

# 'Green' chemicals closer to market

19 December 2008

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Rice University and Roquette Frères have signed a licensing deal to enable bio-based production of succinic acid, a substance used in plastics, textiles, drugs and solvents and as a food additive. notably fuels and chemicals using renewable resources as an alternative to fossil fuels. The overall goal is to reduce energy requirements to a sustainable level.

Roquette Frères, one of the world's most advanced starch and starch-derivatives businesses, was intrigued by Rice's patented microbial metabolic engineering technologies, which can produce bio-based succinic acid from renewable resources via "green" chemistry. The technique has a desirable carbon footprint since it captures carbon dioxide. "The process is actually carbon-negative," said San. "It uses about 0.75 molecules of carbon dioxide for every molecule of succinic acid it produces from glucose."

The technologies were developed in the labs of Rice professors Ka-Yiu San, the E.D. Butcher Professor in Bioengineering, and George Bennett, the E.D. Butcher Professor of Biochemistry and Cell Biology. The process employs the principles of "white biotechnology" – that is, production without the use of petroleum. Until recently, petroleum-based production was the only way to make succinic acid in industrial quantities. Roquette intends to develop a demonstration plant in France by the end of 2009 with the capacity to produce several hundred metric tons of succinic acid per year. After successful demonstration of the technology, the company expects to begin large-scale production by 2011.

Under the agreement, Roquette obtained the right to commercialize technologies by San and Bennett, who genetically engineered *E. coli* bacteria that produce high yields of succinic acid through fermentation. The Rice process will make producing bio-based succinic acid price-competitive with that of petrochemical origin and further stimulate market development of bio-based and biodegradable polymers that use succinic acid as an intermediate.

Source: Rice University

"A lot of organisms can make succinic acid in small quantities; however, we were interested in the science of making large-scale changes in the metabolic network," said Bennett. "Biological processes have been developed for industrial production of several commercial chemicals with more on the horizon, and we feel these methods are both friendly to the environment as well as being an economical long-term strategy for industry."

"In this process, we're close to the maximum theoretical yield of succinic acid from glucose," said San, who began talking with Roquette officials a few years ago.

Their techniques address the need to develop biorefinery-based techniques that can produce

APA citation: 'Green' chemicals closer to market (2008, December 19) retrieved 26 November 2022 from <https://phys.org/news/2008-12-green-chemicals-closer.html>

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