Harnessing ocean water for sustainable cellulose biomanufacturing

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Abstract

Cellulose, a highly versatile and abundant biopolymer, has traditionally been derived from plants, often involving substantial freshwater use and synthetic chemicals[1,2]. In response to these environmental challenges, our research explores sustainable alternatives for cellulose production by utilizing ocean water as an innovative and eco-friendly medium for bacterial cellulose production[3]. Specifically, we employ *Komagataeibacter xylinus*[4], a native cellulose-producing microorganism, achieving promising yields under optimized laboratory conditions. This represents a significant advancement in bioproduction. Techno-economic assessment underscores the potential of ocean water as a sustainable and economically viable solution, driving a shift towards more efficient and environmentally conscious practices in the cellulose biomanufacturing industry. In addition, life cycle assessment reveals considerable reductions in both freshwater dependency and land use compared to conventional methods. Our study highlights the importance of rethinking traditional production methods and embracing ocean-water-based approaches to promote sustainability, innovation, and the development of new applications in the field.

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