

Methane as emerging raw material for biopolymers

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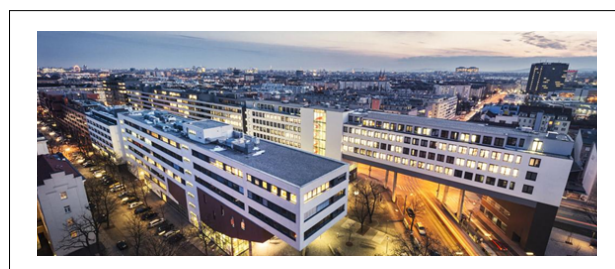


Abstract

Biobased polymers can offer the advantages of a reduced carbon footprint, and they are able to reduce microplastics pollution by being biodegradable. Common feedstocks are starch and sugar, which creates a debate around food competition. Methane is an attractive raw material for polymers. It can be sourced from natural gas and non-conventional methane sources, and it is accessible from landfill gas or biogas. Thermocatalytic processes for obtaining polyolefins polyethylene (PE) and polypropylene (PP) from methane already exist at large scale. In this presentation, an alternative, promising approach to make biodegradable polymers from methane is presented: Methanotrophic bacteria consume CH₄ to produce polyhydroxyalkanoates (PHA), a class of naturally occurring biopolymers which is degradable also in the marine environment. Methanotrophs like *methylosinus trichosporium*, *methylocystis hirsuta* or *methylocystis capsulatus* are able to yield polyhydroxybutyrate (PHB), a potential replacement for PP. Co-feeding other monomers allows the production of copolymers such as the softer PHBV, which is also of commercial interest. Using methane as feedstock for PHA biopolymer production has the potential to make PHA even more sustainable and cost-competitive, due to higher production rates than PHA-producing cyanobacteria. Other building blocks of interest like isoprene and butanediol are accessible through engineered methanotrophs such as *methylomicrobium alcaliphilum*. It is expected that methane is the next-generation feedstock, contributing significantly to the biobased, circular economy.

Biography

Maximilian Lackner earned his PhD in technical chemistry in 2002 and his habilitation in chemical engineering in 2009, from Vienna University of Technology. He has held senior leadership positions in the petrochemical industry in Europe and in Asia. He has teaching assignments at Vienna University of Technology, Austria, Johannes Kepler University, Austria, Xidian University, China, and is head of two study programmes at the University of Applied Sciences Technikum Wien, Austria. He is founding editor-in-chief of the international journal of biobased plastics and has authored over 200 publications. His research interests are bioprocess development for sustainable bioplastics production of polyhydroxyalkanoates (PHA), particularly polyhydroxybutyrate (PHB), biopolymer characterization and applications.



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