Combining fermentation technology and green chemistry the chemical modification of sophorolipids

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In the pursuit of sustainability, the European chemical industry is increasingly becoming aware of the importance of renewable resources. They are good alternatives for fossil resources since the latter have a major environmental impact and a limited supply. Traditionally, renewable resources are broken down into base chemicals which are then used to synthesize the desired products. The cost for these renewable based chemicals is very often higher than for their fossil counterparts, rendering them uncompetitive for the synthesis of high value products. Instead, natural compounds with a complex structure can directly be used as building blocks in an organic synthesis pathway to reduce the number of synthetic steps required to obtain high value products. Their chemical modification contributes to the sustainability of the process and the end product. This green synthesis approach can be applied on sophorolipids. These glycolipids are produced directly by the yeast Starmerella bombicola from renewable resources through fermentation. They have been successfully commercialized as biosurfactants due to their surface-active properties, beneficial biological activities and high production quantities. A drawback is that, to date, their microbial production is restricted to only a few derivatives. Consequently, the variation in their surface-active properties such as hydrophilic/lipophilic balance or foaming properties is limited and their biological activities have not yet been optimized. A chemical modification pathway was developed to extend the existing set of sophorolipid analogues. The major microbial product, i.e. the diacetylated sophorolipid lacton, was transformed into a sophorolipid platform molecule in a limited number of consecutive steps. This platform molecule was then used for the synthesis of a range of innovative sophorolipid analogues which can serve as green surface-active compounds or compounds with biomedical potential.

References

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BIO

Prof. Dr. ir. Christian V. Stevens (1965) is currently senior full professor at the Department of Green Chemistry and Technology, Faculty of Bioscience Engineering (Ghent University). He graduated as bio-engineer in chemistry in 1988 and obtained a PhD in 1992 at Ghent University. He then performed postdoctoral work at the University of Florida, USA with the late Prof. Alan Katritzky as a NATO Research Fellow. In 1994, he performed a postdoctoral training at the University of Alicante (Spain) with Prof. Miguel Yus and became research leader of the FWO-Flanders (Fund for Scientific Research) in 1995.
In 2000, he became associate professor and started the research group SynBioC (Synthesis, Bioresources and Bio-organic Chemistry). In 2008 he became full professor, was Chair of the Department in 20216-2017, and was promoted to senior full professor in 2014. He became Fellow of the Royal Society of Chemistry Britain in 2011.
In 2015, he received the First Prize in the Emerging Technologies Competition from the Royal Society of Chemistry (UK, London) and is Elected Member of the Royal Flemish Academy for Science and the Arts. Prof. C.V. Stevens published over 360 international peer reviewed scientific papers and reviews. He holds also several patents on the synthesis and applications of heterocyclic compounds and renewable resources. His research interests are focussed on microreactor technology, on synthetic heterocyclic chemistry related to agrochemical and medicinal applications and on the use of renewable resources for the industry.