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DOE Awards \$2.5 Million to NatureWorks to Transform Biogas into the Lactic Acid Building Block for Ingeo

The DOE grant supports a NatureWorks and Calysta multi-year program aimed at Ingeo™ feedstock diversification

MINNETONKA, Minn., October 30, 2014 — The [U.S. Energy Department's Office of Energy Efficiency and Renewable Energy, Bioenergy Technologies Office](#) announced a grant of up to \$2.5 million to [NatureWorks](#), one of the world's leading suppliers of bioplastics, in support of an ongoing program that aims to sequester and use methane, a potent greenhouse gas, as a feedstock for the company's Ingeo™ biopolymers and intermediates.

The grant supports an ongoing multi-year joint development program between NatureWorks and [Calysta](#), with the specific goal of transforming, via a fermentation process, renewable biomethane into lactic acid, the building block for Ingeo. Ingeo naturally advanced bioplastics and intermediates are used worldwide in a host of consumer and industrial products.

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The research and development (R&D) collaboration with Calysta addresses NatureWorks' strategic interests in feedstock diversification and a structurally simplified, lower cost Ingeo production platform and leverages Calysta's Biological Gas-to-Chemicals® platform for biological conversion of methane to high value chemicals. For NatureWorks, methane could be an additional feedstock several generations removed from the simple plant sugars used today in a lactic acid fermentation process at the NatureWorks Blair, Nebraska, Ingeo production facility.

This June, a year after the joint development program was announced, Calysta demonstrated [lab-scale production](#) of lactic acid from methane, a major milestone in the project. Fundamental R&D should be completed in the next two to three years, enabling pilot production in three to five years.

A greenhouse gas 20 times more harmful than carbon dioxide, methane is generated by the natural decomposition of plant materials and is a component of natural gas. Biomethane refers specifically to renewably sourced methane produced from such activities as waste-water treatment, decomposition within landfills, farm wastes, and anaerobic digestion. If successful, the technology could directly produce lactic acid from any of these methane sources.

“If proven through this collaboration, methane to lactic acid conversion technology could be revolutionary, providing sustainable alternative feedstocks for Ingeo,” said NatureWorks Ken Williams, Program Leader for the Calysta-NatureWorks collaboration. “When coupled with NatureWorks' proven commercial process for lactic acid to Ingeo, the methane to lactic acid process would transform a harmful greenhouse gas into useful and in-demand consumer and industrial products. This disruptive platform could support high-value chemicals and liquid

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fuels. Our team thanks the Bioenergy Technologies Office and is proud to have been recognized by the Department of Energy grant for this NatureWorks and Calysta research collaboration.”

For more information on NatureWorks and Ingeo, visit www.natureworkslc.com. Follow NatureWorks on Twitter ([@natureworks](https://twitter.com/natureworks)) for the latest updates. For more information on Calysta, visit www.calysta.com.

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About NatureWorks

NatureWorks LLC is a company dedicated to meeting the world’s needs today without compromising the earth’s ability to meet the needs of tomorrow. NatureWorks LLC is the first company to offer a family of commercially available, naturally advanced low-carbon-footprint Ingeo™ lactides and biopolymers derived from abundant local resources with performance and economics that compete with oil-based intermediates, plastics, and fibers, and provide brand owners new cradle-to-cradle options after the use of their products. NatureWorks is jointly owned by Thailand’s largest chemical producer, PTT Global Chemical, and Cargill, which provides food, agriculture, financial and industrial products and services to the world. For general information on NatureWorks and Ingeo, visit www.natureworkslc.com.

About Calysta

Calysta, Inc. (www.calysta.com) Menlo Park, CA, is an innovator in industrial products from sustainable sources. Calysta Energy is developing new Biological Gas-to-Liquids® and Biological Gas-to-Chemicals® technologies using methane as a new feedstock for high value chemicals and transportation fuels with cost and performance advantages over current processes. Calysta Nutrition develops and commercializes fish and livestock nutritional products based on gas fermentation of methane. Calysta Nutrition has operations in Stavanger, Norway.

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