

Lssignin

Chunbao Xu, Fatemeh Ferdosian

Lignin Matheus Poletto,2018-03-21 Lignin - Trends and Applications consists of 11 chapters related to the lignin structure, modification, depolymerization, degradation process, computational modeling, and applications. This is a useful book for readers from diverse areas, such as physics, chemistry, biology, materials science, and engineering. It is expected that this book may expand the reader's knowledge about this complex natural polymer.

Lignin Wolfgang G. Glasser,Simo Sarkanen,1989 This volume brings together the current research on all aspects of lignins, the second most abundant group of biopolymers. It covers recent progress in elucidating some of the more intractable aspects of lignin preparation. Among the topics covered in its 41 chapters are: various methods for studying the structure of lignins; discussions of polymer products derived from the modification of lignin; water-soluble polymers; organosolv pulping, wood adhesives, and enzymatic lignin modification; and various products from lignins, including polyols, polyurethanes, polyblends, grafts, epoxies, and acrylics

Lignin-based Materials Kuruvilla Joseph,Runcy Wilson,Gejo George,Saritha Appukuttan,2023-06-14 Providing a neat overview of the current research for the biomaterials science community, this book is a one-stop resource for researchers and practitioners working on lignin-based biomaterials..

Lignin Chemistry and Applications Jin Huang,Shiyu Fu,Lin Gan,2019-02-07 Lignin Chemistry and Application systematically discusses the structure, physical and chemical modification of lignin, along with its application in the field of chemicals and materials. It presents the history of lignin chemistry and lignin-modified materials, describes recent progresses, applications and studies, and prospects the development direction of high value applications of lignin in the field of material science. In addition to covering the basic theories and technologies relating to the

research and application of lignin in polymer chemistry and materials science, the book also summarizes the latest applications in rubber, engineering plastics, adhesives, films and hydrogels. Systematically discusses the structure, physical and chemical modification of lignin and its application in materials. Presents the latest research results in the field of lignin. Indicates the development direction of high value applications of lignin in a range of fields, including petrochemicals, household applications, medicine, agriculture, and more.

The Chemistry of Lignin Friedrich Emil Brauns, Dorothy Alexandra Brauns, 2013-09-24 The Chemistry of Lignin provides a critical review of the literature published from 1949 to 1958. This book provides information pertinent to the fundamental aspects of lignin chemistry. Organized into 27 chapters, this book begins with an overview of the derivatives that are prepared for the characterization of the mother substance. This text then examines the various kinds of lignin and biosynthetic lignin-like products, which have been characterized by their behavior toward oxidation with nitrobenzene and alkali. Other chapters consider the morphological distribution of lignin in the wood fiber and the place of origin of lignin precursors and of the lignification process. This book discusses as well the formation or biosynthesis of lignin in plants and reviews the structure, isolation, and biosynthesis of lignin. The final chapter deals with producing lignin by the action of enzymes. This book is a valuable resource for lignin chemists, scientists, research workers, and botanists.

Lignin and Lignans Cyril Heitner, Don Dimmel, John Schmidt, 2016-04-19 Over the past four decades, there has been immense progress in every area of lignin science, ranging from the enzymology of lignin biodegradation, to the delignification of wood fiber during pulping and bleaching, to advances in spectroscopy. Lignin and Lignans: Advances in Chemistry captures the developments that have been achieved by world-class scientists in the most critical aspects of this burgeoning field. Tools for the

characterization of lignin and lignans After an overview of the topic, the book discusses the significance and comparative performances of the most commonly used chemical degradation methods and presents lignin structural information based on the use of these methods. Next, the book explores spectroscopic methods, including UV-visible absorption, fluorescence, Raman, infra red (IR), near-infrared (NIR), nuclear magnetic resonance (NMR), and heteronuclear NMR spectroscopy. It then compares the results of studies of lignin in situ with studies of isolated lignins. Predicting reactivity The authors discuss polymer properties related to thermal stability and molecular motion of lignin in the solid state. They describe applications of electronic structure calculations to the chemistry of lignin, and they explore lignin reactions that occur during the chemical pulping of wood by soda, kraft, AQ, and polysulfide processes. Chemistry associated with industrial processes The book describes chemical pulp bleaching, oxidative and reductive lignin-retaining bleaching, and lignin biodegradation. It also examines the application of microorganisms and the enzymes they produce in the manufacturing of chemical and mechanical pulp. The book closes with chapters on photodegradation and chromophore formation and the pharmacological properties of lignans. Highlighting significant developments on selected topics, this essential reference for those in industry and academia is designed to fuel further research and discovery in this specialized area, especially in the emerging field of biorefining.

Chemical Modification, Properties, and Usage of Lignin

Thomas Q. Hu, 2012-12-06 One of the most significant challenges facing mankind in the twenty-first century is the development of a sustainable global economy. Within the scientific community, this calls for the development of processes and technologies that will allow the sustainable production of materials from renewable natural resources. Plant material, in particular lignin, is one such resource. During the annual production of about 100 million metric

tons of chemical wood pulps worldwide, approximately 45 and 2 million metric tons/year of kraft lignin and lignosulfonates, respectively, are also generated. Although lignosulfonates have found many applications outside the pulp and paper industry, the majority of kraft lignin is being used internally as a low-grade fuel for the kraft pulping operation. A surplus of kraft lignin will become available as kraft mills increase their pulp production without expanding the capacity of their recovery boilers that utilize lignin as a fuel. There is a tremendous opportunity and an enormous economic incentive to find better uses of kraft lignin, lignosulfonates and other industrial lignins. The pulp and paper industry not only produces an enormous amount of lignins as by products of chemical wood pulps, but it also utilizes about 10 million metric tons of lignin per year as a component of mechanical wood pulps and papers. Mechanical wood pulps, produced in a yield of 90-98% with the retention of lignin, are mainly used to make low-quality, non-permanent papers such as newsprint and telephone directories because of the light-induced photooxidation of lignin and the yellowing of the papers.

Depolymerization of Lignin to Produce Value Added Chemicals Pratima Bajpai, 2023-09-26 Enables readers to convert lignin using a variety of depolymerization methods and develop it into industrially relevant and functional compounds. *Depolymerization of Lignin to Produce Value Added Chemicals* summarizes the depolymerization and utilization of lignin from different sources and covers the emerging field of biological depolymerization, enabling the reader to identify the high added value of a biomass residue and support him/her in its possible use for mass and niche high impact application sectors. Lignin has great potential to significantly improve the economics of a biorefinery due to its conversion into value-added products. To illustrate, this book includes information on: Feasibility of large-scale implementation of covered technologies, including thermal, biological, and chemical depolymerization, especially in relation to potential

industrial applications Lignin-first biorefining approach, and potential applications of lignin-derived monomers and their derivatives as bioactives in food, natural health products, and pharmaceuticals Business and market scenarios and challenges that intersect with lignin, along with perspectives on lignin valorization Benefits and drawbacks of a lignin-first approach to biorefining, and techno-economic considerations of lignin and its applications Depolymerization of Lignin to Produce Value Added Chemicals is an essential resource for researchers, chemists, engineers, analysts, and consultants within universities, independent research organizations, and government.

Lignin Swati Sharma,Ashok Kumar,2020-04-13 This book presents a comprehensive overview on origin, structure, properties, modification strategies and applications of the biopolymer lignin. It is organized into four themed parts. The first part focuses on the analysis and characterization of the second most abundant biopolymer. The following part is devoted to the biological aspects of lignin such as biosynthesis and degradation. In the third part, chemical modification strategies and the preparation of composites as well as nano- and microparticles are discussed.The final part addresses the industrial application of lignin and its derivatives, as well as lignin materials. The usage for synthesis of biofuels, fine chemicals and in agriculture and food industry is covered. This book is a comprehensive source for researchers, scientists and engineers working in the field of biopolymers as well as renewable materials and sources.

Lignin-based Materials for Biomedical Applications Patrícia Figueiredo,Hélder A. Santos,2021-07-26 Lignin-based Materials for Biomedical Applications: Preparation, Characterization, and Implementation explores the emerging area of lignin-based materials as a platform for advanced biomedical applications, guiding the reader from source through to implementation. The first part of the book introduces the basics of lignin, including extraction methods, chemical modifications, structure and

composition, and properties that make lignin suitable for biomedical applications. In addition, structural characterization techniques are described in detail. The next chapters focus on the preparation of lignin-based materials for biomedical applications, presenting methodologies for lignin-based nanoparticles, hydrogels, aerogels, and nanofibers, and providing in-depth coverage of lignin-based materials with specific properties—including antioxidant properties, UV absorbing capability, antimicrobial properties, and colloidal particles with tailored properties—and applications, such as drug and gene delivery, and tissue engineering. Finally, future perspectives and possible new applications are considered. This is an essential reference for all those with an interest in lignin-based materials and their biomedical applications, including researchers and advanced students across bio-based polymers, polymer science, polymer chemistry, biomaterials, nanotechnology, materials science and engineering, drug delivery, and biomedical engineering, as well as industrial R&D and scientists involved with bio-based polymers, specifically for biomedical applications. Unlocks the potential of lignin-based materials with advanced properties for cutting-edge applications in areas such as drug delivery, gene delivery and tissue engineering Presents state-of-the-art methodologies used in the development of lignin-based nanoparticles, hydrogels, aerogels and nanofibers Explains the fundamentals of lignin, including structure and composition, extraction and isolation methods, types and properties, chemical modifications, and characterization techniques

Functional Materials from Lignin Xian Jun Loh, Dan

Kai, 2018-06-12 Lignin is one of the most abundant plant-derived feedstock on earth and qualifies as a renewable material.

However, lignin is widely recognized as waste byproduct of the cellulosic ethanol and pulp and paper industry. How to properly modify lignin and develop it into functional polymers is a huge challenge, but an attractive research topic in both industry and

academia. This book brings together leading engineering approaches to address the challenges of lignin valorization. It presents the chemistry and properties of different types of lignin, and explores the cutting-edge approaches of lignin modifications. Unlike any existing texts, this book not only summarizes the traditional ways of using lignin, but also presents various potential applications of lignin materials together with advanced processing techniques. The basis of lignin (its chemistry, types and properties) is described, as are different approaches to modify it. The features of lignin and its copolymers are explored and aligned with their potential applications. In addition to the carbon materials from lignin, the advanced fabrication approaches to engineer lignin-based micro/nano-structural materials are summarized.

Lignin and Lignans as Renewable Raw Materials Francisco G. Calvo-Flores, José A. Dobado, Joaquín Isac-García, Francisco J. Martín-Martínez, 2015-08-11 As naturally occurring and abundant sources of non-fossil carbon, lignin and lignans offer exciting possibilities as a source of commercially valuable products, moving away from petrochemical-based feedstocks in favour of renewable raw materials. Lignin can be used directly in fields such as agriculture, livestock, soil rehabilitation, bioremediation and the polymer industry, or it can be chemically modified for the fabrication of specialty and high-value chemicals such as resins, adhesives, fuels and greases. *Lignin and Lignans as Renewable Raw Materials* presents a multidisciplinary overview of the state-of-the-art and future prospects of lignin and lignans. The book discusses the origin, structure, function and applications of both types of compounds, describing the main resources and values of these products as carbon raw materials. Topics covered include: • Structure and physicochemical properties • Lignin detection methods • Biosynthesis of lignin • Isolation methods • Characterization and modification of lignins • Applications of modified and unmodified lignins • Lignans: structure, chemical and

biological properties • Future perspectives This book is a comprehensive resource for researchers, scientists and engineers in academia and industry working on new possibilities for the application of renewable raw materials. For more information on the Wiley Series in Renewable Resources, visit www.wiley.com/go/rrs

Constitution and Biosynthesis of Lignin Karl Freudenberg, Arthur Charles Neish, 1968

Lignin Valorization Gregg T. Beckham, 2018-03-29 A comprehensive, interdisciplinary picture of how lignocellulosic biorefineries could potentially employ lignin valorization technologies.

Lignin Robert A. Northey, Wolfgang G. Glasser (ed.), Tor P. Schultz, 2000 Lignin forms the woody cell walls of plants and the cement material between the plant walls, and after cellulose, it is the second most abundant biopolymer in the world. This book examines the biochemistry of lignin formation, lignin modification and utilization as a polymer, lignin in pulping and bleaching, chemical and physical properties of lignin, and lignin biodegradation.

What to Know about Lignin María González Alriols, 2021-04-15 This book presents recent developments about lignin documented with world renown researchers. The book is divided into 3 parts: a. Lignin Extraction/Characterization b. Lignin Modification c. Lignin Applications Lignin chemistry is still a mysterious area with various lignin types from various plants in the world providing us new opportunities to discover new materials. With the world extensive knowledge on surface chemistry, there are various methods to modify lignin structure. There are also many applications in polymeric resins, polymer composites, fertilizers and enhanced oil recovery. The book covers all the important developments about this highly important material group Lignin.

Conversion of Lignin into Bio-Based Chemicals and

Materials Chunbao Xu, Fatemeh Ferdosian, 2017-06-05 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 de-polymerization) 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/FPINnovations 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.

Lignin Biodegradation: Microbiology, Chemistry, and Potential Applications T. Kent. Kirk, 2019-07-23 Lignin is a generic name for the complex aromatic polymers that are major components of vascular plant tissues. Lignin is abundant; in terms of weight it is probably second only to cellulose among renewable organic materials, and in terms of energy content it might well be the single most abundant. An international seminar on lignin biodegradation was organized and was held May 9 to 11, 1978, at the U.S. Forest Products Laboratory in Madison, Wisconsin. This book records the proceedings of that seminar and is meant to provide a summary of research. Each speaker/author was asked to summarize his research, including his latest unpublished results,

and to describe how his work fits into the overall picture. Following two orientation chapters, one a review of lignin structure and morphological distribution in plant cell walls, and the second a review of the microbial catabolism of relevant aromatics, the book is comprised of chapters in the three subject areas given by the book's title. It does, as intended, provide comprehensive coverage of research to date (August 1978).

Natural Polyphenols from Wood Kun Cheng, Cornel Hagiopol, 2021-03-24 Natural Polyphenols from Wood: Tannin and Lignin – An Industrial Perspective is a detailed guide to the sourcing and processing of tannin and lignin for valuable advanced applications across areas such as fuels, chemicals, drugs, and food. Drawing on the latest academic research and patent literature, this book provides strong practical understanding of the use of these valuable materials in novel industrial applications. This book introduces natural polyphenols from wood and the fundamental aspects of carbon management within the tree. In-depth presentation of extraction and characterization methods is followed by an extensive coverage of practical and industrial applications of wood polyphenols. This is an essential resource for researchers and advanced students working with lignin or tannin, and across biopolymer science, biomass, wood chemistry, paper, wood adhesives, polymer materials, renewable resources, and biotechnology. It also supports industrial R&D and scientists working with wood polyphenols or bio-based polymers. This book re-evaluates wood polyphenols from an industrial perspective, revealing the latest techniques and drawing on patent literature. It addresses fundamental issues of wood polyphenols, such as carbon cycle, wood fractionation, structure, and properties. It offers a comprehensive review of practical applications, including lignin depolymerization, wood reconstruction, fuels, chemicals, drugs, and food.

Lignin Fachuang Lu, Fengxia Yue, 2019 Lignin is the main natural resource of aromatic structures on Earth. With the

depletion of fossil oil and increased environmental concerns, renewable resources for energy and chemical production have attracted tremendous attention from scientists and engineers. As a renewable aromatic polymer, lignin has been, for a long time, studied in terms of its biosynthesis, structures, reactivities and applications although few portions of lignins available from the industry, mainly pulping mills, have been utilized for various applications. The key for complete and efficient utilization of lignins is that all aspects, including lignin biosynthesis, structures, functionalities, and properties, about lignins should be understood. Another important attribute related to lignin utilization comes from analytical methods essential for our understanding of lignins and mechanisms involved in various processes. This book provides critical reviews and the latest research results relating to selected fields of lignin biosynthesis, functional characterization and applications.

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