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Polysaccharides-Based Hybrid Materials for Bio- and Non-Bio Sectors

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There is a growing demand from the government, industry, and end-users for products that possess biodegradability, carbon neutrality, environmental friendliness, and low risks to human health. Polysaccharides are vital biopolymers that consist of monosaccharide subunits connected by glycosidic linkages. Different polysaccharides exhibit a wide array of functional groups, including hydroxyl, carboxyl, amino, acetyl, and sulfonic acids, contributing to their versatility as biopolymers compared to other biomolecules. Furthermore, the bioprocessing of polysaccharides is characterized by its simplicity, environmental friendliness, cost-effectiveness, and suitability for large-scale production. The appealing combination of biodegradability, non-toxicity, and biocompatibility displayed by these biopolymers, along with their diverse structural characteristics and desirable physical, biological, and chemical properties, has captured the interest of researchers from various disciplines. Consequently, there has been a substantial spike in the exploration of polysaccharides and their prospective applications in biotechnological fields, such as tissue engineering, gene delivery, drug delivery, wound dressing, cancer therapy, biosensing, and water treatment.

Naturally occurring polysaccharides like starch, alginates, chitin, chitosan, cellulose, dextran, and hyaluronic acid, as well as their hybrid derivatives with multifunctional attributes, have garnered substantial interest in biotechnological, industrial, and biomedical applications. Additionally, nanostructured materials based on polysaccharides have demonstrated great promise in recent years, particularly in chemical and biomedical research, due to their abundance, excellent biocompatibility, biodegradability, cost-effectiveness, and non-toxic nature. Therefore, there has been a notable shift in focus towards hybrid materials, encompassing both micro- and nano-scale dimensions and their potential applications across various sectors in the modern world. Exploiting meticulously designed materials facilitates the creation of well-defined prototypes that enable a series of purposeful actions.

This special edition spotlights the recent research in the design, development, and emerging applications of polysaccharides-based hybrid materials for biotechnological and biomedical purposes. All the articles published in this issue underscore the significance of materials derived from cellulose, alginate, chitosan, starch, and carrageenan for various applications, including enzyme production, encapsulation, targeted drug delivery, controlled drug release, tissue engineering, cosmeceutical formulations, food packaging, and water/wastewater treatment. On behalf of the editorial board, I would like to extend sincere gratitude to all the authors who have made significant contributions to this special issue. The *Starch* journal is committed to advancing our understanding of polysaccharides-based hybrid materials in biotechnology.

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