging applications, help with writing specifications, designing, fabricating, testing, and controlling the quality of the plastic material are covered comprehensively.

Expanded and updated information on PET bottle production, retort pouches, polylactides, and plastic recycling among other topics make the third edition an indispensable resource for both the packaging expert and the novice.

Contents:
- Introduction
- Basic Concepts and Definitions
- Polymer Structure and Properties
- Major Plastics in Packaging
- Additives and Compounding
- Adhesion, Adhesives, and Heat Sealing
- Extrusion, Film and Sheet
- Converting, Lamination, and Coating
- Flexible Packaging
- Thermoforming
- Injection Molding, Closures, Rotational Molding, Compression Molding, and Tubes
- Blow Molding and Bottles
- Foams, Cushioning and Distribution Packaging
- Mass Transfer in Polymeric Packaging Systems: Sorption, Diffusion, Permeation, and Shelf Life
- US Regulations and Plastic Packaging Issues
- Environmental Considerations
The origins of this book not only include Moldflow Design Principles, but also includes Warp-age Design Principles published by Moldflow, and C-Mold Design Guide. Collectively, these documents are based on years of experience in the research, theory, and practice of injection molding. These documents are now combined into one book, the Moldflow Design Principles. This book is intended to help practicing engineers solve problems they encounter frequently in the design of parts and molds, as well as during production. This book can also be used as a reference for training purpose at industrial as well as educational institutions.

Contents:

- Polymer Flow Behaviour in Injection Molds
- Molding Conditions and Injection Pressure
- Filling Pattern
- Moldflow Design Principles
- Meshes used in Moldflow
- Product Design
- Gate Design
- Runner System Design
- Cooling System Design
- Shrinkage and Warpage
- Moldflow Design Procedure
- Part Defects
- Injection Molding
- Injection Molding Machine, System, and Operations
- Injection Molding Process Control
- Plastics Materials
The book provides an overview of flame retardants that are either in actual commercial use or in advanced stages of market development. It reviews flame retardants polymer-by-polymer and gives the reader insight in their modes of action and interaction. With this "how-to" approach it offers suggestions for selecting between alternatives, provides formulations, and most importantly offers a starting point for the compounder or plastics fabricator to pass commercial flammability requirements.

Contents:

- Flame Retardants in Commercial Use or Development for Polyolefins
- Polystyrenes and Thermoplastic Styrene Copolymers
- Flame and Smoke Retardants in Vinyl Chloride Polymers - Commercial Usage and Current Developments
- Current Practice and Recent Commercial Developments in Flame Retardancy of Polyamides
- Flame Retardants for Thermoplastic Polyesters
- Flame Retardants in Polycarbonates and Polycarbonate Blends
- Commercial Flame Retardancy of Unsaturated Polyesters, Vinyl Resins, Phenolics and their Composites
- Flame Retardants in Commercial Use or Advanced Development in Polyurethanes
- Current Flame Retardant Systems for Epoxy Resins
- Flame Retardants in Commercial Use or Development for Textiles
- Comments on Flammability and Smoke Tests
- Overview of Modes of Action and Interaction of Flame Retardants
- Directory of Flame Retardant Manufacturers, Distributors, and Compounders