Bio-butylene glycol makes its debut

Genomatica

These 85,000 litre fermenters in Leuna, Germany, are making bio-1,3-butylene glycol

Genomatica has added another string to its bow with the development of a bioprocess to make 1,3-butylene glycol

CYNTHIA CHALLENER VERMONT

Genomatica has extended its fermentation technology platform with the development of the *GENO BG* process, designed to produce 1,3-butylene glycol (BG) from common sugars. The process delivers benefits in performance, sustainability and economics, according to Genomatica CEO Christophe Schilling. The Bio-BG product made by the process brings a naturally sourced and sustainable ingredient to the cosmetics and personal care industry.

Genomatica's successful development with *GENO BG* follows Novamont's smooth start-up and operation of a 30,000 tonne/year plant based on Genomatica's commercial bio-1,4-butanediol (BDO) process.

"*GENO BG* is further validation of our increasing ability to programme biology and the benefits of our pragmatic, economics-driven whole-process approach," Schilling states.

"That translates into faster development of processes that we license to producers of high-volume chemicals, and fast development and ramp-up to directly supply users of specialty chemicals," he adds.

Genomatica uses its bioengineering platform and extensive intellectual property (around 700 patents and applications, plus trade secrets, optimised pathways, proof of concepts, etc) to develop highly optimised microorganisms and processes for multiple high-volume target chemicals. The company applied its experience in developing and transferring processes to more than a dozen sites worldwide to the *GENO BG* process.

"We started by applying computational models to the design of novel pathways, identifying the optimal ways to produce BG. Pathways were constructed using novel enzymes, and then we 'system-engineered' a high-yield organism and complete process based on the needs of the entire production process," says Schilling. He notes that Genomatica's work with biobased butadiene, performed in partnership with ENI Versalis, also influenced the *GENO BG* programme.

Engineering an optimised organism to make Bio-BG did, however, require tackling new challenges beyond Genomatica's prior innovations. For example, the BG organism required overcoming a strong thermodynamic barrier; focusing on key enzymes; and optimising the host-redox metabolism to balance the pathway and fermentation process, according to Schilling.

The process is more sustainable than the conventional petrochemical-based route because it uses renewable, naturally-sourced plant sugars instead of acetaldehyde, a known toxin, carcinogen and irritant. The *GENO BG* process also provides a distinctive level of purity that is difficult and expensive to achieve using conventional chemical methods, according to Schilling.

The global market for butylene glycol is about $200m/year, according to Genomatica. The company is selling Bio-BG as a branded ingredient, focusing on the cosmetics and personal care industry given the rising demand for natural and sustainably-produced ingredients in this market. Genomatica believes that its ingredient will be highly competitive, given these appealing product benefits added to similar or better product performance.

In addition, the distinctive purity of Bio-BG offers the possibility of new applications and new markets, including in sports drinks and medical supplements – an example where mastering the selectivity of biology can deliver practical benefits, according to Schilling.

For Genomatica, success with *GENO BG* further validates the company's ability to rapidly commercialise new, desired process technologies and products. It also marks the firm's entry into specialty chemicals as a complement to its established position as a technology innovator for intermediate chemicals, according to Schilling.

CHRISTOPHE SCHILLING
CEO, Genomatica

"*GENO BG* is another concrete example by Genomatica of biology's power to delivery a commercial bioprocess"

Samples of Bio-BG have been available since mid-2017. Genomatica continues to produce sizable volumes for market sampling in large scale (85,000 litre) fermenters at EW Biotech in Germany. Charter partners have been secured and the company is also engaging with multiple firms to validate quality and usability. ■

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