

Preface

Cellulose is one of the oldest raw materials that have been used by human since ancient times. Meanwhile, it is also the most common organic compound on earth. Due to its unique structure and excellent properties, such as renewability, biocompatibility, biodegradability, chemical stability, and derivatizability, cellulose has diverse applications, e.g., papers, textiles, building materials, composites, and so on. However, there are still great challenges that hinder this readily available and renewable natural polymer to be further used. One drawback of cellulose is its limited processability, which is mainly caused by the large proportion of intra- and inter-molecular hydrogen bonding systems. Until now, the traditional processes for cellulose conversion such as viscose process still dominate the cellulose products market.

Nowadays, the trend of science and technology is tending towards renewable resources and eco-friendly processes. Materials based on natural polymers including cellulose thus have attracted great attention. Especially, the development of new and “green” solvents for cellulose provides efficient and eco-friendly platforms for cellulose shaping and chemical modification. More recently, new frontiers such as nanocelluloses and advancements in nanotechnologies also offer great opportunities in the field of functional materials over a broad range of applications.

This book is intended to review the novel functional materials based on cellulose that were developed during the last few decades. Chapter 1 provides a general introduction to the sources and structure of cellulose, including molecular structures, hydrogen bond systems, and crystalline structures as well as the hierarchical organization of wood cellulose. In Chaps. 2 and 3, several dissolution-regeneration processes (including viscose, Carbacell, N-methylmorpholine-N-oxide, aqueous alkali system and ionic liquids) and the resulting regenerated cellulose products (fibers, films, beads, etc.) are summarized. Chapter 4 covers the novel functional and smart materials based on cellulose, such as electrically conducting materials,

magnetic materials, photofunctional materials, and so on. Chapter 5 is about the new family of nature-based materials, nanocelluloses, and the functional materials derived from them.

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