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Process scale up for Polyhydroxyalkanoate (phas) production utilizing the biodiesel waste streams

Sourish Bhattacharya

CSIR-Central Salt and Marine Chemicals Research Institute, India

The developed process for polyhydroxyalkanoate (P3HB) production using biodiesel by products at shake flask scale was scaled up to bench scale in a 800L fermentor wherein various process parameters e.g. Agitation rate, aeration rate and production age was optimized. 51.86% PHA yield (4.3gm out of 8.29 gm CDW) was obtained in the 14 L fermentor having medium composition 2% BWR & 10% JOCH, agitation 200 rpm, aeration 1.0 vvm, 39.2 l/h oxygen transfer rate, temperature 37°C, inoculum Size: 10%, seed age: 24 hrs. and production age: 96 hrs. The P3HB productivity was 0.269 g/l/d. Extraction and purification of P3HB at pilot scale: After completion of 96 h fermentation, culture broth was centrifuged at 15,296× g rcf for 10 min in refrigerated centrifuge. The cell pellets were oven dried overnight at 60 °C. Cellular digestion of dried cell pellet was carried out by re-suspending it in 6% (v/v) sodium hypochlorite solution followed by centrifugation at 10,000 rpm for 5 min. Further, the digested cell pellets were washed twice with methanol followed by distilled water to remove the traces of impurities resulting in a purified product and kept for drying. The purified polymer (P3HB) was further dissolved in chloroform and dried in ambient air to obtain the film. An integrated process for simultaneous production of intracellular Polyhydroxyalkanoates (PHAs) and extracellular ε-polylysine is developed through marine bacterial strain (*Bacillus licheniformis*) isolated from west coast of India utilizing *Jatropha* biodiesel waste residues as carbon rich source. The simultaneous yield of 0.2 g/l ε-polylysine and 64.6% (w/w) polyhydroxyalkanoate was obtained in the fermentation broth (1L shake flask) through *Bacillus licheniformis* after 96 hours. The production medium comprises of 2% biodiesel waste residue, 0.5 % yeast extract, 1% ammonium sulphate, 0.08% dipotassium hydrogen phosphate, 0.136% potassium dihydrogen phosphate, 0.05 % magnesium sulphate, 0.004 % zinc sulphate and 0.003% ferrous sulphate, pH 8.9±0.2. The developed process needs to be further optimized further for gaining still better yield of both the products.

maite.lazo@braskem.com