

Biobased Materials For Polyurethane Dispersions

Biobased Smart Polyurethane Nanocomposites
 Micro and Nano Fibrillar Composites (MFCs and NFCs) from Polymer Blends
 Polyurethane Polymers: Blends and Interpenetrating Polymer Networks
 Bio-Based Plant Oil Polymers and Composites
 Synthesis, Properties, and Advanced Applications
 Green Materials from Plant Oils
 Eco-Friendly Waterborne Polyurethanes
 Science, Technology, Markets, and Trends
 Fundamentals and Applications
 Biomass, Yield and Productivity
 Polymer Dispersions and Their Industrial Applications
 From Synthesis to Applications
 A Definitive Practical Guide
 Modern Physical Chemistry: Engineering Models, Materials, and Methods with Applications
 From Synthesis to Applications
 Avenues and Sustainability
 Processing and Characterization
 Chemistry and Technology of Polyols for Polyurethanes, 2nd Edition
 Handbook of Waterborne Coatings
 Resins for Water-borne Coatings
 Persuasion Across Genres
 Carbon-Based Nanofillers and Their Rubber Nanocomposites
 Ionomers
 Advanced Polymeric Materials
 Fundamentals and Applications
 Synthesis, structure, properties and applications
 Developments in Surface Contamination and Cleaning - Vol 2
 Conversion of Lignin into Bio-Based Chemicals and Materials
 Handbook of Formulating Dermal Applications
 Sustainability of Polymeric Materials
 Advances in Polyurethane Biomaterials
 Concept, Solutions, and Implementation
 From Synthesis to Applications
 Biobased Products and Industries
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 Synthesis, Properties, and Applications
 Polymeric Materials with Antimicrobial Activity
 Soybean
 Szycher's Handbook of Polyurethanes, Second Edition

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MACIAS ANDREWS

Biobased Smart Polyurethane Nanocomposites CRC Press

Polyurethanes are one of the most dynamic groups of polymers, they find use in nearly every aspect of modern life, in applications such as furniture, bedding, seating and instrument panels for cars, shoe soles, thermoinsulation, carpet backings, packaging, adhesives, sealants, binders and as coatings. In 2004 10.6 million tons of polyurethanes were produced, in 2014 the world production was close to 20 million tons. In the last decade (2005-2015) important, worldwide developments in the area of polyols for polyurethanes were carried out, especially for polyols from renewable resources, described in detail in this second edition of the book. The main raw materials used for the production of PU are polyols and isocyanates. The first of these is the subject of this two volume handbook. Volume 1 is dedicated to polyols for elastic PU (flexible foams, elastomers and so on). Volume 2 is dedicated to polyols for rigid PU (rigid foams, wood substitute, packaging, flotation materials and so on). The book considers the raw materials used to build the PU polymeric

architecture. It covers the chemistry and technology of oligo-polyol fabrication, the characteristics of the various oligo-polyol families and the effects of the oligo-polyol structure on the properties of the resulting PU. It presents the details of oligo-polyol synthesis, and explains the chemical and physico-chemical subtleties of oligo-polyol fabrication. This book links data and information concerning the chemistry and technology of oligo-polyols for PU, providing a comprehensive overview of: Basic PU chemistry Key oligo-polyol characteristics Synthesis of the main oligo-polyol families, including: polyether polyols, filled polyether polyols, polyester polyols, polybutadiene polyols, acrylic polyols, polysiloxane polyols, aminic polyols Polyols from renewable resources Flame retardant polyols Chemical recovery of polyols Relationships between polyol structure and PU properties This book will be of interest to all specialists working with polyols for the manufacture of PU and to all researchers that would like to know more about polyol chemistry. *Micro and Nano Fibrillar Composites (MFCs and NFCs) from Polymer Blends* Royal Society of Chemistry

The conceptualization and formulation of skin care products intended for topical use is a multifaceted and evolving area of science. Formulators must account for myriad skin types,

emerging opportunities for product development as well as a very temperamental retail market. Originally published as "Apply Topically" in 2013 (now out of print), this reissued detailed and comprehensive handbook offers a practical approach to the formulation chemist's day-to-day endeavors by: Addressing the innumerable challenges facing the chemist both in design and at the bench, such as formulating with/for specific properties; formulation, processing and production techniques; sensory and elegancy; stability and preservation; color cosmetics; sunscreens; Offering valuable guidance to troubleshooting issues regarding ingredient selection and interaction, regulatory concerns that must be addressed early in development, and the extrapolation of preservative systems, fragrances, stability and texture aids; Exploring the advantages and limitations of raw materials; Addressing scale-up and pilot production process and concerns; Testing and Measurements Methods. The 22 chapters written by industry experts such as Roger L. McMullen, Paul Thau, Hemi Nae, Ada Polla, Howard Epstein, Joseph Albanese, Mark Chandler, Steve Herman, Gary Kelm, Patricia Aikens, and Sam Shefer, along with many others, give the reader and user the ultimate handbook on topical product development. Royal Society of Chemistry

Biobased Smart Polyurethane Nanocomposites From Synthesis to Applications Royal Society of Chemistry

Polyurethane Polymers: Blends and Interpenetrating Polymer Networks Elsevier
Polyurethanes are formed by reacting a polyol (an alcohol with more than two reactive hydroxyl groups per molecule) with a diisocyanate or a polymeric isocyanate in the presence of suitable catalysts and additives. Because a variety of diisocyanates and a wide range of polyols can be used to produce polyurethane, a broad spectrum of materials can be produced to meet the needs of specific applications. During World War II, a widespread use of polyurethanes was first seen, when they were used as a replacement for rubber, which at that time was expensive and hard to obtain. During the war, other applications were developed, largely involving coatings of different kinds, from airplane finishes to resistant clothing. Subsequent decades saw many further developments and today we are surrounded by polyurethane applications in every aspect of our everyday lives. While polyurethane is a product that most people are not overly familiar with, as it is generally "hidden" behind covers or surfaces made of other materials, it would be hard to imagine life without polyurethanes.

Bio-Based Plant Oil Polymers and Composites John Wiley & Sons

This edited book focusses on green chemistry as the research community endeavours to create eco-friendly materials and technologies. It provides an in-depth overview of the fundamentals, key concepts and experimental techniques for eco-friendly synthesis of organic compounds and metal/metal oxide nanoparticles/nanomaterials. It also emphasizes the mechanisms, designing and industrial technologies for green synthesis and its applications. Each chapter brings the recent developments, state of the art, challenges and perspectives which cover all the aspects in one place, and which concern the green synthesis and evolution. Authored by world-renowned experts in a broad range of green chemistry sectors, this book is an archival reference guide for researchers, engineers, scientists and postgraduates working in the field of sustainable science, green chemistry, environmental science, engineering sciences and industrial technologies.

Synthesis, Properties, and Advanced Applications Springer Nature

A Practical Guide to Plastics Sustainability: Concept, Solutions, and Implementation is a groundbreaking reference work offering a broad, detailed and highly practical vision of the complex concept of sustainability in plastics. The book's aim is to present a range of potential pathways towards more sustainable plastics parts and products, enabling the reader to further integrate the idea of sustainability into their design process. It begins by introducing the context and concept of sustainability, discussing perceptions, drivers of change, key factors, and environmental issues, before presenting a detailed outline of the current situation with types of plastics, processing, and opportunities for improved sustainability. Subsequent chapters focus on the different possibilities for improved sustainability, offering a step-by-step technical approach to areas including design, properties, renewable plastics, and recycling and re-use. Each of these pillars are supported by data, examples, analysis and best practice guidance. Finally, the latest developments and future possibilities are considered. Approaches the idea of sustainability from numerous angles, offering practical solutions to improve sustainability in the development of plastic components and products Explains how sustainability can be applied across plastics design, materials selection, processing, and end of life, all set alongside socioeconomic factors Considers key areas of innovation, such as eco-design, novel opportunities for recycling or re-use, bio-based polymers and new technologies

Green Materials from Plant Oils Springer Science & Business Media

Finding alternatives to fossil feedstocks is increasing in importance with the challenges of global warming, increasing oil prices and depleting fossil fuel reserves that we currently face. Today, plant oils are important renewable raw materials for the chemical industry and are heavily used for surfactants, cosmetic products and lubricants. This book covers the green chemistry of products and intermediates synthesised from plant oils. Photo-initiated polymerisation and polymerization of vegetable oils in environmental media are covered as well as click reactions to chemically modify vegetable oils. Useful products from plant oils such as polymers, biomaterials, biofibres and lubricants, as well as their further applications, are described. This book is a valuable resource for researchers in academia and industry, biomass producers and suppliers and manufacturers of end-products.

Eco-Friendly Waterborne Polyurethanes CRC Press

A practical handbook rather than merely a chemistry reference, Szycher's Handbook of Polyurethanes, Second Edition offers an easy-to-follow compilation of crucial new information on

polyurethane technology, which is irreplaceable in a wide range of applications. This new edition of a bestseller is an invaluable reference for technologists, marketers, suppliers, and academicians who require cutting-edge, commercially valuable data on the most advanced uses for polyurethane, one of the most important and complex specialty polymers. Internationally recognized expert Dr. Michael Szycher updates his bestselling industry "bible" with seven entirely new chapters and five that are revised and updated, this book summarizes vital contents from U.S. patent literature—one of the most comprehensive sources of up-to-date technical information. These patents illustrate the most useful technology discovered by corporations, universities, and independent inventors. Because of the wealth of information they contain, this handbook features many full-text patents, which are carefully selected to best illustrate the complex principles involved in polyurethane chemistry and technology. Features of this landmark reference include: Hundreds of practical formulations Discussion of the polyurethane history, key terms, and commercial importance An in-depth survey of patent literature Useful stoichiometric calculations The latest "green" chemistry applications A complete assessment of medical-grade polyurethane technology Not biased toward any one supplier's expertise, this special reference uses a simplified language and layout and provides extensive study questions after each chapter. It presents rich technical and historical descriptions of all major polyurethanes and updated sections on medical and biological applications. These features help readers better understand developmental, chemical, application, and commercial aspects of the subject.

Science, Technology, Markets, and Trends John Wiley & Sons

Plants are important for a permanent ecosystem, because in the ecological pyramid plants support all the other living organisms at the base. Very important organization is thought to be the integral process of resource, transport, partitioning, metabolism, and production, which involves yield, biomass, and productivity in plants. Accordingly, it is important to obtain more information about the knowledge concerning yield, biomass, and productivity in plants. Soybean is one of the main crops largely contributing to our life, which is thought to be connected to our ecosystem through the above-mentioned integral process. This book focuses on the soybean, and reviews and research concerning the yield, biomass, and productivity of soybean are presented herein. This text updates the book published in 2017. Although there are many difficulties, the main aim of this book is to present a basis for the above-mentioned integral processes of resource, transport, partitioning, metabolism, and production, which involves yield, biomass, and productivity in plants (soybean), and to understand what supports this basis and the integral process. It is hoped that this and the preceding book will be essential reads.

Fundamentals and Applications Springer

Biopolymeric Nanomaterials: Fundamentals and Applications outlines the fundamental design concepts and emerging applications of biopolymeric nanomaterials. The book also provides information on emerging applications of biopolymeric nanomaterials, including in biomedicine, manufacturing and water purification, as well as assessing their physical, chemical and biological properties. This is an important reference source for materials scientists, engineers and biomedical scientists who are seeking to increase their understanding of how polymeric nanomaterials are being used for a range of biomedical and industrial applications. Biopolymeric nanomaterials refer to biocompatible nanomaterials, consisting of biopolymers, such as protein (silk, collagen, gelatin, β -casein, zein, and albumin), protein-mimicked polypeptides and polysaccharides (chitosan, alginate, pullulan, starch, and heparin). Biopolymeric nanomaterials may be used as i) delivery systems for bioactive compounds in food application, (ii) for delivery of therapeutic molecules (drugs and genes), or for (iii) tissue engineering. Provides information on the design concepts and synthesis of biopolymeric nanomaterials in biomedical and industrial applications Highlights the major properties and processing methods for biopolymeric nanomaterials Assesses the major challenges of producing biopolymeric nanomaterials on an industrial scale

Biomass, Yield and Productivity Walter de Gruyter GmbH & Co KG

Polyurethane nanocomposites present an attractive and sustainable way for designing smart materials that can be used in packaging, health and energy applications. Biobased Smart Polyurethane Nanocomposites brings together the most recent research in the field from the basic concepts through to their applications. Special emphasis is given to sustainable biodegradable polyurethane nanocomposites with hyperbranched architecture. The book introduces biobased polyurethanes and the nanomaterials that can be used as nanocomposites followed by the resulting polyurethane nanocomposites. The second part then explores important applications in paints and surface coatings, shape memory, self-healing, self-cleaning, biomaterials and packaging

materials. Written by a leading expert on polyurethane nanocomposites, the book is a great introduction to this smart material and its applications.

Polymer Dispersions and Their Industrial Applications BoD – Books on Demand

Carbon-Based Nanofillers and their Rubber Nanocomposites: Fundamentals and Applications provides the synthetic routes, characterization, structural properties and effect of nano fillers on rubber nanocomposites. The synthesis and characterization of all carbon-based fillers is discussed, along with their morphological, thermal, mechanical, dynamic mechanical, and rheological properties. The book also covers the theory, modeling, and simulation aspects of these nanocomposites and their various applications. Users will find a valuable reference source for graduates and post graduates, engineers, research scholars, polymer engineers, polymer technologists, and those working in the biomedical field. Reviews rubber nanocomposites, specifically carbon-associated nanomaterials (nanocarbon black, graphite, graphene, carbon nanotubes, fullerenes, diamond) Presents the synthesis and characterization of carbon based nanocomposites Relates the structure of these nanocomposites to their function as rubber additives and their many applications

From Synthesis to Applications William Andrew

This edited book compiles all category viewpoints in waterborne polyurethanes (WPU) dispersions, composites, characterizing techniques, and allied applications such as coatings, adhesives, sealants, anticorrosive, flame-retardant, and biomedical applications. The book brings together panels of highly accomplished experts in the field of advanced polymers for versatile applications. It encompasses basic studies and addresses topics of novel issues which cover all the aspects in one place. The book is an invaluable guide to newcomers, research scholars, professors, and R&D industrial experts working in the field of polyurethane chemistry. Polyurethanes are excellent materials in coating technology owing to their chemical resistance, toughness, abrasion resistance, and mechanical stability. However, polyurethane dispersion contains volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) which are harmful to the environment. Hence, green chemistry research focuses on discovery of waterborne polyurethanes (WPU) and pay attention. WPU have fascinated growing interest in wide range of industrial and commercial applications.

A Definitive Practical Guide William Andrew

In recent years, bio-based materials technology is developing rapidly. Bio-based materials especially vegetable oil-based materials are considered as the potential alternatives to conventional petroleum-based materials in the future. For example, vegetable oil derived polyols have been widely applied in coatings, plastic films, lubricants, rubbers, elastomers, and many other intermediate products. Although some of the petroleum-based products could be replaced by bio-based materials, many important petroleum-based materials have rarely suitable alternatives for the industrial application. Therefore, from a sustainable point, it is significant to continuously study the alternatives to petroleum-based materials for coating development. In this work, three projects of vegetable oil-based green organic coatings were investigated. In Chapter 3, a self-healing coating contained vegetable oil-based epoxy ester as the healing agent was designed to improve the self-healing function. In Chapter 4, a waterborne polyurethane coating with improved mechanical property and corrosion resistance was synthesized from vegetable oil-based isocyanate. In Chapters 5 to 7, the fundamental structure-property relationships for non-isocyanate polyurethane (NIPU) coatings synthesized through green approaches were studied. In Chapter 3, poly urea formaldehyde (PUF) microcapsules containing vegetable oil-based epoxy ester were successfully synthesized through in-situ polymerization. Self-healing coatings were prepared by embedding PUF epoxy ester microcapsules in the epoxy coatings. The scratched self-healing coating can provide good recovery of the corrosion resistance, compared with the neat epoxy coating. These findings demonstrated that the vegetable oil-based epoxy ester is applicable for anticorrosive smart self-healing coatings as a healing agent. In Chapter 4, the waterborne polyurethane coatings were synthesized from dimer fatty acid diisocyanate (DDI). Previous reports showed they were challenging for the inadequate mechanical property which is due to the high flexibility of a long fatty acid chain on DDI. This problem had been solved in this study by incorporating an alkoxy silane group into vegetable oil-based waterborne polyurethane coatings. This enhancement was mainly caused by the formation of a Si-O-Si network structure from the alkoxy silane group. Additionally, the alkoxy silane modified DDI based polyurethane dispersion showed outstanding corrosion resistance due to the formation of a Si-O-Si network structure. The significantly improved mechanical property and anticorrosion property extended the potential application of DDI based material in waterborne polyurethane coatings. In Chapter 5, green

waterborne two components (2K) NIPU epoxy hybrid coatings were synthesized from renewable cyclic carbonate, fatty acid amine, amine-based internal dispersion agent, and waterborne epoxy chain extender. Then, the thermal and mechanical properties were studied. The synthesized waterborne 2K NIPU showed the excellent balance of the mechanical strength and elongation-at-break which revealed that the rigid NIPU could be tailored by introducing fatty acid amine as a soft segment. Furthermore, in Chapter 7, to develop a more effective method for the preparation of waterborne NIPU coatings, a series of the waterborne one component (1K) NIPU coatings were synthesized from the amine-based internal dispersion agent, fatty acid amine, bisphenol A diglycidyl ether (DGEBA) cyclic carbonate, and multiple epoxy resins including DGEBA, trimethylolpropane triglycidyl ether, and 4,4'-Methylenebis(N,N-diglycidylaniline). Besides, in Chapter 6, the NIPU tetraethyl orthosilicate (TEOS) hybrid coatings were successfully prepared from amine-terminated NIPU, bisphenol A (BPA) epoxy, and TEOS. The anti-corrosion performance of environmentally friendly NIPU coatings was significantly enhanced by the sol-gel chemistry of TEOS. The results revealed that the organic phase NIPU cannot provide enough compatibility for inorganic phase TEOS. Therefore, phase separation occurs at the interface between the aggregation phase and the continuous phase. As a result, incorporating TEOS into NIPU coating can be an effective approach to improve the anti-corrosion performance of NIPU coating. In general, the successfully synthesized vegetable oil-based self-healing coating, waterborne polyurethane coating, waterborne 2K, and 1K NIPU epoxy hybrid coating are the green alternatives to conventional petroleum-based coatings. The green vegetable oil-based coatings with great performance would expand their potential industrial application and promote the replacement of petroleum materials by green materials.

Modern Physical Chemistry: Engineering Models, Materials, and Methods with Applications Woodhead Publishing

The growing interest in replacing petroleum-based products by inexpensive, renewable, natural materials will have a significant impact on sustainability, environment, and the polymer industry. This book provides scientists a useful framework to help take advantage of the latest research conducted in this rapidly advancing field enabling them to develop and commercialize their own products quickly and more successfully.

From Synthesis to Applications Wiley-VCH

The growing interest in replacing petroleum-based products by inexpensive, renewable, natural materials will have a significant impact on sustainability, environment, and the polymer industry. This book provides scientists a useful framework to help take advantage of the latest research

conducted in this rapidly advancing field enabling them to develop and commercialize their own products quickly and more successfully.

Avenues and Sustainability Springer Nature

Expand your knowledge and get fully acquainted with the various aspects of water-borne coatings - from production to properties to special features of their use! With the slow change from solvent-borne resins and coatings to water-borne coatings "Resins for waterborne coatings" is a must-read for any formulator wanting to expand their knowledge. The authors discuss important aspects of the "solvent-to-water-transition" of the past 40 to 50 years, take a deep dive into the key aspects and theories behind the production, properties and applications of these resins as well as providing an overview of how they are currently used in water-borne coatings. Suitable for: Newcomers, career-changers, students and professionals wanting to broaden and deepen their knowledge and seeking crucial background information to assist them with the selection and use of resins in water-borne coatings.

Processing and Characterization Biobased Smart Polyurethane Nanocomposites From Synthesis to Applications

Micro and Nano Fibrillar Composites (MFCs and NFCs) from Polymer Blends is a comprehensive reference for researchers, students and scientists working in the field of plastics recycling and composites. The book aims to determine the influence of micro and nanofibrillar morphology on the properties of immiscible blend systems. Chapters cover micro and nanofibrillar composites based on polyolefin, liquid crystal polymer, biodegradable polymers, polyester and polyamide blends in various industrial application fields. The book brings together panels of highly-accomplished experts in the field of plastics recycling, blends and composites systems. For several decades, plastic technology has played an important role in many industrial applications, such as packaging, automobiles, aerospace and construction. However the increasing use of plastics creates a lot of waste. This has led to restrictions on the use of some plastics for certain applications and a drive towards recycling of plastics. More recently, microfibrillar in-situ composites have been prepared from waste plastics such as PET/PP, PET/PE and Nylon/PP as a way of formulating new high performance polymer systems. This book tackles these issues and more, and is an ideal resource for anyone interested in polymer blends. Provides information on MFC and NFC based polymer blends that have been accumulated over the last 25 years, providing a useful reference Adopts a novel approach in terms of understanding the relationship between processing, morphology, structure, properties and applications in micro and nanofibrillar composites Contains

contributions from leading experts in the field from both industrial and academic research

Chemistry and Technology of Polyols for Polyurethanes, 2nd Edition Walter de Gruyter GmbH & Co KG

The polyurethane industry is among the fastest growing, with polyurethanes used in consumer as well as industrial sectors. Waterborne polyurethanes (WPU) exhibit many advantages over conventional volatile organic compounds (VOCs) based polyurethanes and have emerged as an environmentally friendly alternative. WPU offer an opportunity to use sustainable raw materials to produce environmentally sustainable polymers, particularly, polyols derived from vegetable oils. Eco-Friendly Waterborne Polyurethanes: Synthesis, Properties, and Applications provides state-of-the-art knowledge of the synthesis, application, and property enhancement of WPU. Covers various types of eco-friendly materials and technologies used to synthesize WPU Presents an overview and applications of WPU in several advanced research areas Provides fundamentals of synthetic processes and their chemistries for specific applications Elaborates on advanced approaches used to convert renewable resources into polymers Offers new direction to scientists, researchers, and students to better understand the chemistry, technologies, and applications Written for polymer chemists, materials scientists, and other researchers and industry, this book serves as a comprehensive reference for readers interested in the development and application of sustainable polymers.

Handbook of Waterborne Coatings Elsevier

This book presents an overview of various types of lignin and their unique structures and properties, as well as utilizations of crude or modified technical lignin for high-value bioproducts such as lignin-based PF resins/adhesives, epoxy resins, PF foams, PU foams, rubber reinforcement and carbon fibers and as dispersants in drilling fluids in the oil and gas industry. It subsequently discusses various thermal/chemical modification techniques (pyrolysis, direct liquefaction and depolymerization) for converting lignin into oils and chemical feedstocks, and the utilization of crude lignin, lignin-derived oils or depolymerized lignins (DLs) of reduced molecular weights and improved reactivity to produce lignin-based PF resins/adhesives, PF/PU foams and epoxy resins. The book will interest and benefit a broad readership (graduate students, academic researchers, industrial researchers and practitioners) in various fields of science and technology (chemical engineering, biotechnology, chemistry, material science, forestry, etc.). Chunbao (Charles) Xu, PhD, is currently a Professor of Chemical Engineering and NSERC/FPIInnovations Industrial Research Chair in Forest Biorefinery at the University of Western Ontario, Canada. Fatemeh Ferdosian, PhD, is currently a postdoctoral fellow at the University of Waterloo, Canada.

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