Biological Conversion of Ethylene to n-Butanol and Other Chemicals Using E. Coli

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ABSTRACT

Researchers at the University of California, Davis have developed novel methods using *Escherichia coli* as a biocatalyst to convert ethylene to acetyl-CoA and ultimately n-butanol, a potential fuel substitute and an important C4 chemical feedstock.

FULL DESCRIPTION

Declining fossil fuel reserves and an expansion of natural gas production has increased efforts in seeking to commercialize the conversion of natural gas into chemical feedstocks and fuels as an alternative to petroleum. Currently, the vast majority of natural gas is used for heating purposes due to the properties of methane as a heating fuel and difficulty in converting methane into larger, higher value chemicals and liquid fuels. Therefore, there is significant interest in chemical synthesis methods to generate desired compounds.

Researchers at the University of California, Davis have developed novel methods using *E. coli* as a biocatalyst to convert ethylene to acetyl-CoA and ultimately n-butanol, a potential fuel substitute and an important C4 chemical feedstock. The method uses bio-assimilation of ethylene, a green chemical synthesis method that converts methane to acetyl-CoA, using *E. coli.* By using *E. coli* as the biological host bacteria, the method overcomes current limitations of large scale production due to difficulties in maintaining cultures and a lack of tools for genetic modification. Since ethylene is already a high volume chemical feedstock used in the chemical industry and acetyl-CoA can subsequently be used to synthesize n-butanol and other chemicals using established biosynthetic pathways., a high performance ethylene assimilation pathway in *E. coli* could enable immediate industrial applications.

APPLICATIONS

- Biological conversion of ethylene to acetyl-CoA, n-butanol, and other chemicals

FEATURES/BENEFITS

- Green chemistry methods use less-toxic catalysts, lower temperatures, and avoid organic solvents
- *E. coli* has many genetic tools and well-established large scale bio-assimilation applications
- Biological plants are more energy efficient and have less capital costs than chemical plants

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,184,138	01/22/2019	2014-854

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Remediation of Volatile Phenols in Smoke-Exposed Fruit
- Engineered Phosphite Dehydrogenases for Recycling Orthogonal Noncanonical Cofactors
- Using Escherichia coli to Produce Human Milk Oligosaccharide Lactodifucotetraose
- A Thermostable Lipase for PU Degradation
- Novel Enzymes Enabling Microbial Fermentation of Sugar into Long Chain Alcohols
- Biological Production of Industrial Small Esters
- Renewable Energy Synthesis System
- Lacto-N-tetraose Biosynthesis from Lactose via Metabolically Rewired Escherichia Coli

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OTHER INFORMATION

KEYWORDS

n-butanol, E. coli, biofuel, bio-assimilation, ethylene, acetyl-CoA, biobutanol, biocatalyst

CATEGORIZED AS

- **Biotechnology**
  - Industrial/ Energy
- **Materials & Chemicals**
  - Biological
  - Chemicals

RELATED CASES

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