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Extractive Bioconversion of Polyhydroxyalkanoates (PHAs) from Ralstonia Eutropha Via Aqueous Two-Phase System-An Integrated Approach

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Abstract : Being biodegradable, non-toxic, renewable and have similar or better properties as commercial plastics, polyhydroxy alkanoates (PHAs) can be a potential game changer in the polymer industry. PHAs are the biodegradable polymer produced by bacteria, which are in interest as a sustainable alternative to petrochemical-derived plastics; however, its commercial value has significantly limited by high production and recovery cost of PHA. Aqueous two-phase system (ATPS) offers different chemical and physical environments, which contains about 80-90% water delivers an excellent environment for partitioning of cells, cell organelles and biologically active substances. Extractive bioconversion via ATPS allows the integration of PHA upstream fermentation and downstream purification process, which reduces production steps and time, thus lead to cost reduction. The ability of Ralstonia eutropha to grow under different ATPS conditions was investigated for its potential to be used in a bioconversion system. Changes in tie-line length (TLL) and a volume ratio (Vr) were shown to have an effect on PHA partition coefficient. High PHA recovery yield of 65% with a relatively high purity of 73% was obtained in PEG 6000/Sodium sulphate system with 42.6 wt/wt % TLL and 1.25 Vr. Extractive bioconversion via ATPS is an attractive approach for the combination of PHA production and recovery process.

Keywords : aqueous two-phase system, extractive bioconversion, polyhydroxy alkanoates, purification
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