Plastics In Medical Devices Second Edition Properties Requirements And Applications Plastics Design Library


This extensively updated second edition was created for medical device, medical packaging, and food packaging design engineers, material product technical support, and research/development personnel. This comprehensive databook contains important characteristics and properties data on the effects of sterilization methods on plastics and elastomers. It provides a ready reference for comparing materials in the same family as well as materials in different families. Data is presented on 43 major plastic and elastomer packaging materials, including biodegradable or organic polymers. New to this edition are resin chapters containing textual summary information including: category; general description; applications; resistances to particular sterilization methods; and regulatory status considerations for use in medical devices and medical/food packaging. The resin chapter material supplier trade name product data is presented in graphical and tabular format, with results normalized to SI units, retaining the familiar format of the best selling first edition and allowing easy comparison between materials and test conditions.

UHMWPE Biomaterials Handbook describes the science, development, properties and application of ultra-high molecular weight polyethylene (UHMWPE) used in artificial joints. This material is currently used in 1.4 million patients around the world every year for use in the hip, knee, upper extremities, and spine. Since the publication of the 1st edition there have been major advances in the development and clinical adoption of highly crosslinked UHMWPE for hip and knee replacement. There has also been a major international effort to introduce Vitamin E stabilized UHMWPE for patients. The accumulated knowledge on these two classes of materials are a key feature of the 2nd edition, along with an additional 19 additional chapters providing coverage of the key engineering aspects (biomechanical and materials science) and clinical/biological performance of UHMWPE, providing a more complete reference for industrial and academic materials specialists, and for surgeons and clinicians who require an understanding of the biomaterials properties of UHMWPE to work successfully on patient applications. The UHMWPE Handbook is the comprehensive reference for professionals, researchers, and clinicians working with biomaterials technologies for joint replacement New to this edition: 19 new chapters keep readers up to date with this fast moving topic, including a new section on UHMWPE biomaterials; highly crosslinked UHMWPE for hip and knee replacement; Vitamin E stabilized UHMWPE for patients; clinical performance, tribology an biologic interaction of UHMWPE State-of-the-art coverage of UHMWPE technology, orthopedic applications, biomaterial characterisation and engineering aspects from recognised leaders in the field.

Carbon Nanotube Reinforced Composites introduces a wide audience of engineers, scientists and product designers to this important and rapidly expanding class of high performance composites. Dr Loos provides readers with the scientific fundamentals of carbon nanotubes (CNTs), CNT composites and nanotechnology in a way which will enable them to understand the performance, capability and potential of the materials under discussion. He also investigates how CNT reinforcement can be used to enhance the mechanical, electrical and thermal properties of polymer composites. Production methods, processing technologies and applications are fully examined, with reference to relevant patents. Finally, health and safety issues related to the use of CNTs are investigated. Dr. Loos compares the theoretical expectations of using CNTs to the results obtained in labs, and explains the reasons for the discrepancy between theoretical and experimental results. This approach makes the book an essential reference and practical guide for engineers and product developers working with reinforced polymers – as well as researchers and students in polymer science, materials and nanotechnology. A wealth of...
applications information is included, taken from the wide range of industry sectors utilizing CNT reinforced composites, such as energy, coatings, defense, electronics, medical devices, and high performance sports equipment. Introduces a wide range of readers involved in plastics engineering, product design and manufacturing to the relevant topics in nano-science, nanotechnology, nanotubes and composites. Assesses effects of CNTs as reinforcing agents, both in a materials context and an applications setting. Focuses on applications aspects – performance, cost, health and safety, etc – for a wide range of industry sectors, e.g. energy, coatings, defense, electronics, medical devices, high performance sports equipment, etc.

Exploring the practical, entrepreneurial, and historical aspects of medical device development, this second edition of The Medical Device R&D Handbook provides a how-to guide for medical device product development. The book offers knowledge of practical skills such as prototyping, plastics selection, and catheter construction, allowing designers to apply these specialized techniques for greater innovation and time saving. The author discusses the historical background of various technologies, helping readers understand how and why certain devices were developed. The text also contains interviews with leaders in the industry who offer their vast experience and insights on how to start and grow successful companies—both what works and what doesn’t work. This updated and expanded edition adds new information to help meet the challenges of the medical device industry, including strategic intellectual property management, operating room observation protocol, and the use of new technologies and new materials in device development.

PEEK biomaterials are currently used in thousands of spinal fusion patients around the world every year. Durability, biocompatibility and excellent resistance to aggressive sterilization procedures make PEEK a polymer of choice replacing metal in orthopedic implants, from spinal implants and hip replacements to finger joints and dental implants. This Handbook brings together experts in many different facets related to PEEK clinical performance as well as in the areas of materials science, tribology, and biology to provide a complete reference for specialists in the field of plastics, biomaterials, medical device design and surgical applications. Steven Kurtz, author of the well respected UHMWPE Biomaterials Handbook and Director of the Implant Research Center at Drexel University, has developed a one-stop reference covering the processing and blending of PEEK, its properties and biotribology, and the expanding range of medical implants using PEEK: spinal implants, hip and knee replacement, etc. Full coverage of the properties and applications of PEEK, the leading polymer for spinal implants. PEEK is being used in a wider range of new applications in biomedical engineering, such as hip and knee replacements, and finger joints. These new application areas are explored in detail. Essential reference for plastics engineers, biomedical engineers and orthopedic professionals involved in the use of the PEEK polymer, and medical implants made from PEEK.

Plastics in Medical Devices for Cardiovascular Applications enables designers of new cardiovascular medical devices to make decisions about the kind of plastics that can go into the manufacture of their device by explaining the property requirements of various applications in this area, including artificial valves, lead insulation, balloons, vascular grafts, and more. Enables designers to improve device performance and remain compliant with regulations by selecting the best material for each application. Presents a range of applications, including artificial valves, stents, and vascular grafts. Explains which materials can be used for each application, and why each is appropriate, thus assisting in the design of better tools and processes.

Handbook of Thermoplastic Elastomers, Second Edition presents a comprehensive working knowledge of thermoplastic elastomers (TPEs), providing an essential introduction for those learning the basics, but also detailed engineering data and best practice guidance for those already involved in polymerization, processing, and part manufacture. TPEs use short, cost-effective production cycles, with reduced energy consumption compared to other polymers, and are used in a range of industries including automotive, medical, construction and many more. This handbook provides all the practical information engineers need to successfully utilize this material group in their products, as well as the required knowledge to thoroughly ground themselves in the fundamental chemistry of TPEs. The data tables included in this book assist engineers and scientists in both selecting and processing the materials for a given product or application. In the second edition of this handbook, all chapters have been reviewed and updated. New polymers and applications have been added — particularly in the growing automotive and medical fields — and changes in chemistry and processing technology are covered. Provides essential knowledge of the chemistry, processing, properties, and applications for both new and established technical professionals in any industry utilizing TPEs. Datasheets provide “at-a-glance” processing and technical information for a wide range of commercial TPEs and compounds, saving readers the need to contact suppliers. Includes data on additional materials and applications, particularly in automotive and medical industries.

Plastics in Medical Devices is a comprehensive overview of the main types of plastics used in medical device applications. It focuses on the applications and properties that are most important in medical device design, such as chemical resistance, sterilization capability and biocompatibility. The roles of additives, stabilizers, and fillers as well as the synthesis and production of polymers are covered and backed up with a wealth of data tables. Since the first edition the rate of advancement of materials technology has been constantly increasing. In the new edition Dr. Sastri not only provides a thorough update of the first edition chapters with new information regarding new plastic materials, applications and new requirements, but also...
adds two chapters – one on market and regulatory aspects and supplier controls, and one on process validation. Both chapters meet an urgent need in the industry and make the book an all-encompassing reference not found anywhere else. Comprehensive coverage of uses of polymers for medical devices. Unique coverage of medical device regulatory aspects, supplier control and process validation. Invaluable guide for engineers, scientists and managers involved in the development and marketing of medical devices and materials for use in medical devices.

This reference guide brings together a wide range of essential data on the effects of weather and UV light exposure on plastics and elastomers, enabling engineers to make optimal material choices and design decisions. In both normal and extreme environments, outdoor use has a variety of effects on different plastics and elastomers, including discoloring and brittleness. The data is supported by explanations of real-world engineering applications. The data tables in this book are supported by examples of real-world applications, enabling engineers and scientists to select the right materials for a given situation, across a wide range of sectors including construction, packaging, signage, consumer (e.g. toys, outdoor furniture), automotive and aerospace, defense, etc. The third edition includes new text chapters that provide the fundamental knowledge required to make best use of the data. Author Larry McKeen has also added detailed descriptions of the effect of weathering on the most common polymer classes such as polyolefins, polyamides, polyesters, elastomers, fluoropolymers, biodegradable plastics, etc., making this book an invaluable design guide as well as an industry standard data source. Essential data and practical guidance for engineers and scientists working with plastics in outdoor applications and products New introductory chapters on weathering processes and the effect of light and heat on plastics 25% new data

• A comprehensive book which collates the experience of two well-known US plastic engineers. • Enables engineers to make informed decisions. • Includes a unique chronology of the world of plastics. The use of plastics is increasing year on year, and new uses are being found for plastics in many industries. Designers using plastics need to understand the nature and properties of the materials which they are using so that the products perform to set standards. This book, written by two very experienced plastics engineers, provides copious information on the materials, fabrication processes, design considerations and plastics performance, thus allowing informed decisions to be made by engineers. It also includes a useful chronology of the world of plastics, a resource not found elsewhere.

Plastics in Medical Devices: Properties, Requirements, and Applications is a comprehensive overview of the main types of plastics used in medical device applications, focusing on the applications and properties that are most important in medical device design, such as chemical resistance, sterilization capability and biocompatibility. The roles of additives, stabilizers, and fillers as well as the synthesis and production of polymers are covered and backed up with a wealth of data tables. The book also covers other key aspects in detail, including regulations, compliance, purchasing controls and supplier controls, and process validation. This new Third Edition has been thoroughly revised and updated with regard to new plastic materials, applications and requirements, covering global regulations including the incoming EU Medical Device Regulation (MDR), and includes two new chapters covering the latest advances in materials for coatings, adhesives, and 3D printing in a medical device context, and risk management and biocompatibility. This is a valuable resource for engineers, scientists, and managers involved in the design and manufacture of medical devices, or working in the development of materials for use in medical device manufacture, as well as other professionals involved in medical devices, clinical use, compliance, or supply chain, and across the plastics industry. This is also of interest to researchers and advanced students involved in medical plastics, materials for medical applications, and plastics engineering.

The Medical Device R&D Handbook presents a wealth of information for the hands-on design and building of medical devices. Detailed information on such diverse topics as catheter building, prototyping, materials, processes, regulatory issues, and much more are available in this convenient handbook for the first time. The Medical Device R&D Ha

While the prevalence of plastics and elastomers in medical devices is now quite well known, there is less information available covering the use of medical devices and the applications of polymers beyond medical devices, such as in hydrogels, biopolymers and silicones beyond enhancement applications, and few books in which these are combined into a single reference. This book is a comprehensive reference source, bringing together a number of key medical polymer topics in one place for a broad audience of engineers and scientists, especially those currently developing new medical devices or seeking more information about current and future applications. In addition to a broad range of applications, the book also covers clinical outcomes and complications arising from the use of the polymers in the body, giving engineers a vital insight into the real world implications of the devices they’re creating. Regulatory issues are also covered in detail. The book also presents the latest developments on the use of polymers in medicine and development of nano-scale devices. Gathers discussions of a large number of applications of polymers in medicine in one place Provides an insight into both the legal and clinical implications of device design Relevant to industry, academic and medical professionals Presents the latest developments in the field, including medical devices on a nano-scale

Thermoforming of Single and Multilayer Laminates explains the fundamentals of lamination and plastics thermoforming technologies along with current and new developments. It focuses on properties and thermoforming mechanics of plastic films and in particular single and multilayered laminates, including barrier films. For environmental and economic reasons, laminates are becoming increasingly important as a replacement for solid sheets and paint finishes in many industries, including transportation, packaging, and construction. Yet the processes of film formability during the extensive deformation and elevated temperatures experienced in conventional processing technologies, such as thermoforming, are poorly understood by most engineers. This book covers production processes, such as extrusion, calendaring, and casting, as well as mechanical and impact testing methods. It also describes how testing protocols developed for metals can be leveraged for plastic films and laminates, and includes a thorough discussion on methods for performing optical strain analysis.

Applications in transportation vehicles and packaging, including packaging for food, medical and electronics applications, sports equipment, and household appliances, are discussed. Safety, recycling and environmental aspects of thermoforming and its products complete the book. First comprehensive source of information and hands-on guide for the thermoforming of multilayered laminates Covers applications across such sectors as automotive, packaging, home goods, and construction.

Introduces new testing methods leveraging protocols used for metals

Biopolymers Reuse, Recycling and Disposal is the first book covering all aspects of biopolymer waste management and post-usage scenarios, embracing existing technologies, applications, and the behavior of biopolymers in various waste streams. The book investigates the benefits and weaknesses, social, economic and environmental impacts, and regulatory aspects of each technology. It covers different types of recycling and degradation, as well as life cycle analysis, all supported by case studies, literature references, and detailed information about global patents. Patents in particular—comprising 80% of published technical literature in this emerging field, widely scattered, and often available in Japanese only—are a key source of information. Dr. Niaounakis draws on disciplines such as polymer science, management, biology and microbiology, organic chemistry, environmental chemistry, and patent law to produce a reference guide for engineers, scientists and other professionals involved in the development and production of biopolymers, waste management, and recycling. This information is also valuable for regulators, patent attorneys and academics working in this field. Explores techniques and technologies involved in managing biopolymers in the waste stream, including recycling and upcycling Provides waste management and recycling professionals the knowledge they need to plan for the exponential growth in biopolymer waste. Helps engineers and product designers fully consider the end-of-life aspects of their environmentally sustainable ‘green’ products and solutions.

Medical Devices and Regulations: Standards and Practices will shed light on the importance of regulations and standards among all stakeholders, bioengineering designers, biomaterial scientists and researchers to enable development of future medical devices. Based on the authors’ practical experience, this book provides a concise, practical guide on key issues and processes in developing new medical devices to meet international regulatory requirements and standards. Provides readers with a global perspective on medical device regulations. Concise and comprehensive information on how to design medical devices to ensure they meet regulations and standards. Includes a useful case study demonstrating the design and approval process.

Microbiological matters continue to exercise considerable influence on product quality. In both the pharmaceutical and medical device industries, products of greater sophistication, along with evolving regulatory requirements, are elevating the challenges related to maintaining microbiological integrity. Updated to reflect technological and regulatory changes, the Guide to Microbiological Control in Pharmaceuticals and Medical Devices, Second Edition covers those principal aspects of microbiology that are relevant to the preformulation, formulation, manufacturing, and license application stages involved with the production of pharmaceuticals and medical devices. In recognition of the diverse disciplines involved in pharmaceutical and medical device production, this work provides a brief introduction to microbiology geared towards the nonmicrobiologist. Covering good manufacturing practice in the control of contamination, the text explores quality control, the preservation of formulations, and principles of sterilization, including microbiological-specific considerations for biotechnological products and other medical devices. It also provides additional materials on package integrity and contamination risks in clean rooms. The editors have produced a companion text, the Handbook of Microbiological Quality Control in Pharmaceuticals and Medical Devices (see reverse), which when paired with the Guide offers a complete theoretical and practical treatment of microbiological control. This book provides a comprehensive distillation of information concerning methodology and regulations that would otherwise remain scattered throughout the literature. It allows scientists from many fields to address potential problems in advance and implement suitable strategies at the earliest stages of development.

Fluoroplastics, Volume 2: Melt Processible Fluoropolymers - The Definitive User's Guide and Data Book compiles the
working knowledge of the polymer chemistry and physics of melt processible fluoropolymers with detailed descriptions of commercial processing methods, material properties, fabrication and handling information, technologies, and applications, also including history, market statistics, and safety and recycling aspects. Both volumes of Fluoroplastics contain a large amount of specific property data useful for users to readily compare different materials and align material structure with end use applications. Volume Two concentrates on melt-processible fluoropolymers used across a broad range of industries, including automotive, aerospace, electronic, food, beverage, oil/gas, and medical devices. This new edition is a thoroughly updated and significantly expanded revision covering new technologies and applications, and addressing the changes that have taken place in the fluoropolymer markets. Exceptionally broad and comprehensive coverage of melt processible fluoropolymers processing and applications Provides a practical approach, written by long-standing authorities in the fluoropolymer industry. Thoroughly updated and significantly expanded revision covering new technologies and applications, and addressing the changes that have taken place in the fluoropolymer markets.

The second edition of this bestselling title examines how sterilization methods affect the properties of plastics and elastomers. It provides the comprehensive detail necessary to make first evaluations, materials comparisons, and final decisions in applications pursuits.

Biopolymers and Biodegradable Plastics are a hot issue across the Plastics industry, and for many of the industry sectors that use plastic, from packaging to medical devices and from the construction industry to the automotive sector. This book brings together a number of key biopolymer and biodegradable plastics topics in one place for a broad audience of engineers and scientists, especially those designing with biopolymers and biodegradable plastics, or evaluating the options for switching from traditional plastics to biopolymers. Topics covered include preparation, fabrication, applications and recycling (including biodegradability and compostability). Applications in key areas such as films, coatings controlled release and tissue engineering are discussed. Dr Ebnesajjad provides readers with an in-depth reference for the plastics industry – material suppliers and processors, bio-polymer producers, bio-polymer processors and fabricators – and for industry sectors utilizing biopolymers – automotive, packaging, construction, wind turbine manufacturers, film manufacturers, adhesive and coating industries, medical device manufacturers, biomedical engineers, and the recycling industry. Essential information and practical guidance for engineers and scientists working with bioplastics, or evaluating a migration to bioplastics. Includes key published material on biopolymers, updated specifically for this Handbook, and new material including coverage of PLA and Tissue Engineering Scaffolds. Coverage of materials and applications together in one handbook enables engineers and scientists to make informed design decisions.

This reference guide brings together a wide range of critical data on the effect of temperature on plastics and elastomers, enabling engineers to make optimal material choices and design decisions. The effects of humidity level and strain rate on mechanical and electrical properties are also covered. The data are supported by explanations of how to make use of the data in real world engineering contexts. High (and low) temperatures can have a significant impact on plastics processing and applications, particularly in industries such as automotive, aerospace, oil and gas, packaging, and medical devices, where metals are increasingly being replaced by plastics. Additional plastics have also been included for polyesters, polyamides and others where available, including polyolefins, elastomers and fluoropolymers. Entirely new sections on biodegradable polymers – automotive, packaging, construction, wind turbine manufacturers, film manufacturers, adhesive and coating industries, medical device manufacturers, biomedical engineers, and the recycling industry. Essential information and practical guidance for engineers and scientists working with bioplastics, or evaluating a migration to bioplastics. Includes key published material on biopolymers, updated specifically for this Handbook, and new material including coverage of PLA and Tissue Engineering Scaffolds. Coverage of materials and applications together in one handbook enables engineers and scientists to make informed design decisions.

Approaching the material from a chemistry and engineering perspective, High Performance Polymers presents the most reliable and current data available about state-of-the-art polymerization, fabrication, and application methods of high performance industrial polymers. Chapters are arranged according to the chemical constitution of the individual classes, beginning with main chain carbon-carbon polymers and leading to ether-containing, sulfur-containing, and so on. Each chapter follows an easily readable template, provides a brief overview and history of the polymer, and continues on to such sub-topics as monomers; polymerization and fabrication; properties; fabrication methods; special additives; applications; suppliers and commercial grades; safety; and environmental impact and recycling. High Performance Polymers brings a wealth of up-to-date, high performance polymer data to you library, in a format that allows for either a fast fact-check or more detailed study. In this new edition the data has been fully updated to reflect all developments since 2008, particularly in the topics of monomers, synthesis of polymers, special polymer types, and fields of application. Presents the state-of-the-art polymerization, fabrication and application methods of high performance industrial polymers Provides fundamental information for practicing engineers working in industries that develop advanced applications (including electronics, automotive and medical) Discusses environmental impact and recycling of polymers.

Emerging Trends in Medical Plastic Engineering and Manufacturing gives engineers and materials scientists working in the
field detailed insights into upcoming technologies in medical polymers. While plastic manufacturing combines the possibility of mass production and wide design variability, there are still opportunities within the plastic engineering field which have not been fully adopted in the medical industry. In addition, there are numerous additional challenges related to the development of products for this industry, such as ensuring tolerance to disinfection, biocompatibility, selecting compliant additives for processing, and more. This book enables product designers, polymer processing engineers, and manufacturing engineers to take advantage of the numerous upcoming developments in medical plastics, such as autoclaved volume-correction to achieve zero defect production or the development of ‘intelligent’ single use plastic products, and methods for sterile manufacturing which reduce the need for subsequent sterilization processes. Finally, as medical devices get smaller, the book discusses the challenges posed by miniaturization for injection molders, how to respond to these challenges, and the rapidly advancing prototyping technologies. Provides a roadmap to the emerging technologies for polymers in the medical device industry, including coverage of ‘intelligent’ single use products, personalized medical devices, and the integration of manufacturing steps to improve workflows. Helps engineers in the biomedical and medical devices industries to navigate and anticipate the special requirements of this field with relation to biocompatibility, sterilization methods, and government regulations. Presents tactics readers can use to take advantage of rapid prototyping technologies, such as 3D printing, to reduce defects in production and develop products that enable entirely new treatment possibilities.

This chapter focuses on adhesives used in direct physiological contact in dental and medical procedures. Activity in both areas has been quite extensive outside the United States for decades. In contrast, adhesive use in medical devices, patches, and plasters has been ongoing in the United States for a long time. In the case of medical devices, adhesion is concerned with the joining of materials such as plastics, elastomers, textiles, metals, and ceramics, which are examined in other chapters of the present volume and are covered in various references [1–6]. The coverage of this chapter is devoted to applications where to adhesives are in direct contact with tissues and other live organs.

This chapter presents common concepts applicable to the entire field of thermosetting plastics. Included are basic definitions and terminology, chemical reaction mechanisms, and selected analysis techniques.

Introduction to Fluoropolymers, Second Edition, provides a comprehensive overview of the history, principles, properties, processing and applications of fluoropolymers, supporting their development and utilization in high-performance applications, components, and products. This second edition has been updated and expanded to include new in-depth chapters on manufacturing and applications of PTFE and melt processible fluoropolymers. The book begins by demonstrating the role of fluoropolymers in everyday life, before introducing the history and basic principles of fluoropolymers. This is followed by detailed coverage of the main fluoropolymer types. Properties and applications are illustrated by real-world examples as diverse as waterproof clothing, vascular grafts and coatings for aircraft interiors. The different applications of fluoropolymers show the benefits of a group of materials that are highly water-repellant and flame-retardant, with unrivalled lubrication properties and a high level of biocompatibility. Health and safety and environmental aspects are also covered throughout the book, with a final chapter examining safety, disposal, and recycling in detail. This book is an essential resource for anyone looking to understand or use fluoropolymer materials in their products. This includes engineers, product designers, manufacturers, scientists, researchers, and other professionals, across industries such as automotive, aerospace, medical devices, food and beverages, high performance apparel, oil and gas, renewable energy, solar photovoltaics, electronics and semiconductors, pharmaceuticals, and chemical processing. This is also a valuable introductory guide for academic researchers and advanced students in plastics engineering, polymer science, and materials science. Introduces and demystifies fluoropolymers for a wide audience of engineers, designers, professionals, and researchers, across industries and disciplines. Covers a broad range of materials, including polytetrafluoroethylene (PTFE), polyvinyl fluoride (PVF), vinylidene fluoride polymers, fluoroelastomers, and more Focuses on properties, processing methods and advanced industrial applications of fluoropolymers.

Plastic has become a ubiquitous part of modern life. A cheap, lightweight material, it is used in everything from food packaging to consumer electronics and microbeads in cosmetic products. However, we are becoming increasingly aware of the problems our reliance on plastic is causing in the environment. For example, recent campaigns have highlighted the build-up of microbeads in the marine environment and the damage this is doing to wildlife, and the problem of marine litter, often in very remote locations. There are also concerns over exposure to plasticisers and their possible consequences for health. The plastics industry is under increasing pressure, not only from the government and environmental groups, but also from consumers, to improve the environmental impact of their products. This book presents an introduction to the uses of plastics and an overview of how they interact with the environment. It is a valuable resource for students studying environmental science as well as researchers working in the plastics industry, and policy makers and regulators concerned with waste disposal and environmental planning and conservation.

This book bridges the technology and business aspects of thermosets, providing a practical guide designed for engineers working in real-world industrial settings. The author explores the criteria for material selection, provides information on material properties for each family of thermosets, and discusses the various processing options for each material type. He
explains advantages and disadvantages of using thermosets and composites in comparison to competing materials and assesses cost aspects, enabling the reader to balance out technical and economic constraints when choosing a thermoset and processing technology for a given application. This second edition contains a new section on composites solutions for practical problems, gathering information on trends contributing to the breakthrough of composites in various sectors. Other new sections on specific crosslinking processes, processing trends, machinery and equipment manufacturers, applications, bio-sourced thermosets and natural fibers, and recycling of thermosets and composites are included. Case studies are provided, illustrating many design and production challenges. Furthermore, new market data and information about health and safety will be added. All data is fully updated throughout, with pricing in USD and EUR, and both ASTM (North American) and European standards. Thermosets and Thermoset Composites, Second Edition is the only book that gives in-depth coverage of a wide range of subject matters and markets, yet in brevity and concision in a single volume, avoiding the need of consulting a series of other specialized books. By providing the knowledge necessary for selecting a fabrication process, thermoset material and methods for determining the all important cost of thermoset parts this new edition is an invaluable decision-making aid and reference work for practitioners in a field with growing importance. Combining materials data, information on processing techniques, and economic aspects, Biron provides a unique end-to-end approach to the selection and use of materials in the plastics industry and related sectors New material on bio-sourced thermosets, natural fibers, and recycling of thermosets Concise and easy-to-use source of information and decision-making aid

The second edition of a bestseller, Design Controls for the Medical Device Industry provides a comprehensive review of the latest design control requirements, as well as proven tools and techniques to ensure your company’s design control program evolves in accordance with current industry practice. The text assists in the development of an effective design control program that not only satisfies the US FDA Quality System Regulation (QSR) and ISO 9001 and 13485 standards, but also meets today’s third-party auditor/investigator expectations and saves you valuable time and money. The author’s continual participation in FDA QSR inspections and Notified Body ISO audits is reflected in updates to all chapters and appendices of the book, now bursting at the seams with: New coverage of ISO 9001 and 13485 design control requirements More real-world examples from the medical device industry Additional detail for greater understanding and clarity Fresh templates for practical implementation Extensive references for further study The book addresses design control elements such as design planning, input, output, review, verification, validation, change, transfer, and history, as well as risk management inclusive of human factors and usability, biocompatibility, the FDA Quality System Inspection Technique (QSTI) for design controls, and medical device regulations and classes in the US, Canada, and Europe.

This book describes how man-made litter, primarily plastic, has spread into the remotest parts of the oceans and covers all aspects of this pollution problem from the impacts on wildlife and human health to socio-economic and political issues. Marine litter is a prime threat to marine wildlife, habitats and food webs worldwide. The book illustrates how advanced technologies from deep-sea research, microbiology and mathematical modelling as well as classic beach litter counts by volunteers contributed to the broad awareness of marine litter as a problem of global significance. The authors summarise more than five decades of marine litter research, which receives growing attention after the recent discovery of great oceanic garbage patches and the ubiquity of microscopic plastic particles in marine organisms and habitats. In 16 chapters, authors from all over the world have created a universal view on the diverse field of marine litter pollution, the biological impacts, dedicated research activities, and the various national and international legislative efforts to combat this environmental problem. They recommend future research directions necessary for a comprehensive understanding of this environmental issue and the development of efficient management strategies. This book addresses scientists, and it provides a solid knowledge base for policy makers, NGOs, and the broader public.

Background papers 1 to 9 published as technical documents. Available in separate records from WHO/HSS/EHT/DIM/10.1 to WHO/HSS/EHT/DIM/10.9

This volume details current developments in industry practices and standards relating to medical device packaging. This edition offers entirely new as well as revised chapters on packaging materials, package validation and methods and integrity testing, bar-coding technology, environmentally sound packaging and disposal procedures, storage autoclav

Applications of Polymers and Plastics in Medical Devices: Design, Manufacture, and Performance is a comprehensive guide to plastic materials for medical devices, covering fundamentals, materials, applications and regulatory requirements. Sections cover the role of plastics in medical devices, socioeconomic factors, the classification of medical devices. The performance of, medical grades and suppliers of polymer materials, which are categorized by performance level are also explored, along with manufacturing processes for device components, including extrusion, casting, injection molding and assembly processes. The book then covers applications in detail, examining each device and the role that polymers and plastics play in its construction and function. This is an essential resource for engineers, R&D, and other professionals working on plastics for medical devices and those in the plastics industry, medical device manufacturing, pharmaceuticals, packaging and biotechnology. In an academic setting, this book is of interest to researchers and advanced students in medical plastics, plastics engineering, polymer science, mechanical engineering, chemical engineering, biomedical engineering and materials
science. Offers systematic coverage of the major classes of polymers used in medical devices, including properties, characteristics, performance, medical grades and suppliers. Reviews regulatory requirements of the FDA and other global agencies, as well as considering quality control and socioeconomic factors. Includes the latest advances in plastics for medical devices, such as novel applications, use of bio-based polymers, and processing of reusable medical devices.

How easy life would be if only moldings were the same size and shape as the mold. But they never are, as molders, toolmakers, designers and end users know only too well. Shrinkage means that the size is always different; warpage often changes the shape too. The effects are worse for some plastics than others. Why is that? What can you do about it? The Handbook of Molded Part Shrinkage and Warpage is the first and only book to deal specifically with this fundamental problem. Jerry Fischer's Handbook explains in plain terms why moldings shrink and warp, shows how additives and reinforcements change the picture, sets out the effect of molding process conditions, and explains why you never can have a single 'correct' shrinkage value. It goes on to demonstrate how to alleviate the problem through careful design of the molded part and the mold, and by proper material selection. It also examines computer-aided methods of forecasting shrinkage and warpage. And most important of all, the Handbook gives you the data you need to work with. Authoritative and rooted in extensive industrial experience, the expert guidance contained in this handbook offers practical understanding to novices, and new insights to readers already skilled in the art of injection molding and mold making. Contains the answers to common problems and detailed advice on how to control mold and post-mold shrinkage and warpage. Case Studies illustrate and enrich the text; Data tables provide the empirical data that is essential for success, but hard to come by.

No book has been published that gives a detailed description of all the types of plastic materials used in medical devices, the unique requirements that the materials need to comply with and the ways standard plastics can be modified to meet such needs. This book will start with an introduction to medical devices, their classification and some of the regulations (both US and global) that affect their design, production and sale. A couple of chapters will focus on all the requirements that plastics need to meet for medical device applications. The subsequent chapters describe the various types of plastic materials, their properties profiles, the advantages and disadvantages for medical device applications, the techniques by which their properties can be enhanced, and real-world examples of their use. Comparative tables will allow readers to find the right classes of materials suitable for their applications or new product development needs.

The history of plastics and medical devices traces a complex course of slowly evolving ideas punctuated by moments of intellectual revolution. When viewed from the vantage of retrospect, it becomes apparent that milestones in the progress of biomaterial science represent culminations of gradual shifts in theory and iterative experimentation. This has been as true for methodological developments in polymer chemistry as it has for technological breakthroughs in medical equipment design. The two disciplines, though now inextricable from one another, initially advanced along largely separate and occasionally redundant paths. Until the latter decades of the twentieth century, physicians and surgeons modified existing materials to create and refine devices according to their clinical needs while chemists and engineers synthesized materials de novo without specific attention to their potential medical applications. In the modern era, however, the lines between the chemical and biological sciences have blurred, paving way for an interdisciplinary approach toward the design and application of medical plastics.

The authoritative introduction to all aspects of plastics engineering — offering both academic and industry perspectives in one complete volume. Introduction to Plastics Engineering provides a self-contained introduction to plastics engineering. A unique synergistic approach explores all aspects of material use — concepts, mechanics, materials, part design, part fabrication, and assembly — required for converting plastic materials, mainly in the form of small pellets, into useful products. Thermoplastics, thermosets, elastomers, and advanced composites, the four disparate application areas of polymers normally treated as separate subjects, are covered together. Divided into five parts — Concepts, Mechanics, Materials, Part Processing and Assembly, and Material Systems — this inclusive volume enables readers to gain a well-rounded, foundational knowledge of plastics engineering. Chapters cover topics including the structure of polymers, how concepts from polymer physics explain the macro behavior of plastics, evolving concepts for plastics use, simple mechanics principles and their role in plastics engineering, models for the behavior of solids and fluids, and the mechanisms underlying the stiffening of plastics by embedded fibers. Drawing from his over fifty years in both academia and industry, Author Vijay Stokes uses the synergy between fundamentals and applications to provide a more meaningful introduction to plastics. Examines every facet of plastics engineering from materials and fabrication methods to advanced composites Provides accurate, up-to-date information for students and engineers both new to plastics and highly experienced with them Offers a practical guide to large number of materials and their applications Addresses current issues for mechanical design, part performance, and part fabrication Introduction to Plastics Engineering is an ideal text for practicing engineers, researchers, and students in mechanical and plastics engineering and related industries.

This reference guide brings together a wide range of essential data on the sterilization of plastics and elastomers, enabling engineers to make optimal material choices and design decisions. The data tables in this book enable engineers and scientists to select the right materials, and right sterilization method for a given product or application. The third edition includes new
text chapters that provide the underpinning knowledge required to make best use of the data. Larry McKeen has also added
detailed descriptions of sterilization methods for most common polymer classes such as polyolefins, polyamides, polyesters,
elastomers, fluoropolymers, biodegradable plastics. Data has been updated throughout, with expanded information on newer
classes of polymer utilized in medical devices and sterile packaging, such as UHMWPE, high temperature plastics (PEEK,
PES, PPS, etc.), PBT, PETG, etc. The resulting Handbook is an essential reference for Plastics Engineers, Materials
Scientists and Chemists working in contexts where sterilization is required, such as food packaging, pharmaceutical
packaging and medical devices. Essential data and practical guidance for engineers and scientists working with plastics in
applications that require sterile packaging and equipment. 3rd edition includes new introductory chapters on sterilization
processes and polymer chemistry, providing the underpinning knowledge required to utilize the data. Provides essential
information and guidance for FDA submissions required for new Medical Devices.

Includes bibliographical references (v. 1. p. 1-li) and indexes.

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