Abstact

Polyhydroxyalkanoates (PHAs) is a carbon and energy storage material synthesized by numerous bacteria in response to environmental stress. PHAs have been considered promising candidates for biodegradable plastics and elastomers of industrial interest and of environmental value. PHA can be utilized in drug delivery, bone replacement applications, for making films having excellent gas barrier properties. Despite PHA's advantages over other polymer materials, the disadvantage of the high production cost has prevented its wide use as a bulk plastic material in the market. Many fermentation processes were developed employing several kinds of bacteria to improve PHA productivity. For this purpose the capability of thermophilic eubacterium *T. thermophilus* to accumulate polyesters was tested from various carbon sources, hoping to promising polyesters due to the high growth temperature of the organism.

The objective of this study was the development of a fermentation strategy for optimization of a high-level production of PHAs by employing *T. thermophilus*, including an evaluation of nitrogen, phosphate and a variety of substrates. In order to find carbon sources suitable for the production of PHAs by *T. thermophilus* several carbon sources were tested including glucose, sodium gluconate and whey.

Using glucose as carbon source and under phosphate limitation (10mM) the production of PHA was high and the PHA content (%) was approximately 50 wt% after 24 h of culture that remained in the same approximately steady amount until 72 h of cultivation time. In contrast, using sodium gluconate as carbon source the production of PHA was induced by nitrogen limitation and the PHA content was approximately 42 wt% after 24 h of culture. When whey was used as carbon source, the productivity of PHA was lower and the PHA content was approximately 26 wt% after 24 h of culture, and the optimum initial concentration for best PHA productivity seems to be the higher tested, 50 mM.

IR spectroscopy analysis of the product material showed strong bands at 1740cm^{-1} confirming that *T. thermophilus* can produce PHA, since PHA shows strong bands ranging from 1720-1744 cm^{-1} in the IR spectra.