Isobutanol Production Using Metabolically Engineered Escherichia Coli

Tech ID: 30043 / UC Case 2007-394-0

SUMMARY
UCLA researchers at the Department of Chemical and Biomolecular Engineering have engineered Escherichia coli bacteria to produce isobutanol from glucose.

BACKGROUND
The production of fuel substitutes such as bioalcohols and biodiesel from renewable resources present promising commercial opportunities as replacements to fossil fuels. Currently, ethanol is the major form of biofuel. However, bioethanol has several significant drawbacks including low energy density and incompatibility with existing fuel infrastructure. Advanced biofuels such as C3-C5 alcohols and isoprenoids are believed to circumvent these problems. However, these advanced biofuel compounds are not commonly produced naturally in quantities capable of support large-scale use. Development of simple, efficient methods of producing advanced biofuels will be essential to the viability of large-scale biofuel use.

INNOVATION
Dr. James Liao and colleagues have engineered E. coli bacteria to efficiently produce C4 alcohol isobutanol from glucose. The genetically engineered strain expresses a combination of recombinant genes from E. coli, B. subtilis and S. ceravisae to efficiently produce isobutanol from carbon sources such as glucose. In addition, genes involved in byproduct formation have been deleted in order to increase the isobutanol yield. The engineered strain produces isobutanol in large quantities (20g/L isobutanol) and is highly efficient (yield of 86% of the theoretical maximum). The production of isobutanol in such large quantities demonstrates the potential of this pathway and opens the possibility of industrial production of this compound.

APPLICATIONS
▶ Production of isobutanol for biofuel use

ADVANTAGES
▶ E. coli is easy to grow and maintain
▶ Isobutanol has a high octane number
▶ Isobutanol has a similar energy level to gasoline

STATE OF DEVELOPMENT
Demonstrated isobutanol production in engineered E. coli strain to be 86% of theoretical max (20g/L).

RELATED MATERIALS

PATENT STATUS

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CATEGORIZED AS
▶ Energy
▶ Bioenergy
▶ Hydrocarbon
▶ Materials & Chemicals
▶ Biological
▶ Chemicals

RELATED CASES
2007-394-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
▶ Conversion Of Co2 To Higher Alcohols Using Photosynthetic Microorganisms
▶ Non-Oxidative Glycolysis For Production Of Acetyl-CoA Derived Compounds
▶ Novel Enzymes Enabling Microbial Fermentation of Sugar into Long Chain Alcohols