

ONE-POT BIOCONVERSION OF DISTILLER'S GRAINS TO ADVANCED BIOFUELS

Patent Pending
Technology Readiness Level: 4

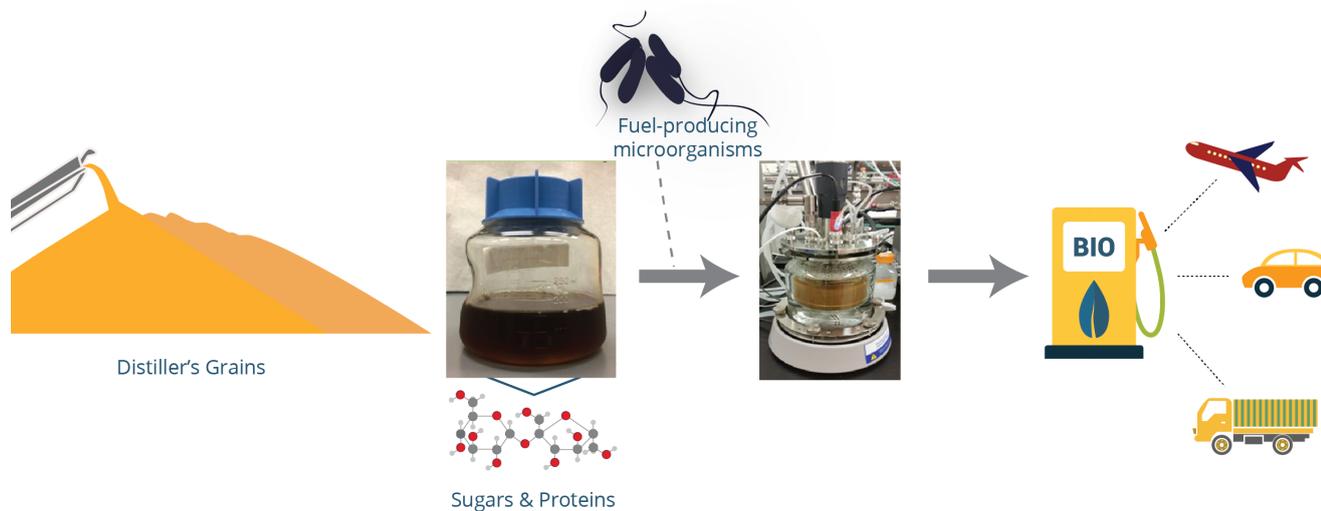
Basic technological components have been integrated to establish the pieces will work together

Increase in bioethanol production throughout US has led to an increase in the process coproduct—distillers grains with solubles (DGS). DGS can be used to feed livestock, however, product inconsistency and contamination issues have greatly reduced demand, resulting in significant surplus. In order to commoditize this DGS surplus, a team at Sandia developed a “one-pot” bioconversion process that converts both the major biochemical pools (carbohydrates, proteins, and lipids) into valuable biofuels, industrial chemicals, and high value acids for fertilization.

While other competing bioconversion processes focus on conversion of the sugar fraction of DGS to fuel, our process simultaneously converts both carbohydrates and proteins—significantly increasing yields and minimizing separation costs. The process involves dilute acid hydrolysis and genetically modified E.coli strains optimized for conversion of hydrolyzed carbohydrates and proteins. The primary bioconversion products are isobutanol and isopentanol—ASTM certified biofuels with higher energy density and lower corrosivity than ethanol, with industrial applications beyond transportation fuels. The process also remineralizes the nitrogen and phosphorus pools present in DGS to struvite, a field-tested fertilizer with low run-off potential.

Sandia’s “one-pot” bioconversion process provides the means to produce ~10 tons of fusel alcohols in addition to the ~30 tons of ethanol per 100 tons of corn, while simultaneously remineralizing the major nitrogen/phosphorus nutrients for use as fertilizer.

Conversion of DGS to alternative fuels will potentially decrease the cost of the established bioethanol process.



TECHNICAL BENEFITS

- Converts DGS into multiple commodities: isobutanol, isopentanol, and struvite
- Easily incorporated into establish bioethanol infrastructure
- Can be used with other biomass sources and organic waste streams, including algae from wastewater treatment and mixed solid wastes

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