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Microbial conversion of biodiesel waste products into medium chain length polyhydroxyalkanoates using *Pseudomonas putida* LS46

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Medium chain-length polyhydroxyalkanoates (mcl-PHAs) are a class of polymers synthesized by certain species of bacteriaas an energy storage mechanism. These polymers have shown promise as a potential renewable alternative to conventional petroleum-based plastics and fuels. Use of an inexpensive and renewable carbon source such as biodiesel waste glycerol and free fatty acids is a requisite for cost-effective mcl-PHA production. Under certain operating conditions, *Pseudomonas putida* LS46 has been shown to be capable of robust growth on these substrates while achieving relatively high cellular mcl-PHA content. Preliminary tests in reactors with a 3-5L working volume have shown that for growth on substrates metabolized via β-oxidation pathways (pure octanoic acid, biodiesel waste fatty acids), the application of oxygen limitation (>0.01 mg/L O_2) improved the cellular PHA content from 45% to 71% using pure octanoic acid, and from 17% to 35% using biodiesel waste fatty acids as compared to conventional nitrogen limitation. The improvement in cellular PHA content using oxygen limitation compensated for the slowed growth rate, resulting in a higher overall mcl-PHA productivity. For growth on waste glycerol, nitrogen limitation was found to be more effective than oxygen limitation, resulting in 25% cellular PHA content. For all substrates, fed batch strategies have been used to reliably achieve biomass yields of 12-15 g/L, in a reactor with working volumes up to 50 L. Further improvements to cell density and overall productivity may be achievable through the design and operation of continuous or semi-continuous feed bioreactors.

Biography

NazimCicek completed his PhD in 1999 in Environmental Engineering at the University of Cincinnati. His research interests include biological wastewater treatment, membrane bioreactors, nutrient recovery from waste streams, anaerobic digestion of livestock manure, and biological conversion of renewable waste materials into biofuels and bio-products. These interests have resulted in more than 85 peer-reviewed publications.

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