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PHA copolymers from methane

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Methane is a low cost and readily available feedstock for production of polyhydroxyalkanoates (PHAs). An enrichment of Type II methanotrophs and two Type II pure cultures (Methylocystis parvus OBBP and Methylosinus trichosporium OB3b) were grown under exponential growth conditions in fill-and-draw reactors with ammonium as sole nitrogen source. Harvested cells were incubated in the absence of nitrogen with various combinations of methane and co-substrates to assess polyhydroxyalkanoate (PHA) production capacity. Methane was required for PHA production. With fed methane alone, only poly (3-hydroxybutyrate) (P3HB) was produced; when methane was supplemented with 3-hydroxybutyrate, additional P3HB was produced; when methane was supplemented with propionate, copolymer poly (3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) was produced; when methane was supplemented with valerate, PHBV levels increased, and the percentage of 3-hydroxyvalerate incorporated into the PHBV increased as the concentration of added valerate increased. We conclude that methane plays a critical role as the source of energy for assimilation of fatty acid co-substrates and that the quantity and composition of PHA produced can be modified by the co-substrates added and their concentration. We also conclude that there is a trade-off between the specific rates of PHA production and co-substrate concentration. Higher co-substrate concentrations decrease specific rates of PHA production.

Biography

Jaewook Myung is a PhD candidate studying environmental engineering at Stanford University. His current work focuses on production of methane-derived polyhydroxyalkanote (PHA) biopolymers and methanotrophic nitrogen removal. He holds BS degree in civil and environmental engineering at KAIST and MS degree in civil and environmental engineering at Stanford University. He is originally from Daejeon, South Korea.

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