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Extraction, purification and modification of Poly (3-hydroxybutyrate) produced by the fermentation of fatty acids with Burkholderia cepacia B27

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Poly (3-hydroxybutyrate) or (P3HB) is a thermoplastic polyester of the family of the polyhydroxyalkanoates (PHAs) produced by different kinds of microorganisms under stress conditions. It has very interesting mechanical and physicochemical characteristics that allow it to be used for packaging applications. However, it's necessary to improve some of its weakest characteristics like the high brittleness, the production cost and the narrow processing window. This improvements can be achieved using different extraction, purification and modification technics that result in materials with different physicochemical characteristics and production costs. In this work different extraction, purification and modification processes were evaluated in order to obtain a polymer with the properties required to make it competitive in the industry. Fatty acids were used as carbon source and the fermentations were made in 5L, 20L and 100L bioreactors. Initially, the polymer must be extracted and separated from the surrounding PHA hyper-productive mutant bacteria Burkholderia cepacia B27 biomass, using techniques like chemical digestion with SDS and NaOH, centrifugation and solvent precipitation. Then the polymer was purified to remove protein and oil residues from the fermentation, for this the performance of different solvents such as acetic acid, acetone, ethanol and methanol was tested under different operation conditions. Finally, the polymer was modified blending it with other biodegradable polymers like polyethilenglycol and adding different organic fillers to evaluate improvements in the mechanical characteristics. The samples where characterized by TGA and DSC essays and different mechanical tests. The results indicate that the use of organic polar solvents such as methanol and ethanol allow to obtain a colorless, odorless and high purity polymer. Also, use this or other solvents as acetic acid and acetone avoid the use of chloroform in the process, which is an expensive and hazardous solvent that can't be used at the industrial production level.

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