

HANDBOOK OF NATURAL POLYMERS

VOLUME 2: FUNCTIONALIZATION, SURFACE
MODIFICATION, AND PROPERTIES

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Handbook of Natural Polymers, Volume 2

Functionalization, Surface Modification, and Properties

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Dr. Sreekala M.S. is recognized for her research in the field of polymer macro-, micro-, and nanocomposites and polymer foams and their blends. After receiving her PhD in Chemistry (Mahatma Gandhi University, Kottayam), she held research positions in Japan and Germany before joining the Sree Sankara College. Currently, she is an Associate Professor of Chemistry at the School of Chemical Sciences, Director of the School of Polymer Science and Technology (SPST), and Joint Director of the School of Nanoscience and Technology (SNST) and the International and Inter University Centre for Nanoscience and Nanotechnology (IIUCNN), Mahatma Gandhi University, Kottayam. The research in Sreekala's laboratory is focused on the development and property improvements of polymer composites for high-end automotive, aerospace, and structural applications; the development of fully biodegradable, green, and sustainable polymer composites from natural fibers, biopolymers, etc., for industrial application; electronic applications of polymer nanocomposites, such as nanogenerators, electromagnetic shielding (EMI) etc.; biomedical applications of polymer composites for effective wound healing; and the development of biofiller-entrapped polymer nanocomposites for water remediation. She was ranked among the top 2% of scientists in the world (Rising Stars list), according to a subject-by-subject study undertaken by a team from Stanford University and Scopus experts for the years 2019, 2020, and 2021. She has an h-index of 37 and a total number of citations of 8555. She is a Member of the Royal Society of Chemistry and the Indian Rubber Institute and was the recipient of the JSPS and AvH Fellowship, CSIR Senior Research Fellowship, and ICS-UNIDO Fellowship.

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in various fields. The professor's center is equipped with various sophisticated instruments and has established state-of-the-art experimental facilities which cater to the needs of researchers within the country and abroad. His h-index is 143, along with 1,03,158 Google citations, 1,400 publications, and 210 edited books.

Preface

Natural polymers are one of nature's most valuable gifts to humanity. Because of the inherent features of biopolymers that limit their applicability in various industries, alternative ways were identified to increase their qualities without greatly changing their native characteristics. As an innovative technique for functionalizing natural polymers and biocomposites, chemical or physical modifications are widely accepted. This book focuses on research and breakthroughs in natural polymers and the various surface modifications of natural polymers to promote better performance. The quality of the interface is one of the most significant variables that determines the final performance of composite materials. Natural polymers and biocomposites, their functionalization, and numerous features related to physical and chemical alterations are summarized in this book.

Biodegradable materials from natural polymer-based materials are becoming more common as a result of the focus on finding alternatives to petroleum and reducing environmental effects. Inherent flaws in natural polymer-based materials, such as limited mechanical performance and moisture resistance, can be overcome using functionalization. Higher modulus and strength, lower gas permeability, and increased water resistance are among the gains. Biologically active substances can be added to provide natural polymers with appropriate functional qualities. As a result, biopolymer-based composite materials with biofunctional qualities have a lot of potential in the active market.

This book is divided into 22 units. The first unit focuses on the significance of modifications of natural polymers. The following units deal with the functionalization of various natural polymers. The next chapters describe the improvements in the properties of natural polymers after functionalization. The last chapter depicts the environmental impact of chemically modified natural biopolymers. This book also covers the various chemical and physical functionalizations of natural polymers and finally, the environmental concerns of natural polymers. We anticipate that this book will benefit the research community and students, and we welcome suggestions and criticism to help us improve it in the future.