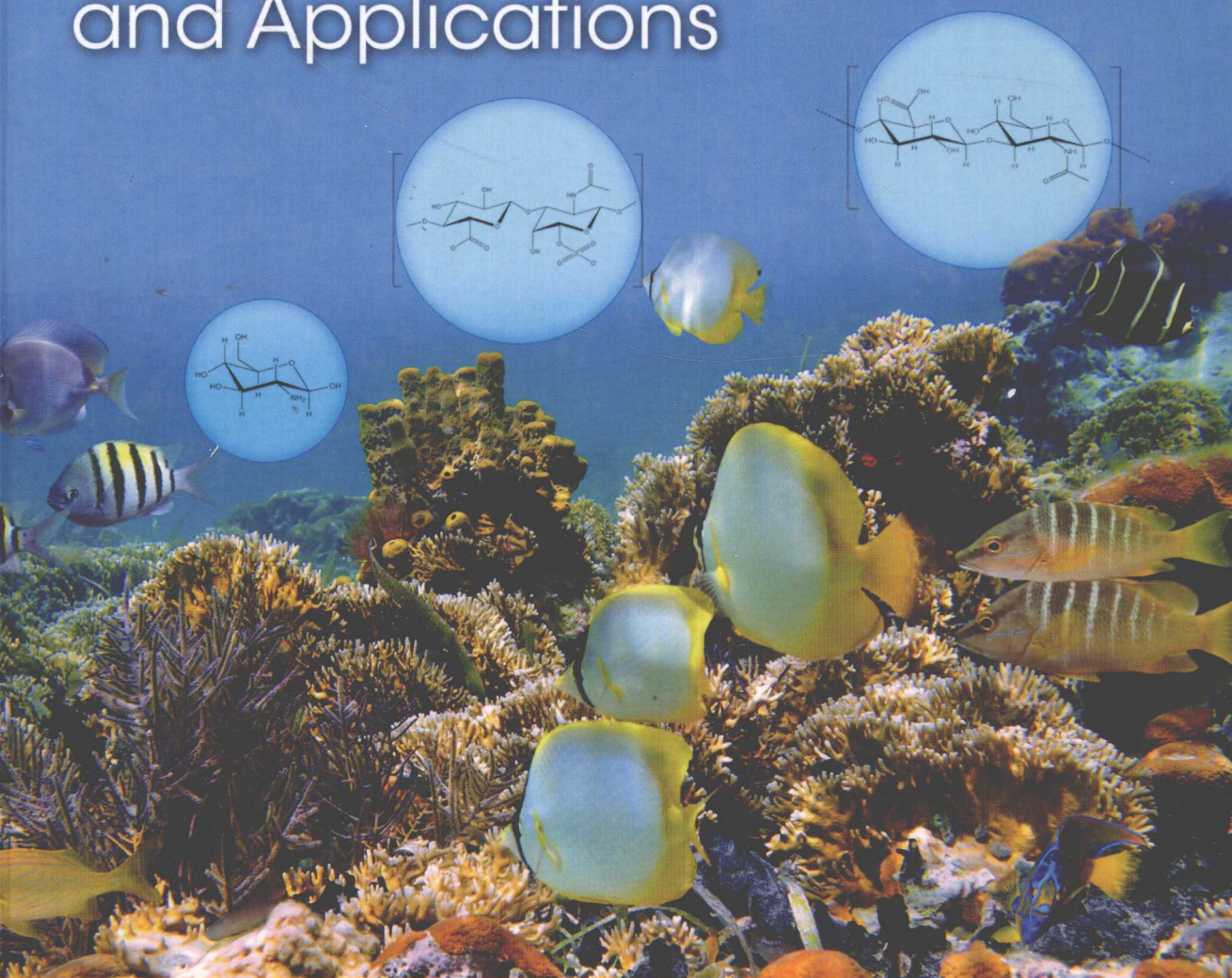


Marine Biomaterials

Characterization, Isolation
and Applications



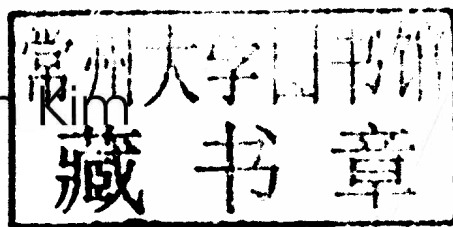
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Marine Biomaterials

Preface

Oceans not only consist of water but are also an abundant source of diverse biomaterials to mankind. Although marine biomaterial is an emerging area of research with significant applications, its usage is limited due to lack of research. To date, countable specific books are available for marine biomaterials as per my scientific knowledge. To bridge this gap and to provide a more comprehensive coverage of marine biomaterials, I decided to compile this literary work. This book presents the development of marine biomaterials and discusses various topics such as isolation and their characterization as well as applications from the preliminary research to clinical trials.

The focus of this book, *Marine Biomaterials: Characterization, Isolation and Applications*, is to provide an up-to-date coverage of marine biomaterials. The book has been divided into four major parts:

- **Part I: Isolation and Characterization of Marine Biomaterials**
Marine biomaterials have a wide range of bioactivity, which can be utilized only once the isolation and characterization are accomplished in an appropriate manner. Part I covers the isolation and characterization of marine biomaterials (bioceramics, biopolymers, fatty acids, toxins and pigments, nanoparticles, and adhesive materials) and problems associated with them together with probable solutions for the same.
- **Part II: Biological Activities of Marine Biomaterials**
Proper characterization ensures further use of the isolated/purified marine biomaterial in different applications. Part II deals mainly with biological applications of marine-derived biomaterials, for example, health benefits, potential biological activities of peptides, and biotoxins. In addition, antiviral activity, antidiabetic properties, and anticoagulant and anti-allergic effects of marine biomaterials have also been explored.
- **Part III: Biomedical Application of Marine Biomaterials**
In recent days, significant development has been achieved with marine-derived bionanomaterials and nanocomposites in the area of biomedical applications (tissue engineering and drug delivery), and this is explored in Part III. Subsequently, several subsections deal with marine-derived chitosan and collagen usage in tissue engineering and scaffolding systems. The applicability of marine biomaterials in the drug delivery arena has also been discussed in light of the current available literature.
- **Part IV: Industrial Application of Marine-Derived Biomaterials**
Last but not the least, the characterized material must reach the market, but for that it needs to be scaled up to the pilot plant level, which can be done only through industrialization. Part IV provides information about this important step of commercialization of marine biomaterials. This part includes the industrial application of marine polysaccharides and marine enzymes.

Various experts from around the globe (Europe, India, Asia-Pacific, Australia, Japan, Korea, and Vietnam) have contributed their knowledge and experience in the form of chapters

in this book. I strongly believe that this book would provide sufficient knowledge about marine-derived biomaterials as it covers the key aspects of the majority of available marine biomaterials for biological and biomedical applications as well as presents techniques for future isolation of novel materials from the oceanic environment. The book covers a vast range of information available on isolation, characterization, as well as biological, biomedical, and industrial application of marine biomaterials, *all at one place*. It is essential reading for the novice and expert in the field of marine biomaterials, marine biotechnology, chemical sciences, natural products, materials science, pharmaceutical, nutraceuticals, and biomedical engineering sciences.

Prof. Se-Kwon Kim
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I would like to thank CRC Press, Taylor & Francis Group, for their encouragement and suggestions to get this wonderful compilation published. I would also like to extend my sincere gratitude to all the contributors for providing help, support, and advice to accomplish this task. Further, I would like to thank Dr. Jayachandran Venkatesan, who worked with me throughout the course of this book project. I strongly recommend this book for marine biomaterials researchers/students and hope that it helps to enhance their understanding in this field.

Editor

Professor Se-Kwon Kim, PhD, currently serves as a senior professor in the Department of Chemistry and the director of the Marine Bioprocess Research Center (MBPRC) at Pukyong National University in the Republic of Korea. He received his BSc, MSc, and PhD from the Pukyong National University and joined as a faculty member. He has previously served as a scientist in the University of Illinois, Urbana Champaign, Illinois (1988–1989), and was a visiting scientist at the Memorial University of Newfoundland in Canada (1999–2000).

Professor Se-Kwon Kim was president of the Korean Society of Chitin and Chitosan (1986–1990) and the Korean Society of Marine Biotechnology (2006–2007). He was also the chairman for the *7th Asia-Pacific Chitin and Chitosan Symposium*, which was held in South Korea in 2006. He is one of the board members of the International Society of Marine Biotechnology and the International Society for Nutraceuticals and Functional Foods. Moreover, he was the editor in chief of the *Korean Journal of Life Sciences* (1995–1997), the *Korean Journal of Fisheries Science and Technology* (2006–2007), and the *Korean Journal of Marine Bioscience and Biotechnology* (2006–present). His research has been credited with the best paper award from the American Oil Chemist's Society (AOCS) and the Korean Society of Fisheries Science and Technology in 2002.

Professor Se-Kwon Kim's major research interests are investigation and development of bioactive substances derived from marine organisms and their application in oriental medicine, nutraceuticals, and cosmeceuticals via marine bioprocessing and mass-production technologies. He has also conducted research on the development of bioactive materials from marine organisms for applications in oriental medicine, cosmeceuticals, and nutraceuticals. To date, he has authored over 500 research papers and holds 110 patents. In addition, he has written or edited more than 40 books.

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