PHA copolymers from methane

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Polyhydroxyalkanoates (PHAs) are microbial storage polymers accumulated by many different groups of bacteria as an intracellular carbon and energy reserve. Use of methane (CH$_4$) as a feedstock for PHA production can significantly decrease costs and environmental impacts. Methane is currently widely available as the major component of natural gas and biogas obtained from the anaerobic degradation of organic waste. When CH$_4$ is the sole feedstock, high molecular weight poly(3-hydroxybutyrate) (P3HB) is the sole PHA product. Herein, we report the first methanotrophic synthesis of PHAs that contain repeating units beyond 3HB, including poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV), poly(3-hydroxybutyrate-co-4-hydroxybutyrate) (P(3HB-co-4HB)), poly(3-hydroxybutyrate-co-5-hydroxyvalerate-co-3-hydroxyvalerate) (P(3HB-co-5HV-co-3HV)), and poly(3-hydroxybutyrate-co-6-hydroxyhexanoate-co-4-hydroxybutyrate) (P(3HB-co-6HHx-co-4HB)).

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