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Trends in the Biomanufacture of Polyhydroxyalkanoates with Focus on Downstream Processing

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ABSTRACT

The aim of the current review is to analyze trends in development of an efficient technology for polyhydroxyalkanoate (PHA) biomanufacture highlighting the up-to-date progress on PHA biosynthesis and focusing on the downstream processing. Three main production pathways were identified: through microbial, enzymic, or plant routes. Microbial fermentation processes were predominant, with a wide range of microorganisms, starting materials and culture conditions reported. Largely, two schemes for recovering PHAs from the reaction medium post fermentation were identified: dissolving biomass to separate PHAs granules with strong oxidants, and extracting PHAs directly from the biomass using suitable solvents. For the valuable industrial scale biosynthesis of PHA several technological elements need to be applied such as robust whole-cell microbial catalyst with its optimal culturing conditions, suitable carbon source, proper mode of process operation, as well as economical and ecological purification methods.

List of abbreviation

ACP acyl carrier protein

CDW cell dry weight

CoA coenzyme A

COD chemical oxygen demand

DNA deoxyribonucleic acid

MCL medium chain length

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