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Properties of P(3HB-co-4HB) produced by *Cupriavidus malaysiensis* by batch and fed-batch strategy

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Polyhydroxyalkanoates (PHA) are microbial biodegradable thermoplastic polyesters with a large scale of chemical and physical properties, which determine their utilization. In the present study, *Cupriavidus malaysiensis* was selected for the production of poly(3-hydroxybutyrate-co-4-hydroxybutyrate), P(3HB-co-4HB) in the Erlenmeyer flasks and 2 or 4 L bioreactor. γ-butyrolactone and ammonium sulphate, were used as carbon and nitrogen substrates.

The volumetric biomass productivity increased from 0.052 $g \cdot l^{-1} \cdot h^{-1}$ (a batch cultivation in the Erlenmeyer flasks) to 0.33 $g \cdot l^{-1} \cdot h^{-1}$ in the case of the fed-batch cultivation in a bioreactor. However, the concentration of copolymer (74%) was higher in the Erlenmeyer flask cultivation. Thermal and mechanical properties of P(3HB-co-4HB) depend on the concentration of 4-hydroxybutyrate unit (4HB) in the copolymer. P(3HB-co-4HB) can be an amorphous copolymer with mechanical behavior similar to elastomers or semi-crystalline copolymer with high stiffness but limited elongation ability. Due to the relatively low content of 4HB, the isolated copolymer was semi-crystalline with the crystallinity of approximately 29 % and the melting temperature at about 154°C. The lower crystallinity and the higher flexibility of P(3HB-co-4HB) compared to highly crystalline poly(3-hydroxybutyrate) (P3HB) are an advantage and should enable its easier thermal processing through an extrusion and thus produce filaments with the acceptable mechanical properties for 3D printing.

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