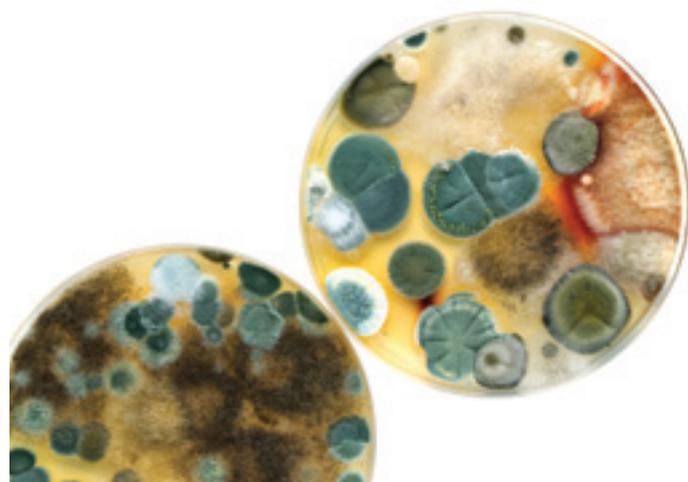


ECO-CLEANERS, GREEN COSMETICS AND BIO-ACTIVE MEDICINE

BIOSURFING – How new yeasts will boost our everyday chemicals

The project: Shaping bio-based platforms for an eco-friendly chemical production

Laundry and household cleaning are facilitated by tons of chemical helpers. They are the agents in our cleansing liquids, wash powders, foams and rinsers. These chemicals, called surfactants or surface active agents, help to make dirt and fat soluble and to keep cleansers smooth or stable. But such chemical all-purpose weapons are not only good for households, they are also applied in oil recovery, and in the agricultural, paper and pharmaceutical industries. Industrialisation would not have happened without these multi-taskers. Their big disadvantage, however, is that the majority are still based on petroleum and are in some cases eco-toxic, damaging water and soil because of their non-biodegradability. Currently, the world annual surfactant production exceeds 13 megatons, with rising trends in the emerging markets of Asia, South America and Africa. As our environmental concerns deepen, ecologically friendly materials gain more global interest.



The EU-funded project, BIOSURFING, therefore found a promising target in the bio-based economy by exploring paths to produce these surfactants in plant-based ways – through molecular-engineered yeasts and the yeast-fermentation of sugars and vegetable oil. Before the green chemicals reach the market, the researchers need to overcome several natural barriers. The overall use of bio-surfactants is hampered by the lack of structural variation. This is in sharp contrast to chemically produced surfactants, which contain a lot of multi-purpose building-blocks, called structural variants. While the

petroleum-based surfactants introduce variation by simply changing the building blocks and can easily be converted into a myriad of different products, the bio-based surfactants are limited in their range. The BIOSURFING project aims to alleviate this fundamental limitation by developing a generic bio-technological production technique for glycolipid bio-surfactants. The BIOSURFING project intends to achieve this by using novel, molecularly engineered yeast strains. These will lead to new product properties, suitable for multi-purpose applications in households, factories and labs.

The product: Cleansers, foods, cosmetics, drugs and nano-particles

The good biodegradability of tailor-made eco-cleaners, bio-based painting materials, polishes, green-wash and cleansing emulsions will turn out to have a real advantage over bio-based bulk chemical production. Soon EU legislation will ask for more eco-friendliness in the entire production cycles. BIOSURFING provides the building-blocks with its novel yeasts.

Bio-surfactants will be compounds in cosmetics, foods, textiles and pharmaceuticals – they intervene practically in nearly every product and every aspect of daily life.

Certain bio-surfactants can also be used for anti-microbial and anti-fungal purposes in agriculture and in plant protection. The immunological properties or inducers of cell differentiation can be applied in pharmaceuticals and bio-medicine. Nano-materials and ceramics can be composed of bio-surfactants.

The end-users: Players in the production and consumption of bio-surfactants

Biochemical industry will most benefit from the process development which offers new molecular-engineered yeasts and process platforms for bio-refineries.

Industrial compound producers for bulk chemicals and fine chemicals will be the clients of the future patent-holders.

Agriculture chemical industry and manufacturing industries will use applications of bio-surfactants on many levels, such as composition of products, protection and finish of surfaces, and the cleaning of machinery and buildings.

Retailers and consumers will see the new eco-friendly products in green mass-markets of chemical household goods, cosmetics, pharmaceuticals and other applications.



It is expected that this technology will result in a breakthrough penetration of glycolipid bio-surfactants in the overall surfactant market, and will help to build the bio-based economy in this way.

The inventors: Academics, SMEs, industries

The project aims to create new-to-nature and tailor-made bio-surfactants through metabolic engineering of the unconventional yeast *Starmerella bombicola*.

The main objectives of the BIOSURFING project can be divided into three main interacting parts: (1) strain development allowing control over all structural parts of the glycolipid bio-surfactant, (2) development of a production and purification process, (3) application evaluation in cleaning and cosmetics, medics and nano-science. The project thus covers the whole innovation chain from basic research to production and application development.

The Centre for Industrial Biotechnology and Biocatalysis at Ghent University coordinates the consortium. Together with the three academic partners in the project (University of Ulster, UK; University Pierre et Marie Curie, France; Ghent University, Belgium), five industry and SME partners are collaborating (Bio Base Europe Pilot Plant, Belgium; Celletics, France; Werner & Metz GmbH, Germany; Cosmetic sp. Greece; Ecover, Belgium).

IPR-securing actions and patenting will be ensured prior to commercialisation of envisaged processes and products.

Development stage: Up-Scaling and piloting

Molecular engineering and development of new strains in yeast *Starmerella bombicola* has been done.

Downstream processing procedures for the new-to-nature glycolipid bio-surfactants are being developed.

Demonstration and scale-up of developed fermentation at 25000 l scale is envisaged.

Samples of new bio-surfactants: supply of gram-to-kilogram sample material planned.

Policy impact: Eco-friendly daily lifestyles, new EU regulations and feeding the GMO debate

The project BIOSURFING clearly contributes to the lead-market initiative for bio-based products, and in overall terms to the Europe 2020 strategy for sustainable economic growth.

The new-to-nature bio-surfactants will meet the requirements of the altered chemical products regulations such as the REACH legislation for novel bio-based products (easier, cheaper, introduce subsidization). The novel products will contribute to a more competitive and eco-friendly European industry.

BIOSURFING and the resulting application also feed into the discussion about GMO use and the need to solve societal challenges.

Next steps: Feasibility assessment, evaluation of applications, marketing

Samples will be evaluated by various companies and in various applications. Economic feasibility studies of processing will be carried out, exploratory marketing will prepare for commercialisation.

Licensing processes will ensure that the novel compounds will be used in real-life products or applications on European and global markets.



BIOSURFING

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