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EDITORIAL

Special issue: Fundamentals and applications of carbohydrate polymers

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Polysaccharides are naturally abundant macromolecular substances consisting of many monosaccharide units linked by glycosidic bonds. The (bio)chemical and physical properties of polysaccharides are diverse and variable due to the diversity of monosaccharide species, stereostructures, linear/branched structures, molecular weights, and so on. Polysaccharides have high potential as environmentally friendly or biologically active/inert polymeric materials in various fields such as food, daily necessity, medical care, etc. Many fascinating findings on science and technology of polysaccharides have been accumulated to date. However, there are still intriguing issues to be solved on the fundamental aspects of polysaccharides in all directions, including production methods, structures, physical properties, and functions. Therefore, the range of applications of polysaccharides is still expanding even in recent years.

In this context, the Editor-in-Chief and associate editors proposed a special issue on emerging topics in carbohydrate polymers, including polysaccharides of natural/unnatural origin and polysaccharide-based synthetic polymers. In this issue, we focus on chemical modification of naturally occurring polysaccharides [1], in vitro enzymatic synthesis of poly-/oligosaccharides and their functional derivatives [2–4], characterizations of assembly structures or chain conformations of chemically modified/unmodified polysaccharides [5–9], biological/medical functions of naturally occurring polysaccharides [6, 10–14], hybrid/composite materials [15–19], and fiberization technology [20], covering a wide range of topics from the fundamentals to applications of carbohydrate polymers.

Polymer Journal has published special issues on biorelated polymers in the past [21–23]. We are very much confident that this issue will inspire many readers who are active in various fields of polymer science/technology and contribute to the further development of carbohydrate polymers in the future. Finally, we would like to express our sincere thanks to all the authors and reviewers who contributed to this issue.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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References

1. Isogai A. TEMPO-catalyzed oxidation of polysaccharides. Polym J. https://doi.org/10.1038/s41428-021-00580-1.
2. Kadokawa J-I. Glucan phosphorylase-catalyzed enzymatic synthesis of unnatural oligosaccharides and polysaccharides using nonnative substrates. Polym J. https://doi.org/10.1038/s41428-021-00584-x.
3. Zhong C, Nidetzky B. Precision synthesis of reducing-end thiol-modified cellulose enabled by enzyme selection. Polym J. https://doi.org/10.1038/s41428-021-00599-4.
4. Sakurai Y, Sawada T, Serizawa T. Phosphorylase-catalyzed synthesis and self-assembled structures of cellulose oligomers in the presence of protein denaturants. Polym J. https://doi.org/10.1038/s41428-021-00592-x.
5. Sato T, Yang J, Terao K Micellar structure of hydrophobically modified polysaccharides in aqueous solution. Polym J. https://doi.org/10.1038/s41428-021-00561-4.
6. Chen H, Liu N, He F, Liu Q, Xu X. Specific β-glucans in chain conformations and their biological functions. Polym J. https://doi.org/10.1038/s41428-021-00587-8.
7. Li H, Mumtaz M, Isono T, Satoh T, Chen W-C, Borsali R. Self-assembly of carbohydrate-based block copolymer systems: glyconanoparticles and highly nanostructured thin films. Polym J. https://doi.org/10.1038/s41428-021-00604-w.

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8. Kinose Y, Sakakibara K, Tsuji Y. Conformational characteristics of regioselectively PEG/PS-grafted cellulosic bottlebrushes in solution: cross-sectional structure and main-chain stiffness. Polym J. https://doi.org/10.1038/s41428-021-00594-9.
9. Kar H, Sun J, Clewett CFM, Thongsai N, Paoprasert P, Dwyer JH, et al. Uniform amphiphilic cellulose nanocrystal films. Polym J. https://doi.org/10.1038/s41428-021-00611-x.
10. Vadanan SV, Basu A, Lim S. Bacterial cellulose production, functionalization and development of hybrid materials with synthetic biology. Polym J. https://doi.org/10.1038/s41428-021-00606-8.
11. Kitagishi H, Mao Q. Capture of carbon monoxide using a heme protein model: from biomimetic chemistry of heme proteins to physiological and therapeutic applications. Polym J. https://doi.org/10.1038/s41428-021-00591-y.
12. Arai T, Aiki Y, Sato T. Accelerated transgene expression of pDNA/polysaccharide complexes by solid-phase reverse transfection and analysis of the cell transfection mechanism. Polym J. https://doi.org/10.1038/s41428-021-00603-x.
13. Sumiya K, Izumi H, Matsunaga T, Tanaka M, Sakurai K. Delivery of therapeutic oligonucleotides targeting Dectin-1 using quantized complexes. Polym J. https://doi.org/10.1038/s41428-021-00595-8.
14. Takada K, Komuro A, Ali MA, Singh M, Okajima M, Matsumura K, et al. Cell-adhesive gels made of sacran/collagen complexes. Polym J. https://doi.org/10.1038/s41428-021-00593-w.
15. Higaki Y, Takahara A. Structure and properties of polysaccharide/imogolite hybrids. Polym J. https://doi.org/10.1038/s41428-021-00588-7.
16. Tanabe K, Izawa H, Ifuku S. Preparation and recycling property of nanofiber-reinforced polystyrene molded product using the emulsion-forming ability of chitin nanofibers. Polym J. https://doi.org/10.1038/s41428-021-00586-9.
17. Zheng C, Wang J, Jiang H, Ma Y, Shao Z. Green synthesis of polyacrylamide/polyanionic cellulose hydrogels composited with Zr-based coordination polymer and their enhanced mechanical and adsorptive properties. Polym J. https://doi.org/10.1038/s41428-021-00590-z.
18. Sagawa T, Oishi M, Yataka Y, Sato R, Iijima K, Hashizume M. Control of molecular permeability of polysaccharides composite films utilizing molecular imprinting approach. Polym J. https://doi.org/10.1038/s41428-021-00605-9.
19. Khoerunnisa F, Sihombing M, Nurhayati M, Dara F, Triadi HA, Nasir M, et al. Poly(ether sulfone)-based ultrafiltration membranes with enhanced permeability and antifouling properties by employing chitosan/ammonium chloride. Polym J. https://doi.org/10.1038/s41428-021-00607-7.
20. Suzuki S, Togo A, Iwata T. Dry-jet wet spinning of β-1,3-glucan and α-1,3-glucan. Polym J. https://doi.org/10.1038/s41428-021-00573-0.
21. Venanzi M, Kimura S. Special issue: peptide materials. Polym J. 2013;45:467–467.
22. Serizawa T. Special issue: biorelated polymers and materials. Polym J. 2014;46:435–435.
23. Ikeda M, Kuzuya K, Matsusaki M, Tanaka K. Special issue: biofunctional gels. Polym J. 2020;52:821–821.