Producing a Biodegradable Plastic Using Ralstnia eutopha to Convert CO2 into a PHB Biolpolymer

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Polyhydroxybutyrate (PHB) is a biodegradable plastic that can be used as a substitute for petroleum based plastics that are harmful for the environment as they do not decompose naturally. The aim of this research is to identify an efficient method to produce PHB by using the bacterium Ralstonia eutropha. By using this organism, CO2 can be converted into a viable biodegradable resource; PHB. R. eutropha is a gram negative chemoautotrophic bacterium in the Betaproteobacteria class that can use hydrogen to convert CO2 into the biopolymer PHB via chemosynthesis. This highlights the second aim of this research; the reduction of CO2 levels in the atmosphere which will, in turn, reduce pollution levels. For the experimentation, an integrated electromicrobial system was developed in order to bubble in CO2 and electrochemically evolve hydrogen, while setting up the right conditions (media) to enable the cells to utilize the CO2/H2 (carbon/energy source) transfer into PHB. Samples were collected in order to assess the amount of growth and PHB produced. Results from the pre-electrochemical chamber media found that phosphate sealed media was the most efficient at producing PHB in the bacteria, because it had a low cell count but high PHB levels. Future works consist of optimizing the uptake of CO2/H2 and the production of PHB in order to reproduce the system on an industrial scale. On an industrial scale, PHB will become a more common plastic in the marketplace as well as a profitable asset to any company concentrating on plastic production.

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