Biodegradable and Biobased Polymers for Environmental and Biomedical Applications

Edited by
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Preface

The use of renewable biobased carbon feedstock is seriously taken into consideration these days because it offers the intrinsic value of a reduced carbon footprint and an improved life cycle analysis, within the framework of a sustainable and environmental development. That is why new and future chemicals and materials for daily applications are obtained more and more from the biomass. These biobased products with particular chemical architectures succeed as a good alternative to conventional and fossil-based chemical feedstock. Keeping in mind the deteriorating environmental conditions, researchers all over the world are focusing their efforts on biodegradable and biobased polymers. Plastic waste and its disposal is one of the major environmental problems in industrial development. Researchers have focused on biobased materials that can easily be biodegraded and only few publications in book form are available on biodegradable and biobased polymers for the benefit of the greater public.

This book is a a unique volume with contributions from many renowned experts in this area of research. It begins with an introduction that summarizes the importance of biodegradable and biobased polymers in the market. The volume covers almost all the topics related to biodegradable and biobased polymers for environmental and biomedical applications. It will prove to be a very useful tool for scientists, academicians, research scholars, polymer engineers and industries. The first chapter describes the most recent researches on applications, and new developments in biomedical and pharmaceutical areas of thermoplastic starch. Application of polyhydroxyalkanoates in agriculture, biodegradable packaging material and biomedical field like drug delivery systems, implants, tissue engineering, development of scaffolds are reviewed in Chapter 2. The third chapter covers the synthesis and elaboration of cellulose microfibrils from sisal fibres and the corresponding PLA biocomposites. The authors suggest the use of such materials for high performance engineering applications in various sectors such as the automotive and aerospace industries, or for building and construction. Chapter 4 summarizes the different classes and chemical modifications of tannins. The main chemical pathways to obtain aromatic

materials with specific macromolecular architectures are more particularly presented in this chapter. Electroactivity and applications of Jatropha latex and seed are discussed in chapter 5. Jatropha latex is a high- potential biomaterial for direct generation of power and has high medicinal value. The use of Jatropha latex in various green techniques to develop nanoparticles of metallic compound is also reported here. Chapter 6 deals with synthesis, properties and applications of poly(lactic acid). Chapter 7 focuses on the synthesis, processing and properties of poly(butylene succinate), its copolymers, composites and nanocomposites. The biodegradability and applications of poly(butylene succinate) are also discussed here. Chapter 8 includes the various routes for preparation polymers from vegetable oil. The effects of reinforcement and nano-reinforcement on the physical properties of such biobased polymers are also highlighted in this chapter. The different types of modified drug delivery systems together with the concept of the drug delivery matrix are discussed in Chapter 9. Polysaccharides, modified polysaccharides and cellulose nanocrystals as carriers for drug delivery systems are also reported here. Applications of such drug delivery systems as potential carriers for controlled release of drugs and for antitumor drugs are also discussed. Chapter 10 summarizes the use of nanocellulose as sustainable adsorbents for the removal of water pollutants mainly heavy metal ions, organic molecules, dyes, oil and CO_2. Chapter 11 describes the main extraction techniques, structure, properties and different chemical modifications of lignins. Lignin is an interesting and trendy aromatic building block which can be integrated inside the architecture of different macromolecules by chemical means to obtain new aromatic polymers with high performances. Proteins and nucleic acid-based biopolymers are reported in chapter 12. The role of tamarind seed polysaccharide-based multiple-unit systems in sustained drug release is elaborated in chapter 13.

The editors would like to express their appreciation to all chapter authors of this book who have provided excellent contributions. The editors would like to thank their research teams who helped them in the editorial work. Finally, we gratefully acknowledge permissions to reproduce copyright materials from a number of sources.

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