

Twin Screw Extruder Kraussmaffe Berstorff

Lithium-ion batteries (LIBs), as a key part of the 2019 Nobel Prize in Chemistry, have become increasingly important in recent years, owing to their potential impact on building a more sustainable future. Compared with other batteries developed, LIBs offer high energy density, high discharge power, and a long service life. These characteristics have facilitated a remarkable advance of LIBs in many frontiers, including electric vehicles, portable and flexible electronics, and stationary applications. Since the field of LIBs is advancing rapidly and attracting an increasing number of researchers, it is necessary to often provide the community with the latest updates. Therefore, this book was designed to focus on updating the electrochemical community with the latest advances and prospects on various aspects of LIBs. The materials presented in this book cover advances in several fronts of the technology, ranging from detailed fundamental studies of the electrochemical cell to investigations to better improve parameters related to battery packs.

This book is a printed edition of the Special Issue "Discontinuous Fiber Composites" that was published in *J. Compos. Sci.*

Combining the science of foam with the engineering of extrusion processes, *Foam Extrusion: Principles and Practice* delivers a detailed discussion of the theory, design, processing, and application of degradable foam extraction. In one comprehensive volume, the editors present the collective expertise of leading academic, research, and industry specialists while laying the scientific foundation in such a manner that the microscopic transition from a nucleus to a void (nucleation) and macroscopic movement from a void to an object (formation) are plausibly

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addressed. To keep pace with significant improvements in foam extrusion technology, this Second Edition: Includes new chapters on the latest developments in processing/thermal management, rheology/melt strength, and biodegradable and sustainable foams Features extensive updates to chapters on extrusion equipment, blowing agents, polyethylene terephthalate (PET) foam, and microcellular innovation Contains new coverage of cutting-edge foaming mechanisms and technology, as well as new case studies, examples, and figures Capturing the interesting evolution of the field, Foam Extrusion: Principles and Practice, Second Edition provides scientists, engineers, and product development professionals with a modern, holistic view of foam extrusion to enhance research and development and aid in the selection of the optimal screw, die design, and foaming system.

This monograph discusses the various biomass feedstocks currently available for biofuels production, and mechanical preprocessing technologies to reduce the feedstock variability for biofuels applications. Variability in the properties of biomass—in terms of moisture, particle size distribution, and low-density—results in storage, transportation, handling, and feeding issues. Currently, biorefineries face serious particle bridging issues, uneven discharge, jamming of equipment, and transportation problems. These issues must be solved in order for smooth operations to be possible. Mechanical preprocessing technologies, such as size reduction, densification, and moisture management using drying and dewatering, can help to overcome these issues. Many densification systems exist that will assist in converting low-density biomass to a high-density commodity type feedstock. In 6 chapters, the impact of densification process variables, such as temperature, pressure, moisture, etc., on biomass particle agglomeration, the quality of the densified products, and the overall energy consumption of the

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process are discussed, as are the various compression models for powders that can be used for biomass particles agglomeration behavior and optimization of the densification process using statistical and evolutionary methods. The suitability of these densified products for biochemical and thermochemical conversion pathways is also discussed, as well as the various international standards (CEN and ISO) they must adhere to. The author has worked on biomass preprocessing at Idaho National Laboratory for the last ten years. He is the principal investigator for the U.S. Department of Energy Bioenergy Technologies Office-funded “Biomass Size Reduction and Densification” project. He has developed preprocessing technologies to reduce cost and improve quality. The author has published many papers and books focused on biomass preprocessing and pretreatments. Biomass process engineers and biorefinery managers can benefit from this book. Students in chemical, mechanical, biological, and environmental engineering can also use the book to understand preprocessing technologies, which greatly assist in improving the biomass critical material attributes. The book can help policymakers and energy systems planners to understand the biomass properties limitations and technologies to overcome the same.

Compatibilization of Polymer Blends: Micro and Nano Scale Phase Morphologies, Interphase Characterization and Properties offers a comprehensive approach to the use of compatibilizers in polymer blends, examining both fundamental and advanced knowledge in the field. The book begins by introducing polymer blends, describing thermodynamics, miscibility, and phase separation, and explaining the main concepts of compatibilization. Other sections cover theoretical approaches for nearly compatible blends, incompatible blends, nanofillers, physical compatibilization, reactive compatibilization, morphological and structural characterization, and

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physico-mechanical characterization. Finally, key application areas are covered, including biomedical applications, packaging and automobile engineering. While this book will be a highly valuable reference source for academics, researchers and postgraduate students interested in polymer blends, it will also be ideal for anyone involved in the fields of polymer science, polymer chemistry, polymer physics, materials science, scientists, R&D professionals, and engineers in involved in the development or engineering of polymer products. Offers detailed and systematic coverage of essential and advanced topics relating to the compatibilization of polymer blends Presents a critical analysis of the effect of compatibilization on morphology and thermal, mechanical, electrical and viscoelastic properties of polymer blends Draws on novel studies and state-of-the-art research, discussing the latest issues and developments

From the Preface This book is the first extended look at a new and multifaceted polymer processing technology that has already been discussed in numerous articles. Called Solid-State Shear Pulverization (S3P), this innovative process produces polymeric powders with unique physical properties not found in the output of conventional size-reduction methods.... This technology, which utilizes a pulverizer based on a modified co-rotating twin-screw extruder..., has profound implications for both the creation of new polymer blends and recycling of plastic and rubber waste. Unlike [earlier processes] where polymers are melted prior to pulverization, ...pulverizing mixtures of polymers with the S3P process...does not involve melting. By contrast, S3P maintains polymers in the solid state and avoids the additional heat

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history that occurs during [other processes], which can be detrimental to the physical properties of pulverized materials. The research and development of the S3P technology...has grown significantly since 1990 from the development of a new plastics recycling process to a much broader polymer processing method that allows intimate mixing of polymers with very different viscosities, solid-state dispersion of additives, including pigments, and continuous production of powder with unique shapes and larger surface areas. Polymeric powders are of growing importance to plastics processors due to the increase use of plastics in various applications, such as rotational molding, powder coatings, and compounding, which require powder as the feedstock. ...[I]t has become clear that this process allows for in-situ compatibilization of dissimilar polymers by applying mechanical energy to cause chemical reactions. This aspect of S3P technology that we describe in this book should [be useful in] developing new polymer blends with the use of pre-made compatibilizing agents. In addition, it has been discovered that S3P efficiently mixes polymer blends with different component viscosities, resulting in the elimination of phase inversion. The S3P process directly produces blends with matrix and dispersed phase morphology like those obtained after phase inversion during a long melt-mixing process. This phenomenon is of practical importance because a long processing time is required by conventional melt-mixing to produce a stable blend morphology. S3P is also advantageous for producing thermoplastic or thermoset powder-coating compounds in a one-step process as

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opposed to a conventional multi-step operation that involves melt extrusion followed by batch grinding. The major capabilities of this new process can be summarized as follows:

- o Continuous powder production from plastics or rubber feedstocks
- o Blending of immiscible polymers
- o Efficient mixing of polymers with unmatched viscosities
- o Environmentally friendly recycling of multicolored, commingled plastics waste
- o Solid-state dispersion of heat-sensitive additives
- o Engineered plastic/rubber blends

Materials and processes well illustrated The text is well illustrated with 60 photographs, micrographs, diagrams and others figures. Here is a small sampling of the captions of these figures.

- o Particle-size distribution for virgin LDPE powder made with PT-25 pulverizer
- o Optical photograph of virgin LDPE powder made with PT-25 pulverizer
- o Layout for a three-stage rubber pulverizer
- o Flow chart for powder coating production by conventional process and with new S3P technology
- o SEM image of pulverized virgin PP at 40X (first in series of SEM images of polymer powders)
- o Optical micrograph of melt-crystallized thin films of unpulverized virgin PP under polarized light
- o Log of viscosity vs. log shear rate for virgin HDPE after S3P processing
- o Gel permeation chromatograms (GPC) of polystyrene subjected to S3P processing

Color-photo section One of the several functions of Solid-State Shear Pulverization technology is recycling mixed plastic waste. This section of twenty full-color photographs and micrographs illustrates different processed materials, as well as the machinery and mixed waste used. Here is a small sampling of the photo and

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micrograph captions. o Resultant flake feedstock from granulation o S3P-made uniform powder from feedstock o Flake feedstock of post-consumer HDPE/PP blend (90/10 ratio) o Injection-molded test bar (with translucence) made from S3P powder without pelletization o Injection-molded test bar made from S3P powder without pelletization showing uniform color o Several test bars subjected to tensile testing showing exceptionally high elongation at break Useful reference data in tables More than 60 tables provide useful data in convenient form. Here is a small sampling of table captions. o Physical properties of virgin PP 8020 GU injection-molded from S3P-made powder (first in series of tables on physical properties of various plastics processed from S3P-made powder) o Sieve analysis of powder resulting from S3P of virgin LDPE 509.48 (one of series of tables on sieve analysis of polymer powders) o Melt-flow rate before and after S3P processing for virgin PS and two PP samples o Key physical properties of injection-molded post-consumer polyolefin blends pulverized by S3P process The Authors Klementina Khait, M.S. Ch.E., Ph.D., is Research Associate Professor and Director of the Polymer Technology Center in the Department of Chemical Engineering, Northwestern University. Her industrial experience in polymer science and engineering includes work with Borg-Warner Chemicals and Quantum Chemical Corporation. She received her two advanced degrees, in chemical engineering and polymer chemistry, from the Technological Institute, St. Petersburg, Russia. Dr. Khait holds several patents and has published more than 50 papers in

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scientific and technical journals. Stephen Carr, Ph.D., is Professor of Materials Science and Engineering and Chemical Engineering at Northwestern University. His industrial work includes work in polymer science and engineering with General Motors Corp. He received a doctorate in polymer science from Case Western Reserve University. He has been on the Northwestern University faculty since 1969. Martin H. Mack is Vice President for R&D with the Berstorff Division of Krauss-Maffei Corporation. He holds an engineering degree from the University of Stuttgart. He has served for more than ten years on the Board of Directors of the Society of Plastics Engineers (SPE).

This edited volume contains the selected papers presented at the scientific board meeting of the German Cluster of Excellence on “Integrative Production Technology for High-Wage Countries”, held in November 2014. The topical structure of the book is clustered in six sessions: Integrative Production Technology, Individualised Production, Virtual Production Systems, Integrated Technologies, Self-Optimising Production Systems and Human Factors in Production Technology. The Aachen perspective on a holistic theory of production is complemented by conference papers from external leading researchers in the fields of production, materials science and bordering disciplines. The target audience primarily comprises research experts and practitioners in the field but the book may also be beneficial for graduate students.

The Polymer Blends Handbook is a fundamental reference work on polymer blends, covering all aspects: science, engineering, technology and application. It will appeal to

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anyone working in the field of blends, researchers as well as engineers. The Handbook is designed to be the source of information on all aspects of polymer blends. To this end the Editors have put together an international group of highly respected contributors, each an expert in his chosen subjects.

A comprehensive index to company and industry information in business journals. This review describes the changes in the industry over the last 5 years, concentrating on the screw extrusion process where the extruded product has a constant cross-section. Film and sheet production and pultrusion are not included in this review. Products and applications are reviewed in detail and major advances such as computer control, materials and speed and size issues are also covered. An additional indexed section containing several hundred abstracts from the Rapra Polymer Library database provides useful references for further reading.

As a consultant to the plastics industry, Ottmar Brandau's focus is on using his engineering knowhow and production management experience to improve quality and productivity, cut down cycle time and introduce secondary processes such as inline printing. This book is a thoroughly practical handbook that provides engineers and managers with the toolkit to improve production and engineering aspects in their own businesses - saving money, increasing output and improving competitiveness by adopting new technologies. In this book, Brandau covers the

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engineering aspects of bottle production and the relevant production processes (focusing on blow molding), along with plant layout and organization and production management, to produce the definitive handbook for engineers and managers alike. Learn the tricks of the trade from an experienced engineer and manager Save money: Practical strategies to improve cycle times Increase productivity: Improve plant layout and organization and implement secondary processes such as inline printing

This book presents the theory and methodology used in the design of dies for extruded food and feed products. It is relevant to all types of extruded human foods and animal feeds. In addition to presenting the theory and principles underpinning die design, it uses worked examples to demonstrate the die design process. The author brings decades of industry experience to this book. Dennis Forte is a chemical engineer by training, who has spent his career in extrusion and related processes in areas of human food (breakfast cereals, snacks, pasta, confectionery, texturised vegetable protein), pet foods (dry, semi-moisture, wet texturised) and aquafeeds. He has worked in these areas with both multinational corporations and small manufacturers.

This first comprehensive overview of reactive extrusion technology for over a decade combines the views of contributors from both academia and industry who

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share their experiences and highlight possible applications and markets. They also provide updated information on the underlying chemical and physical concepts, summarizing recent developments in terms of the material and machinery used. As a result, readers will find here a compilation of potential applications for reactive extrusion to access new and cost-effective polymeric materials, while using existing compounding machines.

A complete and timely overview of the topic, this volume imparts knowledge of fundamental principles and their applications for academicians, scientists and researchers, while informing engineers, industrialists and entrepreneurs of the current state of the technology and its utilization. Each article is uniformly structured for easy navigation, containing the latest research & development and its basic principles and applications, examples of case studies, laboratory and pilot plant experiments, as well as due reference to the published and patented literature.

This comprehensive, long-needed reference provides the thorough understanding required to modify and manipulate rigid PVC's thermal/shear sensitivity and rheological properties, helping you utilize rigid PVC most effectively in manufacturing applications as diverse as pipes, house siding, bottles, window frames, and packaging films. With complete, up-to-the-minute coverage in one

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convenient source, Engineering with RigidPVC encompasses rheological principles, resin properties, and additive modification, as well as polymer preparation, melt processing, and forming techniques ... major conversion operations and their manufacturing applications-including actual commercial formulations and processes .. . quality control procedures necessary to monitor compounding processes ... aspects of processability critical for product development and improvement .. . and much more. International in scope, this time- and money-saver is an essential daily resource for all professionals involved in Engineering with Rigid PVC, including plastics engineers, polymer chemists, process engineers, and plastics processors and technicians. Furthermore, the volume is ideal for training programs and professional seminars, and is an outstanding supplement for students in polymer chemistry , materials science , and plastics engineering.

Since their first industrial use polymers have gained a tremendous success. The two volumes of "Polymers - Opportunities and Risks" elaborate on both their potentials and on the impact on the environment arising from their production and applications. Volume 11 "Polymers - Opportunities and Risks I: General and Environmental Aspects" is dedicated to the basics of the engineering of polymers – always with a view to possible environmental implications. Topics include: materials, processing, designing, surfaces, the utilization phase, recycling, and depositing. Volume 12 "Polymers - Opportunities and Risks II: Sustainability, Product Design

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and Processing" highlights raw materials and renewable polymers, sustainability, additives for manufacture and processing, melt modification, biodegradation, adhesive technologies, and solar applications. All contributions were written by leading experts with substantial practical experience in their fields. They are an invaluable source of information not only for scientists, but also for environmental managers and decision makers.

Polymers, main components of plastics and rubbers, are being discarded in increasing quantities. But this waste can also be considered as 'plastic gold'. Public concern, coupled with the inherent value of the material, means that recycling is imperative. The present book presents a survey of current knowledge in the form of case studies, including current legal and educational issues. Topics covered also include regulation and practice in NATO countries, the economics of recycling, the reprocessing of single polymers and mixtures, and future prospects and strategies. Audience: Vital reading for all polymer scientists, technicians and engineers.

Blowing Agents and Foaming Processes is now the longest and most successful running conference on this subject, offering strategic insights from industry leaders within this growing market. This event is the prime opportunity to engage with those involved in the manufacturing of blowing agents, foam insulation and packaging, foam extrusion and equipment manufacture. It brings together processors, materials suppliers, resin manufacturers, academics and end-users to discuss latest developments and findings in this area. This year's conference represented a diverse and interactive agenda, with presentations from across the industry supply chain, a showcase of innovative foamed products and an exclusive live demonstration of injection moulding technology. These proceedings cover all the presentations from the two

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day event which illustrated the dynamic and progressive nature of this industry pushed by a challenging market with substantial and evolving requirements.

Now updated, this industry standard provides information on the aspects and processes of extrusion technology, including design, construction, and operation of extrusion lines. Well-known experts in various fields of extrusion have contributed to this book. As a reference book it will undoubtedly prove a considerable benefit to engineers involved with the extrusion process.

“The presentation of this book is excellent and the quantity of information is immense.”

Applied Mechanics Review “... this book belongs on the bookshelf of every engineer, operations supervisor and maintenance manager. It is also invaluable for plastic engineering students at all levels.” Polymer News “ ... on a value for money basis it is outstanding.”

Plastics & Rubber Weekly

Industrial Applications of Renewable Plastics: Environmental, Technological, and Economic Advances provides practical information to help engineers and materials scientists deploy renewable plastics in the plastics market. It explores the uses, possibilities, and problems of renewable plastics and composites to assist in material selection and rejection. The designer's main problems are examined, along with basic reminders that deal with structures and processing methods that can help those who are generally familiar with metals understand the unique properties of plastic materials. The book offers a candid overview of main issues, including conservation of fossil resources, geopolitical considerations, greenhouse effects, competition with food crops, deforestation, pollution, and disposal of renewable plastics. In addition, an overview of some tools related to sustainability (Life cycle assessments, CO₂ emissions, carbon footprint, and more) is provided. The book is an essential resource for

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engineers and materials scientists involved in material selection, design, manufacturing, molding, fabrication, and other links in the supply chain of plastics. The material contained is of great relevance to many major industries, including automotive and transport, packaging, aeronautics, shipbuilding, industrial and military equipment, electrical and electronics, energy, and more. Provides key, enabling information for engineers and materials scientists looking to increase the use of renewable plastic materials in their work Presents practical guidance to assist in materials selection, processing methods, and applications development, particularly for designers more familiar with other materials, such as metals Includes a candid discussion of the pros and cons of using renewable plastics, considering the technical, economic, legal, and environmental aspects

This report has the objective of bringing together information from a broad spectrum of polymer and pipe supply technology and relating it to the regional and demographic trends of the demand side. This approach will enable readers to view their own more detailed market information within a broader context and consequently gain a more complete understanding of long term trends.

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