

Sustainable and Efficient Recovery of Polyhydroxyalkanoate Polymer from *Cupriavidus necator* Using Environment Friendly Solvents

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Abstract : An imprudent use of environmentally hazardous petrochemical-based plastics and limited availability of fossil fuels have provoked research interests towards production of biodegradable plastics - polyhydroxyalkanoate (PHAs). However, the industrial application of PHAs based products is primarily restricted by their high cost of recovery and extraction protocols. Moreover, solvents used for the extraction and purification are toxic and volatile which causes adverse environmental hazards. Development of efficient downstream recovery strategies along with utilization of non-toxic solvents will accelerate their commercialization. In this study, various extraction strategies were designed for sustainable and cost-effective recovery of PHAs from *Cupriavidus necator* using non-toxic environment friendly solvents viz. 1,2-propylene carbonate, ethyl acetate, isoamyl alcohol, butyl acetate. The effect of incubation time i.e. 10, 30 and 50 min and temperature i.e. 60, 80, 100, 120°C was tested to identify the most suitable solvent. PHAs extraction using a recyclable solvent, 1,2 propylene carbonate, showed the highest recovery yield (90%) and purity (93%) at 120°C and 30 min incubation. Ethyl acetate showed the better capacity to recover PHAs from cells than butyl acetate. Extraction with ethyl acetate exhibited high recovery yield and purity of 96% and 92%, respectively at 100°C. Effect of non-toxic surfactant such as linear alkylbenzene sulfonic acid (LAS) was also studied at 40, 60 and 80°C, and detergent pH range of 3.0, 5.0, 7.0 and 9.0 for the extraction of PHAs from the cells. LAS gave highest yield of 86% and purity of 88% at temperature 80°C and 5.0 pH.

Keywords : polyhydroxyalkanoates, *Cupriavidus necator*, extraction, recovery yield

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