

## **Polyhydroxyalkanoates (PHAs): synthesis, properties and applications**

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Polyhydroxyalkanoates (PHAs) are polyesters produced by microbial fermentation, which have received considerable attention in recent years mainly due to some of their advantages, such as excellent biocompatibility, complete biodegradability, and non-cytotoxicity. The PHAs physical properties strongly depend on their chemical and crystalline structure. Among them, poly(3-hydroxybutyrate) (PHB) is definitely the most common and studied, but several disadvantages such as its brittleness and low toughness strongly restrict its fields of application. As a result, copolymers of PHB mixed with comonomers such as 3-hydroxyvalerate (3HV) or 3-hydroxyhexanoate (3HB) have been developed in order to improve PHAs mechanical properties and to achieve better processability. However, Poly (3-hydroxybutyrate-co-3-hydroxyvalerate) [PHBV] and poly (3-hydroxybutyrate-co-3-hydroxyhexanoate) [PHBH] still have some drawbacks, especially in the rate of crystallization due to their irregularity of chain configuration. Therefore, crystallization behaviour studies of nucleation-induced PHAs represent one of the main challenges to improve their physical properties and make definitively them valid alternatives to fossil-based plastics.