Book review

SUSTAINABILITY OF BIOMASS THROUGH BIO-BASED CHEMISTRY, edited by Valentin I. Popa, Series: "Sustainability: Contributions through Science and Technology", Series Editor: Michael C. Cann, First Edition, CRC Press, Taylor & Francis Group, 2021, 320 p.

This book considers the existing issues related to the challenges of declining fossil resources, energy conservation and the current environmental concerns. In this context, topics of interest are tackled, demonstrating growing openness towards bolstering the valorization of biomass waste and improving its sustainability in a safe way, like using non-toxic, environmentally friendly technologies, which minimize the impact on the environment. Forest products and non-food biomass, for example, lignocellulosic feedstock, such as organic wastes, forestry residues, high-yielding woody or grass energy crops, and algae are alternatives for the non-renewable fossil resources and have the potential to provide possible solutions to the problems, if developed and managed in a sustainable manner.

The book presents comprehensive and critical concepts in 10 chapters, which provide the latest aspects related to the renewable resources of polymeric materials, as potential sources for a sustainable improvement of economically and ecologically attractive technologies.

The first chapter – *Biomass and Sustainability* (Valentin I. Popa) – emphasizes what is sustainability and how the biomass could contribute to this, evaluating various types of resources (forestry and wood processing wastes, agricultural and food processing residues, municipal wastes, dedicated crops) and the possibility to use them for obtaining energy, biofuels and bioproducts.

The second chapter – *Selective Transformation of Lignin into Value-added Chemicals* (Xiaojun Shen and Runcang Sun) – gives an overview of the structure of lignin, summarizes the methods for selective transformation of lignin into phenols, aldehydes, carboxylic acids, alkanes, and arenes, and then discusses the challenges and opportunities for selective transformation of lignin.

Chapter 3 – *Nanocellulose-based Materials for Solar Cells, Wearable Sensors, and Supercapacitors* (Sheng Chen, Meng Wang, Changyou Shao, and Feng Xu) – reviews the preparation, characterization, and applications of nanocellulose and/or nanocellulose-based composites, with an emphasis on the achievement of various nanocellulose-based functional materials, *i.e*., nanopaper, hydrogels, and carbon aerogels for solar cells, wearable sensors and compressible electrodes for supercapacitors.

Chapter 4 – *Horizons for Future Sustainability: From Trash to Functional Cellulose Fibres* (Aleksandra M. Mikhailidi and Nina E. Kotelnikova) – highlights the main problems associated with waste paper recycling, describes the main stages of waste paper recycling on industrial scale and the novel pathways in recycling, and then shows the promising potential for trash conversion to valuable cellulose products (cellulose, cellulose derivatives, cellulose composites, nanocellulose, and nanofibrillated cellulose, as well as aerogels).

Chapter 5 – *Cellulose Valorization for the Development of Bio-based Functional Materials via Topochemical Engineering* (Lokesh Kesavan, Liji Sobhana, and Pedro Fardim) – covers recent advances in topochemical engineering of cellulose-based functional materials, with an emphasis on valorization methods, chemistry, composition, and applications, highlighting the great scope of topochemical engineering of bio-based materials in circular bio-economy.

Chapter 6 – *Sustainable Hydrogels from Renewable Resources* (Diana Ciolacu) – provides an insight into comprehensive knowledge and the most recent advances related to the hydrogels based on fibres and polymers from renewable resources, with reference to their preparation methods and physico-chemical properties, as well as to a wide range of applications in various areas, from agriculture, biotechnology to biomedicine, tissue engineering, and many others.

In Chapter 7 – *Production of Cellulosic Membranes from Rice Husks for Reverse Osmosis Applications* (Ana Carolina de Oliveira, Franciélle Girardi-Alves, and Luizildo Pitol-Filho) – the authors prepared cross-linked membranes from rice husks, with and without the addition of cross-linking agents (oxalic acid and glutaraldehyde), which further recommended them as promising materials for desalination membrane processes, such as reverse osmosis.

Chapter 8 – *Morphological Aspects of Sustainable Hydrogels* (Daniela Rusu, Diana Ciolacu, and Roxana Vlase) – emphasizes the important role of scanning electron microscopy (SEM) in the study of morphological structure of hydrogels obtained from three of the most abundant biopolymers on earth: cellulose, hemicellulose, and lignin, highlighting the fact that the porosity-specific characteristics, such as stability, homogeneity, pore arrangement, dimensions, interconnectivity, and overall surface area, are directly responsible for the final usage and applicative potential of the hydrogel-based material.

Chapter 9 – *Bio-based Stimuli-responsive Hydrogels with Biomedical Applications* (Raluca Nicu and Diana Ciolacu) – presents an overview of recent advances in obtaining polysaccharides-based stimuli-responsive hydrogels, summarizing the structures and properties of bio-based polymers, some important aspects related to the synthesis and characterization of hydrogels, as well as their latest applications in the biomedical field, including controlled drug release and tissue engineering.

Chapter 10 – *Curdlan Derivatives: New Approaches in Synthesis and Their Applications* (Dana M. Suflet) – presents the most recent progress on the chemical modifications of curdlan, highlighting curdlan derivatives synthesized by carboxymethylation, sulfation and phosphorylation reactions, their properties, such as good water solubility and excellent biocompatibility, which can be considered a decisive advantage for their use in biomedicine, pharmaceutical and nutritional fields.

The book "*Sustainability of Biomass through Bio-based Chemistry*" is a valuable source of data and information on the complex topic of biomass sustainability, which aims to open new perspectives on the potential use of renewable resources. The innovations in the development of biomaterials based on biopolymers, preservation of fossil-based raw materials, complete biodegradability, compostability in the earth's natural cycle, climate protection through reduction of carbon dioxide released, and the utilization of agricultural resources for the production of eco-materials are some of the reasons why this work may be of interest. The volume is recommended to all scientists and engineers, as well as to the students, postgraduates and teachers involved in research and practice in the field of biomass or in polymer engineering, material science and engineering, fiber science, and chemical engineering.

Diana Ciolacu