

An overview of biopolymers and its applications in materials engineering

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Abstract

Statement of the problem: Biopolymers, derived from natural sources such as plants, animals, and microorganisms, have big potential in materials engineering due to their renewable nature, biodegradability, and unique properties (Gupta & Kumar, 2020). It offers a sustainable solution to the growing problem of plastic pollution, reducing the accumulation of plastic waste. Biopolymers exhibit a wide range of properties that can be tailored to specific applications through modifications in their chemical structure, processing techniques, and formulation with additives (Dorgan et al., 2018). These properties include mechanical strength, flexibility, thermal stability, barrier properties, and biocompatibility (Thakur et al., 2018). Advances in processing technology have enabled the production of biopolymer-based materials with complex geometries and tailored properties (Li et al., 2019). Biopolymers find applications in various industries, including packaging, biomedical, automotive, textiles, agriculture, and construction. In the packaging industry, biopolymers are used to manufacture biodegradable films, bottles, trays, and bags, providing sustainable alternatives to conventional plastics (Deng et al., 2019).

Advances in synthesis, processing, and application have facilitated the widespread adoption of biopolymers in materials engineering (Jamróz et al., 2018). However, challenges such as cost competitiveness, limited scalability of production, and variability in properties due to natural sourcing persist (Bucci et al., 2019). Ongoing research and development efforts are aimed at overcoming these challenges and further enhancing the performance and cost-effectiveness of biopolymer-based materials.

In summary, biopolymers represent a promising class of materials with the potential to drive sustainable innovation in materials engineering (Pandey & Mohanty, 2020).

The presentation aims at providing a review of current research and knowledge about biopolymers used in materials engineering.

Information

The presentation was possible thanks to funding received from the Norway Grants 2014-2021 via the National Centre for Research and Development.

Image



Fig. 1. The possible industry branches for the application of biopolymers.

Recent Publications

1. Bucci, D. Z., Tavares, L. B., & Sell, I. (2019). Biopolymers and biodegradable plastics: advances in production, environmental impact, and applications. London: Taylor & Francis.
2. Deng, H., Zhang, H., & Zhou, J. (2019). Biodegradable polymers: processing, degradation, and applications. Boca Raton, FL: CRC Press.
3. Dorgan, J. R., Mendez, J. M., & Kim, J. (2018). Biopolymers: applications and trends. Amsterdam: Elsevier.
4. Gupta, B., & Kumar, A. (2020). Handbook of biopolymers: advances and application. Amsterdam: Elsevier.
5. Jamróz, E., Kulawik, P., Kopel, P., & Tkaczewska, J. (2018). Biopolymers for food design. Amsterdam: Elsevier.
6. Li, Y., Gupta, R. K., & Kang, S. (2019). Biopolymers: applications and trends. Amsterdam: Elsevier.
7. Pandey, J. K., & Mohanty, A. K. (2020). Handbook of sustainable polymers: processing and applications. Boca Raton, FL: CRC Press.
8. Thakur, V. K., Thakur, M. K., & Kessler, M. R. (2018). Handbook of bioplastics and biocomposites engineering applications. Hoboken, NJ: John Wiley & Sons.

Photograph



Biography

Assistant professor and lecturer at the Institute of Fiber Science of the Lodz University of Technology. Her scientific field concern medical textiles, biopolymers and its processing. She was a participant and manager of several national and international projects and is currently the manager of a project financed by the Norwegian Fund entitled "engiSCAF – Novel composite biopolymer scaffolds of customizable porous structure and preset biological activity." She serves as an auxiliary supervisor for two doctoral candidates and supervises foreign students.

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