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Succinic acid production from biorefinery glycerol

BACKGROUND

Succinic acid is an important industrial chemical intermediate for a wide range of dyes, perfumes, lacquers, photochemicals, resins, plasticisers and pharmaceuticals. Conventionally, it is produced by catalytic hydrogenation of maleic acid, a petroleum-derived feedstock.

It is identified as one of the leading 'building block' chemicals for non-petroleum based production by the US Department of Energy.

An award-winning research team at the University of Manchester, under the direction of Dr. Constantinos Theodoropoulos and Prof. Colin Webb, has developed an alternative process, which provides a biochemical route to produce succinic acid from glycerol, a plentiful low-value waste product of biodiesel production.

Dr Theodoropoulos with Professor Colin Webb at the 2011 IChemE Award ceremony

THE TECHNOLOGY

The primary innovation is a batch fermentation technology that, with the aid of an adapted microorganism, produces good yields of succinic acid from crude glycerol. In addition, the team has developed predictive computational models of this bioprocess that have been experimentally validated. The models have allowed the team to determine optimal operating conditions and policies yielding excellent experimental results.

KEY BENEFITS

- Turnkey technology to enable transformation of single-process biorefineries to next generation multi-process, integrated biorefineries.
- Improvement of sustainability and cost-effectiveness of biodiesel production through the valorisation of main by-product.
- Use of low-value waste product from biodiesel production to deliver a low-cost low-energy route to a high-value platform chemical.
- Ability to utilise glycerol in its crude form without the need for a purification step.
- Carbon benefits from replacement of petroleum-derived feedstock.

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APPLICATIONS

The technology is likely to be of interest to the biorefinery industry, industrial producers and users of succinic acid and the biodiesel industry.

INTELLECTUAL PROPERTY

The process is protected by international patent filing (PCT/GB2012/050887) and there is additional know-how associated with the modelling and optimisation process.

Schematic of bio-reactor

OPPORTUNITY

Following a UMIP-funded Proof of Principle project, development is currently at around Technology Readiness Level 4/5, with experimental results achieved at 150 litre. The next major technical milestone will be scale-up to between 1000 – 5000 litre, for which we are seeking e.g. TSB funding or investment or a combination of both.

UMIP commissioned the National Non-Food Crops Centre (NNFCC), based in York, to undertake a market review and is currently securing partners interested in commercialising the technology.

It is expected that the transfer of technology would occur by appropriate licensing agreements.

CONTACT

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