SURFtoGREEN
BIO-BASED SURFACTANTS

Bio-based sustainable SURFactants TO foster GREEN industry

Petr Humpolíček

THE PROJECT IS SUPPORTED BY THE CIRCULAR BIO-BASED EUROPE JOINT UNDERTAKING AND ITS MEMBERS

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Department of Biomaterials Research

Established 2011

- Material design
- Material chemistry
- Material technology
- Material characterization
- Biocompatibility
- Cytocompatibility
- Advanced *in vitro* models
- Antimicrobial activity

A unique combination of knowledge and experience of team members across the full spectrum of biomaterials research techniques.

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Global Experience Opens Doors and Builds Trust

Established 2011

- Systematic networking of collaborating laboratories
- Systematic networking through short and long-term exchanges

Finland, Sweden, France, Spain, Portugal, Italy, Austria, Slovenia, Slovakia, Poland, USA, New Zealand …

MIT, Chalmers University of Technology, The University of Auckland, Åbo Akademi University …

≥ 50% publications with foreign partners

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

From Trust to Triumph: The Power of Collaboration

2015
- PhD student intership at Chalmers University of Technology – Sweden

2015 – 2023
- three long-term exchange fellowships, five joint publications

2023
first joint project application H2020

2024 – second joint project application

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Project preparation

- The critical role of the coordinator, in particular his/her experience to date
  - Ensured professional support from the coordinator in terms of preparation of documents, budget, WP layout etc.
    - Professional consultants with experience in H2020 solutions (not only preparation)
  - Successive addition of other consortium members as needs arise during the preparation process.
    - Highly multidisciplinary team

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

SurfToGreen - partners

CSGI – COORDINATOR
INFO

AALTO KORKEAKOULUSAATIO SR (AALTO)
INFO

ADSORBI AB (ADS)
INFO

AIRI – ASSOCIAZIONE ITALIANA PER LA RICERCA INDUSTRIALE
INFO

CHALMERS UNIVERSITY OF TECHNOLOGY
INFO

CHT GERMANY GMBH (CHT)
INFO

INRAE
INFO

MONTINUTRA – BOREAL BIOPRODUCTS
INFO

NOURYON
INFO

OLEON
INFO

PROCTER & GAMBLE
INFO

SOFIA UNIVERSITY ST KLIMENT OHRIDSKI
INFO

SPIGA NORD
INFO

UNIVERSIDAD DE HUELVA
INFO

UNIVERSITÁ CA' FOSCARI
INFO

UNIVERZITA TOMASE BATI
INFO

NIKKO – ASSOCIATED PARTNER
INFO

SHISEIDO – ASSOCIATED PARTNER
INFO

SICHUAN UNIVERSITY – ASSOCIATED PARTNER
INFO

Co-funded by the European Union

Project preparation

- High impact on industrial applications
  - Clearly defined inputs, process requirements and defined outputs in the form of industrial application and impact on society
- Basic research - is also included but is not the primary objective of the project. However, it may be important for some WPs.

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

SurfToGreen - intro

- **Surfactants** are chemical compounds that decrease the surface tension or interfacial tension between two liquids, a liquid and a gas, or a liquid and a solid.

- Formulations in industrial applications primarily rely on fossil-based surfactants/polymers significantly contributing to environmental pollution (CO_2 increase, microplastics) and are scarcely sustainable.

- **SurfToGreen** develops a new portfolio of **fully bio-based surfactants** for key applications. By **using renewable biomass-derived building blocks sourced from EU agricultural and forest side streams**, we are creating surfactants with over 95% bio-based content, **overcoming the current performance and production throughput constraints**, as well as provide environmentally friendly alternatives to conventional petroleum-based products.

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

SurfToGreen - aim

Paradigm shift: To develop new chemicals and formulations technologies that prioritize sustainability at lower costs and without compromising their performances.

We validate the effectiveness, sustainability and safety of our bio-based formulations in key industrial applications such as **home and personal care**, **textile enhancement**, and **agriculture**.

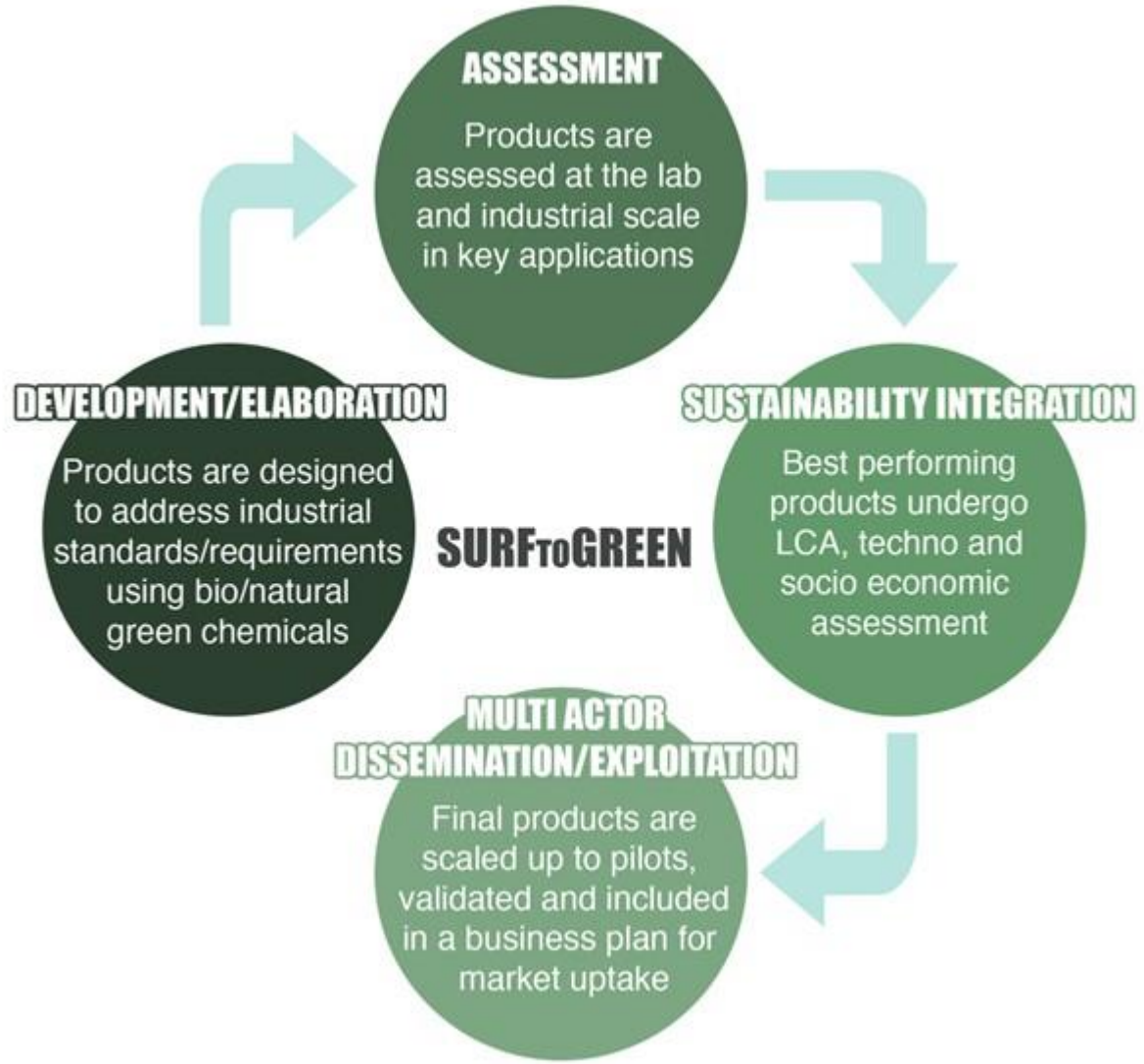
Thanks to a collaboration between major market players and small businesses, SurfToGreen aims to gain significant market share and compete against existing products, ensuring a **paradigm shift towards more environmentally friendly practices**.

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

SurfToGreen - approach

SurfToGreen innovates the formulations landscape by developing new bio-based surfactants derived from renewable and low-value side-stream materials. We propose a radical and comprehensive approach to develop, upscale and secure the integration of novel eco-friendly surfactants into key applications, overcoming the main limitations of traditional methods.



Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

SurfToGreen - approach

We apply a holistic approach **integrating green metrics, safety assessments, Life Cycle Assessment (LCA), Safe and Sustainable by Design (SSbD) and digital technologies**.

We evaluate the bio-based formulations **throughout their entire lifecycle**, and we **assess their functionality** (high performances of the formulations), the **safety** (human health, environmental and physical hazards; risks for workers, public health and the environment along the life cycle) and **sustainability** (environmental impacts, technoeconomic aspects and social acceptance).

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Specific Know-how related to the project

Antimicrobial activity

- *from antibacterial to evaluation of impact on microbioms*

Cytocompatibility evaluation

- *from basic cytotoxicity to in vivo simulated conditions*
- *reconstituted 3D tissues models*
- *from cancer cells to iPSC*

Surfactants characterization

- *surface and interfacial tension, contact angle foamability*

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Role in the project

WP2 & WP3 (minor)

WP5 Task 5.2: Toxicological and ecotoxicological testing (task lead: TBU)

- Antibacterial properties
  - *disk diffusion test*
  - *minimum inhibitory concentration*
  - *absorption method to determinate antibacterial activity of textile products according to EN ISO 20743*

- Biocompatibility
  - *Cytotoxicity - EN ISO 10993-5 Biological evaluation of medical device*
  - *In vitro Skin irritation: OECD Test Guideline N°439 and EN ISO 10993-23*
  - *Further biological testing as required*

- Ecotoxicity
  - *Acute in vivo toxicity (OECD 201 for algae and 202 for Daphnia magna)*

Circular Bio-based Europe Joint Undertaking
Bio-based Industries Consortium
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Contacts

Petr Humpolíček
humpolicek@utb.cz
+420 734 792 298