CHAPTER 5

Nanocomposites of Polyhydroxyalkanoates (PHAs)

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5.1 Introduction

Polyhydroxyalkanoates (PHAs) are a group of polyhydroxyesters with diverse structures. The composition of these polyesters may include 3-, 4-, 5- and 6-hydroxyalkanoic acid monomers that are accumulated by different bacterial species (native or mutant) under nutrient(s)-deprived conditions but abundant carbon sources. A wide range of carbon sources could serve as substrate(s) for microbial PHA accumulation but in terms of its mass production, the use of renewable resources such as fatty acids is very favorable. The accumulated PHAs serve as a carbon and energy reserve within the microorganisms. A range of PHAs comprising both copolymers and block copolymers has been produced using different processes including fermentation and enzymatic catalysis, leading to an accumulated PHA content of as much as 90% of the microbial dry mass. Moreover, alternative production schemes based on genetically modified plants and yeast are currently gaining momentum and may become the preferred route for PHA production. Unlike petrochemical-derived plastics, PHAs are biodegradable, and are biocompatible with gas-barrier properties almost similar to those of polyvinyl chloride and polyethylene terephthalate. These combinations of excellent physico-chemical properties warrant the increasing