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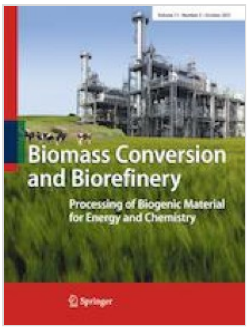

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From Waste to Biopolymer: Synthesis of P(3HB-*co*-4HB) from Renewable Fish Oil

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Journal of Renewable Materials **2025**, *13*(3), 413-432.
https://doi.org/10.32604/jrm.2024.058775

Received 20 September 2024; **Accepted** 10 December 2024; **Issue published** 20 March 2025

Abstract

The article presents the results of a study on the possibility of synthesizing biodegradable poly(3-hydroxybutyrate-co-4-hydroxybutyrate) [P(3HB-*co*-4HB)] from renewable waste fish oil (WFO) by the *Cupriavidus necator* B-10 bacterium. For the first time, waste oil generated during the

processing of *Sprattus balticus* in the production of sprats was used as the main carbon substrate for the synthesis of P(3HB-*co*-4HB), and ε-caprolactone was used as a precursor instead of the more expensive γ-butyrolactone. Samples of P(3HB-*co*-4HB) with a 4HB monomer content from 7.4 to 11.6 mol.% were synthesized, and values of the bacterial biomass yield and the total yield of the copolymer were comparable with the control (where butyric acid was used as carbon source). The following properties of the samples were studied: molecular weight, temperature characteristics, thermal behavior, isothermal crystallization of melts, and the formation of spherulites. The renewable fatty substrate of complex composition was used to synthesize samples of technologically advanced low-crystallinity P(3HB-*co*-4HB) with significant proportions of 4HB, without impairing the physicochemical properties of the polymer. The biotechnological process involving the use of renewable WFO and ε-caprolactone can be emˊ yed to reduce the costs of producing a promising “green”

bioplastic and make it more affordable.

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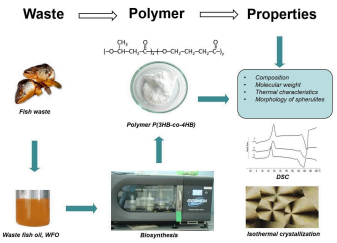

Keywords

Waste fish oil; biodegradable polyhydroxyalkanoates; renewable materials; biosynthesis; copolymers

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