Book review

BIOMASS AS RENEWABLE RAW MATERIAL TO OBTAIN BIOPRODUCTS OF HIGH-TECH VALUE, edited by Valentin Popa and Irina Wolf, Elsevier B.V., 2018, 474 pp., ISBN: 978-0-444-63774-1.

Compared to other resources available, biomass is one of the most common and widespread resources in the world. Thus, biomass obtained from terrestrial and aquatic sources can be used to produce different biomaterials and biofuels required in a modern society.

Editors Valentin Popa and Irina Wolf have done an excellent job organizing their recently published book for understanding the current state of the art for biomass processing into high-value bioproducts. The coverage of the book is broad, encompassing in varying levels of detail and emphasis biomass resources, processes for obtaining biofuels, compounds with special properties, medical and pharmaceutical applications of polysaccharides and cellulose derivatives, as well as issues of bioeconomy applications. The book is divided into 12 chapters, each subject being carefully researched and well documented by expert authors recognized in their field from around the world.

The introductory chapter, *Biomass for Fuels and Biomaterials*, offers a state-of-the-art review on biomass resources and biorefining routes to obtain bioproducts. Bioenergy, biomaterials and biochemicals are produced in gaseous, liquid or solid forms when biomass is treated, using different physical, chemical or biological processes, individually or in combination. A personal conclusion of the opening chapter is that the biggest barrier in the development of a biomass industry is not the lack of know-how, but rather economic and political aspects.

The second chapter, *Microalgae as Renewable Raw Material for Bioproducts: Identification and Biochemical Composition of Microalgae from a Raceway Pond in the Netherlands*, presents a case study of the identification, characterisation, production and biorefinery of microalgae with examples of bioproducts that can be derived from the chemical components of this source of raw materials. In order to prove the economical viability and achieve sustainable processes, extraction components were converted into coatings, surface active agents and other chemical products.

Chapter 3, *Macroalgae Biomass as Sorbent for Metal Ions*, combines commercial relevance and academic rigour to present a literature review on the potential use of seaweeds as low-cost biosorbents for the removal of heavy metals and toxic metalloids from aqueous solution. Special attention was given to physicochemical characterization, biosorption mechanisms and performance on both raw substrate and chemically modified algae biomass.

Chapter 4, *Integrated Processing of Biomass for Fine Chemicals Obtaining: Polyphenols*, describes complex and integrated processes for fractionation and conversion of biomass. The focus was on polyphenols, a class of chemicals produced in small quantity, but with a high added value. For biorefinery systems, no matter what kind of raw material is used, a thorough chemical characterization of biomass has to be made first and then the process can designed and developed to extract the valuable compounds.

Chapter 5, *Assessing the Sustainability of Biomass Use for the Production of Biofuels*, discusses the development of sustainable strategies and indicators for biofuels and bioenergy applications and provides the methodology to integrate these analyses into the education of future multidisciplinary decision makers.

Chapter 6, *Biodiesel a Green Fuel Obtained Through Enzymatic Catalysis*, focuses on two essential aspects of the biodiesel production strategy, the appropriate feedstock and the most efficient technology. The investigations take into account the production of biodiesel in supercritical and non-catalytic processes, non-enzymatic and enzymatic transesterification.

Chapter 7, *Catalytic Approaches to the Production of Furfural and Levulinates from Lignocelluloses*, reviews the production of building blocks from different carbohydrates and lignocelluloses using various solvent and catalyst systems, then surveys their principal derivatives and discusses the relative merits of each compound in the future.

Chapter 8, *Biomass Derived Polyhydroxyalkanoates*: *Biomedical Applications*, investigates the biosynthesis, recovery, properties and derivatives of polyhydroxyalkanoates, as well as their use in emerging medical applications. A concluding remark is that combining these polymers, through chemical or physical

methods, with already established materials for biomedical applications will further expand their use in the medical field.

Chapter 9, *Biochemical Modification of Cellulosic Biomass*, describes the current knowledge and recent advances regarding the enzymatic hydrolysis of lignocellulosic biomass for its conversion to biofuels and bioproducts. The chapter highlights the challenges and the potential solutions for conversion in an economical and environmentally friendly manner.

Chapter 10, *Chemically Modified Polysaccharides with Applications in Nanomedicine*, gives an overview of chemical modification of some representative polysaccharides with recent application in nanomedicine. The chapter underlines the natural polymers already used in the field of nanomedicine, but also those with a very high potential in this regard.

Chapter 11, *Cellulose-Based Hydrogels for Medical/Pharmaceutical Applications*, evaluates the developments in cellulose-based hydrogels with emphasis on the preparation methods, properties and possible applications. Characteristics, such as the large availability of cellulose in nature, renewability, biocompatibility, biodegradability, low cost and non-toxicity, alongside the possibility to design various formulations of composite hydrogels in different forms (microgels, nanogels, films, membranes, beads *etc*.), meet the demands for many medical and pharmaceutical applications (drug delivery, tissue engineering, wound dressing, water purification *etc*.).

Chapter 12, *Thermoresponsive Supramolecular Hydrogels Comprising Diblock Methylcellulose Derivatives*, describes synthetic strategies for diblock cellulose and cello-oligosaccharide derivatives with regioselective functionalization patterns. From the point of view of the structure-property relationships, fascinating functional materials were produced from cellulose, a fascinating biopolymer and sustainable raw material.

Overall, the aim of the book to provide an integrated framework for sustained production, conversion and utilization of biomass was successfully achieved. This book is an important resource for students, technologists, engineers and researchers in biomass industry and in academic, research, government or private institutions for years to come.

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