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Introduction to Marine Biomaterials

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1.1 Introduction

The ocean not only consists of water but is also an abundant source of diverse biomaterials for mankind. Marine biomaterials are a new emerging area of research with significant applications. Recently, researchers have paid a considerable attention to marine-derived biomaterials for various applications. Due to vast diversity and biocompatibility marine-derived bioceramics, polysaccharides, enzymes, peptides, lipids,

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Hemicellulose Biorefinery: A Sustainable Solution for Value Addition to Bio-Based Products and Bioenergy Michel Brienzo, 2022-01-03 This edited book provides knowledge about hemicelluloses biorefinery approaching production life cycle circular economy and valorization by obtaining value added bioproducts and bioenergy A special focus is dedicated to chemical and biochemical compounds produced from the hemicelluloses derivatives platform Hemicelluloses are polysaccharides located into plant cell wall with diverse chemical structures and properties It is the second most spread organic polymer on nature and found in vast lignocellulosic materials from agro and industrial wastes therefore hemicelluloses are considered as abundant and renewable raw material feedstock Biorefinery concept contributes to hemicelluloses production associated with biomass industrial processes Hemicelluloses are alternative sources of sugars for renewable fuels and as platform for chemicals production This book reviews chemical processes for sugar production and degradation obtaining of intermediate and final products and challenges for pentose fermentation Aspects of hemicelluloses chain chemical and enzymatic modifications are presented with focus on physicochemical properties improvement for bioplastic and biomaterial approaches Hemicelluloses are presented as sources for advanced materials in biomedical and pharmaceutical uses and as hydrogel for chemical and medicine deliveries An interdisciplinary approach is needed to cover all the processes involving hemicelluloses its conversion into final and intermediate value added compounds and bioenergy production Covering this context this book is of interest to teachers students researchers and scientists dedicated to biomass valorization This book is a knowledge source of basic aspects to advanced processing and application for graduate students particularly Besides the book serves as additional reading material for undergraduate students from different courses with a deep interest in biomass and waste conversion valorization and chemical products from hemicelluloses

Encyclopedia of Food and Health, 2015-08-26 Approx 3876 pages Approx 3876 pages

Marine Biomaterials Se-Kwon Kim, 2017-03-29 Oceans are an abundant source of diverse biomaterials with potential for an array of uses **Marine Biomaterials Characterization Isolation and Applications** brings together the wide range of research in this important area including the latest developments and applications from preliminary research to clinical trials The book is divided into four parts with chapters written by experts from around the world Biomaterials described come from a variety of marine sources such as fish algae microorganisms crustaceans and mollusks Part I covers the isolation and characterization of marine biomaterials bioceramics biopolymers fatty acids toxins and pigments nanoparticles and adhesive materials It also describes problems that may be encountered in the process as well as possible solutions Part II looks at biological activities of marine biomaterials including polysaccharides biotoxins and peptides Chapters examine health benefits of the biomaterials such as antiviral activity antidiabetic properties anticoagulant and anti allergic effects and more Part III discusses biomedical applications of marine biomaterials including nanocomposites and describes applications of various materials in tissue

engineering and drug delivery Part IV explores commercialization of marine derived biomaterials marine polysaccharides and marine enzymes and examines industry perspectives and applications This book covers the key aspects of available marine biomaterials for biological and biomedical applications and presents techniques that can be used for future isolation of novel materials from marine sources

Functional Marine Biomaterials Se-Kwon Kim,2015-06-29 Functional Marine Biomaterials Properties and Applications provides readers with the latest information on the diverse marine environment as a resource for many new substances including biopolymers bioceramics and biominerals As recent advances and funding has enabled scientists to begin harnessing many of these materials for biomedical applications from drug delivery to bone tissue engineering and biosensors this important new text provides readers with a comprehensive review of these materials and their functional applications in the biomedical field Chapters discuss the properties of the main classes of functional marine biomaterials applications of marine products in tissue engineering applications in drug delivery systems and the role of marine derived materials in medical devices Provides readers with the latest information on the diverse marine environment as a resource for many new substances including biopolymers bioceramics and biominerals Presents a comprehensive review of these materials and their functional applications in the biomedical field Discusses the properties of the main classes of functional marine biomaterials applications of marine products in tissue engineering applications in drug delivery systems and the role of marine derived materials in medical devices

Marine-Derived Biomaterials for Tissue Engineering Applications Andy H. Choi,Besim Ben-Nissan,2019-07-08 This book presents the latest advances in marine structures and related biomaterials for applications in both soft and hard tissue engineering as well as controlled drug delivery It explores marine structures consisting of materials with a wide variety of characteristics that warrant their use as biomaterials It also underlines the importance of exploiting natural marine resources for the sustainable development of novel biomaterials and discusses the resulting environmental and economic benefits The book is divided into three major sections the first covers the clinical application of marine biomaterials for drug delivery in tissue engineering while the other two examine the clinical significance of marine structures in soft and hard tissue engineering respectively Focusing on clinically oriented applications it is a valuable resource for dentists oral and maxillofacial surgeons orthopedic surgeons and students and researchers in the field of tissue engineering

Marine Biotechnology in the Twenty-First Century National Research Council,Division on Earth and Life Studies,Board on Life Sciences,Ocean Studies Board,Committee on Marine Biotechnology: Biomedical Applications of Marine Natural Products,2002-06-29 Dramatic developments in understanding the fundamental underpinnings of life have provided exciting opportunities to make marine bioproducts an important part of the U S economy Several marine based pharmaceuticals are under active commercial development ecosystem health is high on the public s list of concerns and aquaculture is providing an ever greater proportion of the seafood on our tables Nevertheless marine biotechnology has not yet caught the public s or investor s attention Two workshops held in October 1999 and November

2001 at the National Academies were successful in highlighting new developments and opportunities in environmental and biomedical applications of marine biotechnology and also in identifying factors that are impeding commercial exploitation of these products This report includes a synthesis of the 2001 sessions addressing drug discovery and development applications of genomics and proteomics to marine biotechnology biomaterials and bioengineering and public policy and essays contributed by the workshop speakers Springer Handbook of Marine Biotechnology Se-Kwon Kim,2015-01-21 This Springer Handbook provides for the first time a complete and consistent overview over the methods applications and products in the field of marine biotechnology A large portion of the surface of the earth ca 70% is covered by the oceans More than 80% of the living organisms on the earth are found in aquatic ecosystems The aquatic systems thus constitute a rich reservoir for various chemical materials and bio chemical processes Edited by a renowned expert with a longstanding experience and including over 60 contributions from leading international scientists the Springer Handbook of Marine Biotechnology is a major authoritative desk reference for everyone interested or working in the field of marine biotechnology and bioprocessing from undergraduate and graduate students over scientists and teachers to professionals Marine biotechnology is concerned with the study of biochemical materials and processes from marine sources that play a vital role in the isolation of novel drugs and to bring them to industrial and pharmaceutical development Today a multitude of bioprocess techniques is employed to isolate and produce marine natural compounds novel biomaterials or proteins and enzymes from marine organisms and to bring them to applications as pharmaceuticals cosmeceuticals or nutraceuticals or for the production of bioenergy from marine sources All these topics are addressed by the Springer Handbook of Marine Biotechnology The book is divided into ten parts Each part is consistently organized so that the handbook provides a sound introduction to marine biotechnology from historical backgrounds and the fundamentals over the description of the methods and technology to their applications but it can also be used as a reference work Key topics include Marine flora and fauna Tools and methods in marine biotechnology Marine genomics Marine microbiology Bioenergy and biofuels Marine bioproducts in industrial applications Marine bioproducts in medical and pharmaceutical applications and many more

Biomaterials Science William R Wagner,Shelly E. Sakiyama-Elbert,Guigen Zhang,Michael J. Yaszemski,2020-05-23 The revised edition of the renowned and bestselling title is the most comprehensive single text on all aspects of biomaterials science from principles to applications Biomaterials Science fourth edition provides a balanced insightful approach to both the learning of the science and technology of biomaterials and acts as the key reference for practitioners who are involved in the applications of materials in medicine This new edition incorporates key updates to reflect the latest relevant research in the field particularly in the applications section which includes the latest in topics such as nanotechnology robotic implantation and biomaterials utilized in cancer research detection and therapy Other additions include regenerative engineering 3D printing personalized medicine and organs on a chip Translation from the lab to commercial products is

emphasized with new content dedicated to medical device development global issues related to translation and issues of quality assurance and reimbursement In response to customer feedback the new edition also features consolidation of redundant material to ensure clarity and focus Biomaterials Science 4th edition is an important update to the best selling text vital to the biomaterials community The most comprehensive coverage of principles and applications of all classes of biomaterials Edited and contributed by the best known figures in the biomaterials field today fully endorsed and supported by the Society for Biomaterials Fully revised and updated to address issues of translation nanotechnology additive manufacturing organs on chip precision medicine and much more Online chapter exercises available for most chapters

Biomaterials Joon Park,R. S. Lakes,2010-10-29 With sixty years of combined experience the authors of this extensively revised book have learned to emphasize the fundamental materials science structure property relationships and biological responses as a foundation for a wide array of biomaterials applications This edition includes a new chapter on tissue engineering and regenerative medicine approximately 1900 references to additional reading extensive tutorial materials on new developments in spinal implants and fixation techniques and theory It also offers systematic coverage of orthopedic implants and expanded treatment of ceramic materials and implants *Biomaterials* Joon Park,R. S. Lakes,2007-09-07 With sixty years of combined experience the authors of this extensively revised book have learned to emphasize the fundamental materials science structure property relationships and biological responses as a foundation for a wide array of biomaterials applications This edition includes a new chapter on tissue engineering and regenerative medicine approximately 1900 references to additional reading extensive tutorial materials on new developments in spinal implants and fixation techniques and theory It also offers systematic coverage of orthopedic implants and expanded treatment of ceramic materials and implants **Essentials of Marine Biotechnology** Se-Kwon Kim,2020-09-11 This textbook introduces marine biotechnology by collecting the key knowledge on genetics fish breeding genetic diversity seaweed production and microalgae biotechnology and explores marine biomaterials and how they can benefit human health Covering the latest applications of marine biotechnology in natural product development genomics transgenic technology cosmeceuticals nutraceuticals and pharmaceutical development it particularly focuses on future biological resources developing functional materials from marine life production of marine bioenergy and marine microbial resources and biotechnology The author explains the structure of the book in an introductory note and each chapter offers a detailed overview and conclusion to help readers better grasp the acquired knowledge Lastly the final part provides a comprehensive glossary with brief explanations of the key concepts in marine biotechnology Written by a leading expert in the field with more than 30 years of teaching experience this book broadens students understanding of the basics and recent developments in marine biotechnology *Biological Materials of Marine Origin* Hermann Ehrlich,2010-11-03 This text is the first ever to offer a coherent analysis of the nature origin and evolution of biocomposites and biopolymers found within the broad variety of marine invertebrate organisms and

their unusual structural formations It is an interdisciplinary look at the biomineralization biomimetics and materials science unique to marine invertebrates In this seminal work Hermann Ehrlich for the first time proposes the classification biological materials of marine origin He uses numerous unique examples of marine origin to critically analyze many current relevant concepts from both the biological and materials science perspectives including hierarchical organization of biocomposites and skeletal structures structural bioscaffolds biosculpturing and biomimetism In addition he covers many modern topics never before available in textbook format such as phenomenon of multiphase biomineralization biomineralization demineralization remineralization phenomena and silica collagen and silica chitin biocomposites And he reviews the most relevant advances in the marine biomaterials research field detailing the applications of biomaterials science in modern technology and medicine Complete with tables electron micrographs line drawings and dozens of previously unpublished images of unique marine structures Biological Materials of Marine Origin is aimed at scientists and students concerned with the world of marine biological materials

Marine Biomaterials Filipe Natalio, 2010-10 Until today autogenic bone grafts from various donor regions represent the gold standard in the field of bone reconstruction providing both osteoinductive and osteoconductive characteristics However due to low availability and a disequilibrium between supply and demand the risk of disease transfer and morbidity usually associated with autogenic bone grafts the development of biomimetic materials with structural and chemical properties similar to those of natural bone as not not been fully achieved and remains the core of many world wide research Biosilica is marine derived natural occurring biopolymer formed enzymatically under physiological relevant conditions temperature and pH via silicatein silica protein an enzyme isolated from siliceous marine sponges A novel functional implant bifunctional 2 component implant that aim to exploit the advantages of biosilica biopolymer was developed and tested both in vivo and in vitro This bifunctional 2 component implant highly qualifies this marine derived biomaterial for regenerative medicine applications as a potential silica based bone replacement substitution material inspired in biomineralization processes

Biomaterials in Clinical Practice Fatima Zivic, Saverio Affatato, Miroslav Trajanovic, Matthias Schnabelrauch, Nenad Grujovic, Kwang Leong Choy, 2018-09-01 This book covers the properties of biomaterials that have found wide clinical applications while also reviewing the state of the art in the development towards future medical applications starting with a brief introduction to the history of biomaterials used in hip arthroplasty The book then reviews general types of biomaterials polymers ceramics and metals as well as different material structures such as porous materials and coatings and their applications before exploring various current research trends such as biodegradable and porous metals shape memory alloys bioactive biomaterials and coatings and nanometals used in the diagnosis and therapy of cancer In turn the book discusses a range of methods and approaches used in connection with biomaterial properties and characterization chemical properties biocompatibility in vivo behaviour characterisation as well as genotoxicity and mutagenicity and reviews various diagnostic techniques histopathological analysis imaging techniques and

methods for physicochemical and spectroscopic characterization Properties of stent deployment procedures in cardiovascular surgeries from aspects of prediction development and deployment of stent geometries are presented on the basis of novel modelling approaches The last part of the book presents the clinical applications of biomaterials together with case studies in dentistry knee and hip prosthesis Reflecting the efforts of a multidisciplinary team of authors gathering chemical engineers medical doctors physicists and engineers it presents a rich blend of perspectives on the application of biomaterials in clinical practice The book will provide clinicians with an essential review of currently available solutions in specific medical areas also incorporating non medical solutions and standpoints thus offering them a broader selection of materials and implantable solutions This work is the result of joint efforts of various academic and research institutions participating in WIMB Tempus project 543898 TEMPUS 1 2013 1 ES TEMPUS JPHES Development of Sustainable Interrelations between Education Research and Innovation at WBC Universities in Nanotechnologies and Advanced Materials where Innovation Means Business co funded by the Tempus Programme of the European Union

Marine Biomaterials Sougata Jana, Subrata Jana, 2022-04-24 This book provides updated information on marine based biomedical carriers and their therapeutic potential Marine biomaterials and bio based carriers show wide application in pharmaceutical and biomedical fields to deliver small and large molecules Biomaterial based composites scaffolds or matrix systems are sound systems for controlled and prolonged drug release in target sites and control the premature release of drugs or bioactive compounds This book discusses essential topics such as the therapeutic potential of marine collagen management of bone disorders gene delivery natural marine compounds in immunomodulation theranostic applications tissue engineering and regeneration It also describes the use of marine biopolymers in cancer therapy Different chapters describe the tissue engineering techniques to develop these carriers Marine biomaterial based systems are popular for tissue engineering and biomedical imaging This book is ideal for industry experts students and researchers in pharmaceutical sciences and pharmacology

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