

Strategies for Polyhydroxyalkanoates (PHAs) Production by Mixed Culture Using Cheese Whey as Substrate

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Abstract: The advantages of using mixed culture to obtain polyhydroxyalkanoate (PHA) compared to pure culture include an enhanced economy, a simpler process control and an improved use of wastes. The use of cheese whey wastewater is due its high lactose content suitable to ferment to volatile fat acid (VFA) and serve as a substrate in mixed culture to produce PHA. In this work we want to show the performance of a production of PHA in a three- stage using cheese whey as a substrate. The acidogenic fermentation in an A-SBR reactor as a first step forming volatile fat acid as a product; in a second step, a selection of PHA-accumulating culture using SBR method, and a final step a PHA batch accumulation using the enriched sludge and fermented effluent from an acidogenic reactor.

Evaluate the organic acids profile and productivity in an acidogenic reactor controlling the pH at 6, 5,5 and 5 using a HRT of 2 days and SRT of 4, 6 and 10 days and an Organic Loading Rate between of 4 -5 kg COD m³ d⁻¹. The conditions of the aerobic reactor are HRT = 1 day, SRT = 10 days with cycle of 12 hour of aerobic dynamic conditions (feast-famine) at 30 0 C, with no control of pH. Strategies of reactor operation to select PHA-accumulating culture on fermented cheese whey wastewater were studied. An SBR reactor operated in a 12h-cycle, at organic loads between 1,4 -1,5 g COD L /d and SRT of 10 d. COD removal was always higher than 85 %, polymer; PHA's storage was 42 % of cell dry weight containing 80 % of HB, observing an increased over time.

The microbial cultures of the PHA accumulating microorganisms were characterized through DGGE analysis and were correlated with reactor performance. Moreover, some polymer properties were determined.

Keywords: PHA, acidogenic fermentation, VFA, cheese whey