



High Performance Bio-based Functional Coatings for Wood and Decorative Applications

Overview of the PERFE COAT project and its approach and technologies

Webinar 1

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The BBI JU project PERFE COAT

BBI JU/CBE JU: The Bio-based Industries Joint Undertaking (BBI JU) and its successor, the Circular Bio-based Europe Joint Undertaking (CBE JU) have since 2014 been a partnership between the European Union and the Bio-based Industries Consortium (BIC) that funds projects advancing competitive circular bio-based industries in Europe.

Call for proposals: BBI2020.SO3.R5: Improve the sustainability of coatings

Project title: High Performance Bio-based Functional Coatings for Wood and Decorative Applications (**PERFE COAT**)

Project type and TRL range: Research and Innovation Action, TRL3-5

Website: www.perfeccoat-project.eu



Circular
Bio-based
Europe
Joint Undertaking



Bio-based Industries
Consortium



The PERFE COAT project

Project consortium and budget

12 Partners from 7 countries:

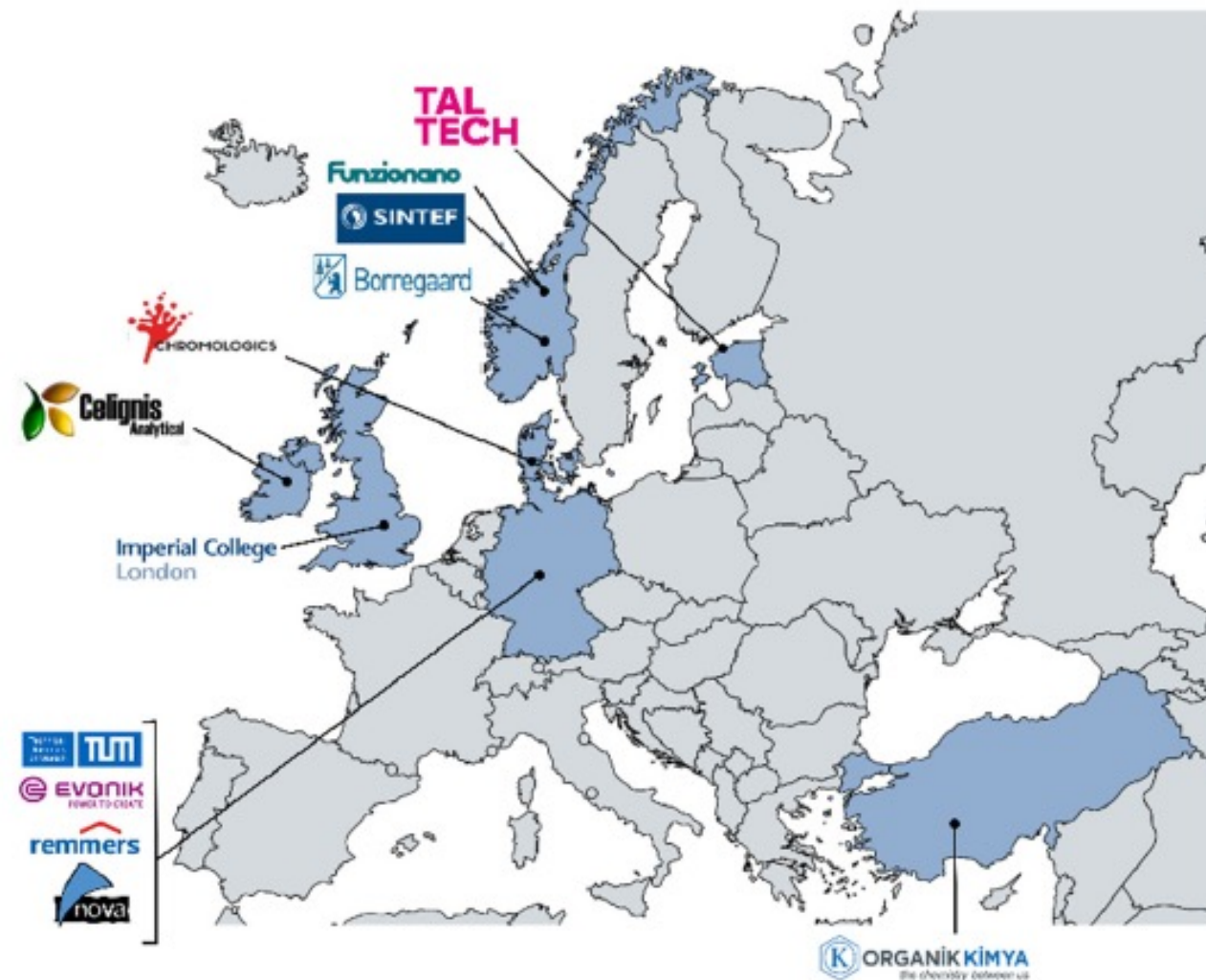
- **4 Large companies** (Evonik, Borregaard, Remmers, Organik Kimya)
- **4 SMEs** (Celignis, Funzionano, Chromologics, Nova-Institut)
- **3 Universities** (Technical University of Munich, Tallinn University of Technology, Imperial College London)
- **1 RTO** (SINTEF)

Project coordination: SINTEF AS (Norway)

Project period: 01.05.2021 – 30.09.2024 (41 m)

Total budget: € 6,250,541.25

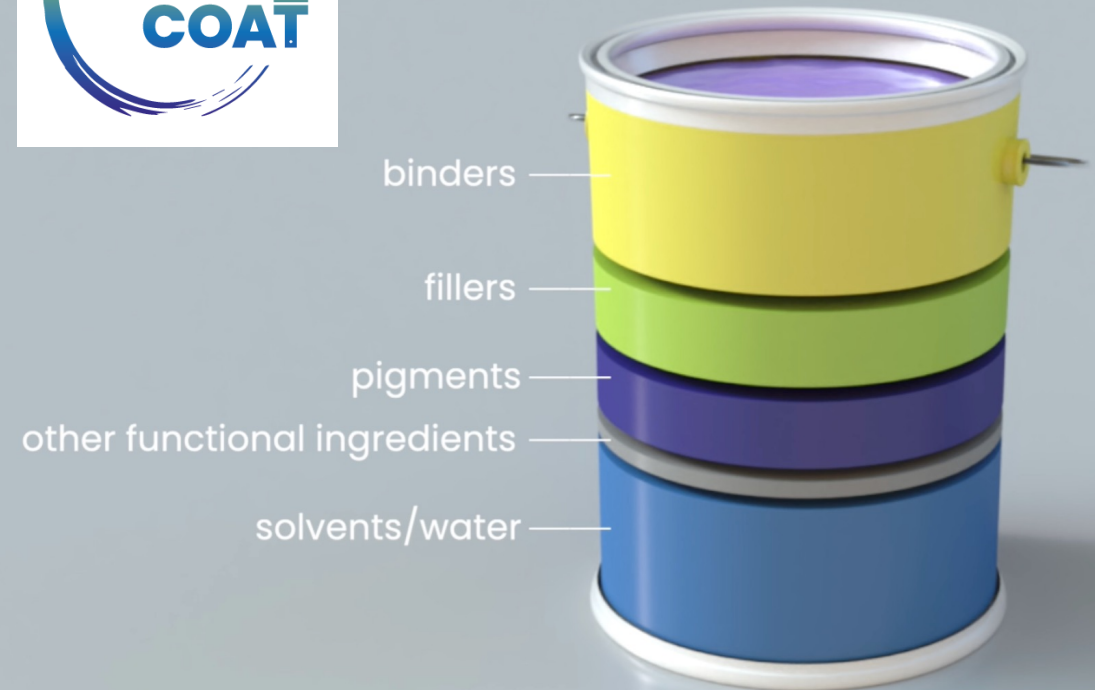
EC/BBI JU contribution: € 4,999,567.50





The challenge... and PERFECOAT's modular solution

The primary goal of the **PERFECOAT** project is to develop and validate a new generation of industrial wood and decorative coatings with significantly more than 25% bio-based components that meet and even surpass the current quality and sustainability standards.





The challenge... and PERFE COAT's modular solution

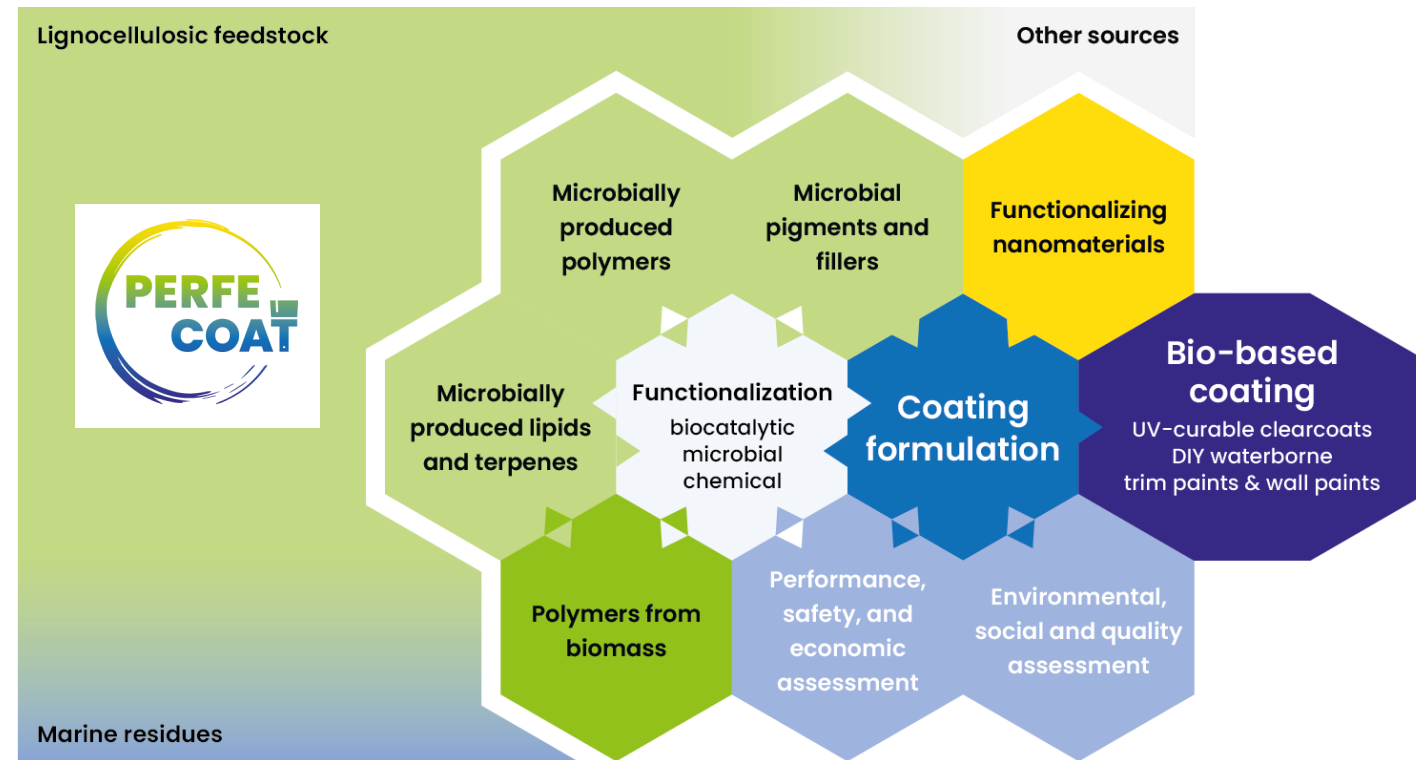
The primary goal of the **PERFE COAT** project is to develop and validate a new generation of industrial wood and decorative coatings with significantly more than 25% bio-based components that meet and even surpass the current quality and sustainability standards.

Our concept is based on a flexible technology platform of novel technologies to produce innovative bio-based binders, fillers, and pigments from a range of biopolymers and functionalized materials and assemble and test them in new coating formulations.

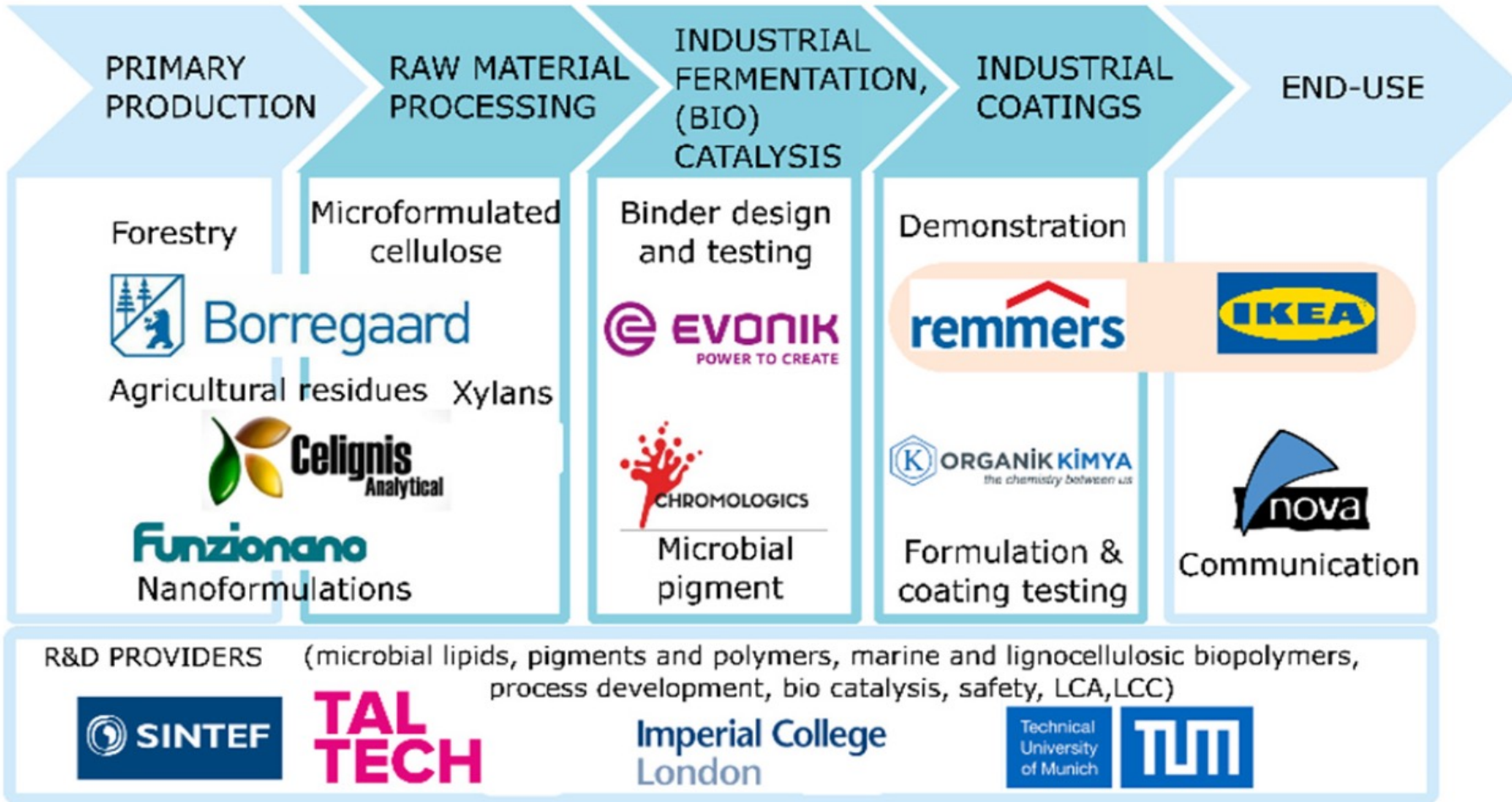
Markets addressed:

- UV-curable clearcoats
- DIY waterborne trim paints
- DIY waterborne wall paints

Modular Approach for the PERFE COAT Coatings Development and Validation



Value chain



The new value chain being developed in the **PERFE COAT** project and the approximate positioning of the project partners along that value chain.

- Complete value chain from substrate provision to industrial scale-up and quality assessments

Value chain and work plan integration

WP 1-3

- WP1** Generation of biopolymers, lipids and terpenes for bio-based binder production
- WP2** Making of UV-curable and waterborne binders
- WP3** Generation of fillers, pigments and functional nanomaterial

- ALGINATE
- TERPENES
- LIPIDS (FA)
- PIGMENTS
- CELL MASS

- MFC
- XYLANS
- CHITOSAN
- POSS



WP 4-5

- WP4** Coating formulation and performance testing
- WP5** Validation and demonstration at TRL4-5



WP 6-8

- WP6** Safety and sustainability assessment
- WP7** Dissemination, communication, exploitation
- WP8** Project management



PERFE COAT value chain implementation

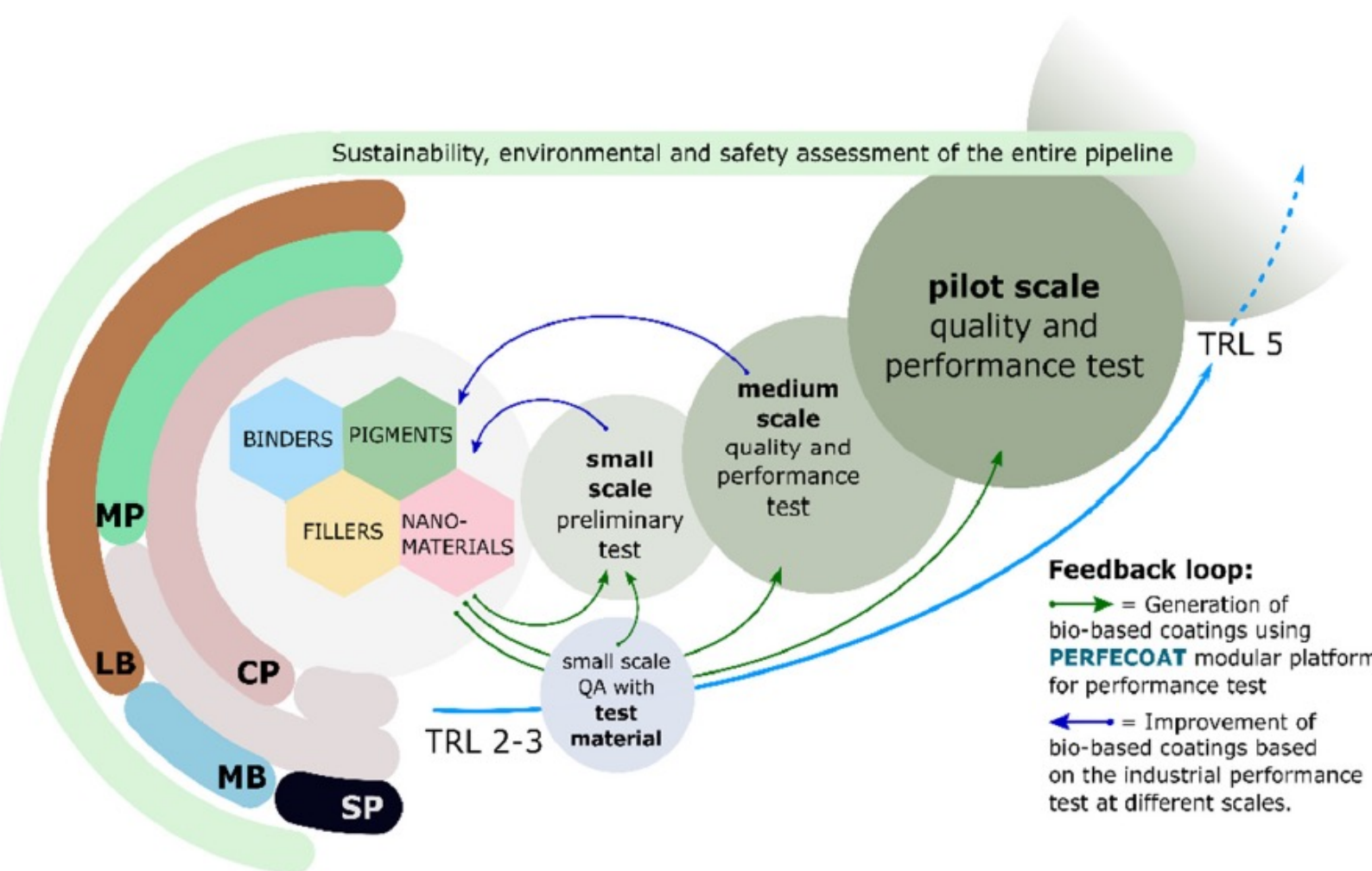
- Integrated work plan to achieve the project goals

Land-based biomass **LB**, marine biomass **MB**, synthetic production **SP**, microbial production **MP**, chemical/chemoenzymatic processing **CP**



Ambition and TRL advancement

Sustainability, environmental and safety assessment of the entire pipeline



Feedback loop:

→ = Generation of bio-based coatings using **PERFE COAT** modular platform for performance test

← = Improvement of bio-based coatings based on the industrial performance test at different scales.

PERFE COAT TRL advancement in repetitive cycles of compound production and testing

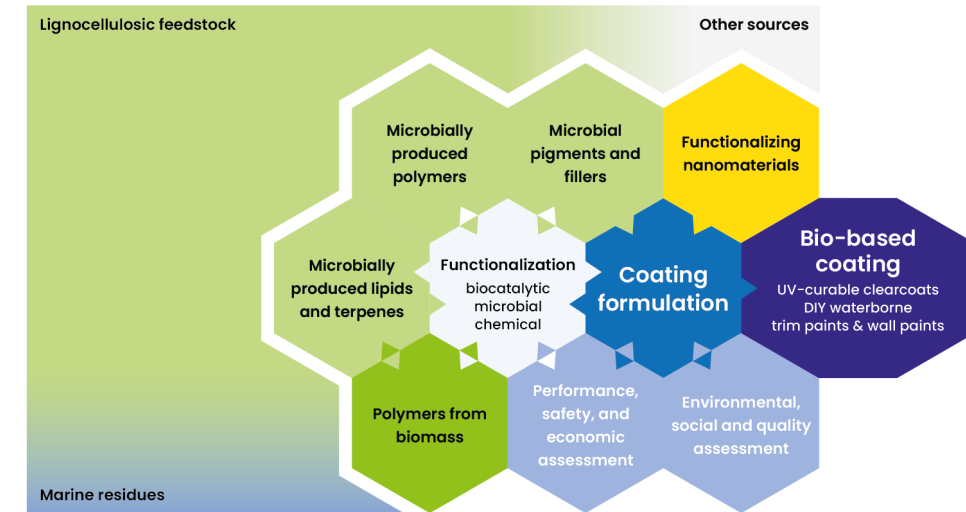
- TRL5 targeted at the end of the project

Land-based biomass **LB**, marine biomass **MB**, synthetic production **SP**, microbial production **MP**, chemical/chemoenzymatic processing **CP**

Using biotechnology to produce bio-based paint ingredients

- Definition (OECD): **Biotechnology** is the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.
- It encompasses various **disciplines** such as genetics, molecular biology, biochemistry, and microbiology to manipulate living organisms or their components (e.g., enzymes) for practical applications.
- **Industrial biotechnology** utilizes microorganisms and enzymes for the production of chemicals, fuels, and materials, for waste treatment, and for bioremediation.
- **Bioprocesses** include the microbial cultivation/fermentation, the fractionation and downstream processing (DSP) of microbial cell cultures for product recovery, and the scale-up of production.

Modular Approach for the PERFECOAT Coatings Development and Validation



PERFECOAT produces base chemicals from [lignocellulosic and marine biomass residues](#) using innovative biotechnological processes, which are then functionalised into new bio-based paints and coating ingredients.

Using biotechnology to produce bio-based paint ingredients

Through fermentation of lignocellulosic sugars:

- Microbial polymers like alginate and xanthan
- Microbial lipids and terpenes
- Microbial pigments
- Microbial cell mass as fillers

Through chemoenzymatic extraction from lignocellulose residues:

- Xylan biopolymers
- Micro-fibrillated cellulose (MFC)

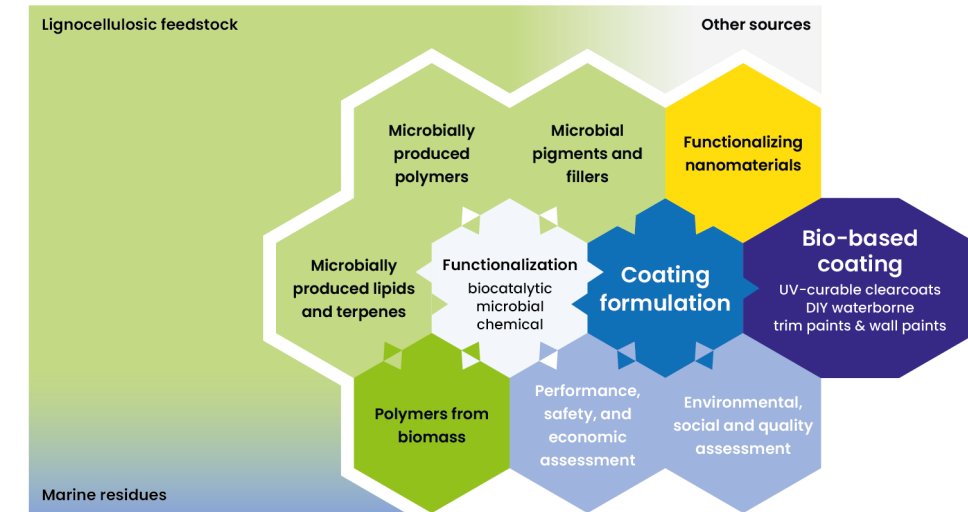
Through chemoenzymatic extraction from marine residues:

- Biopolymers chitin and chitosan

➤ **Chemical upgrading** to achieve the required physical and chemical properties and functional activation

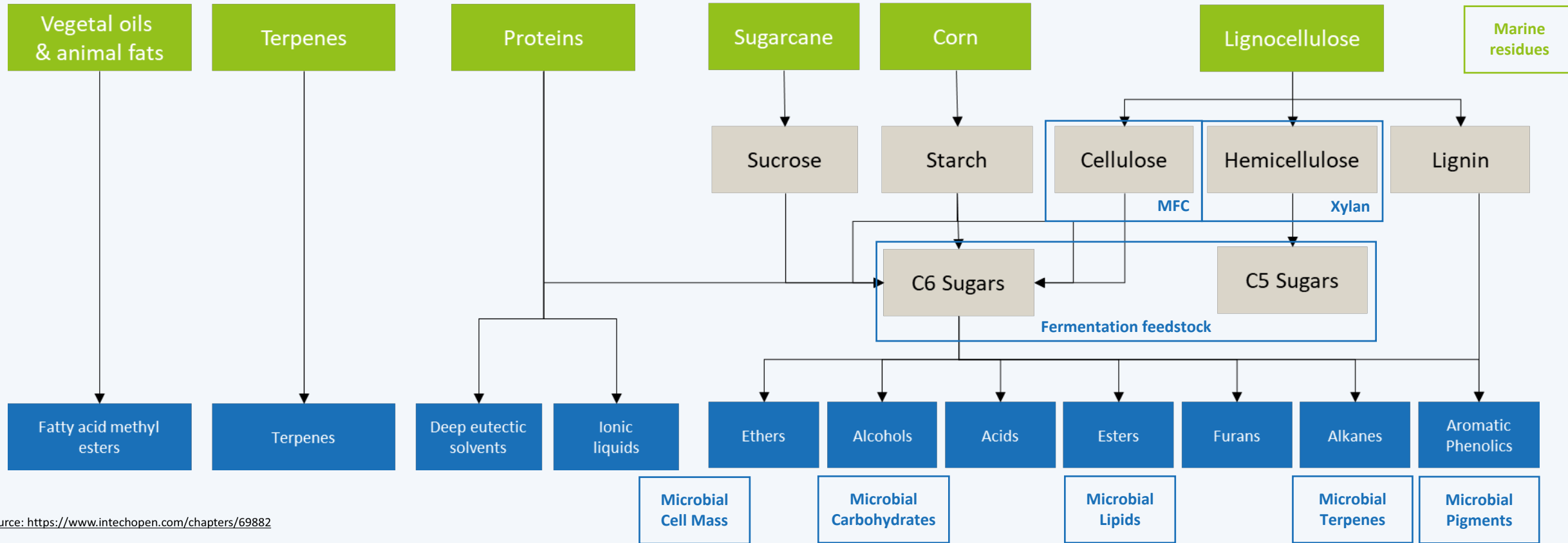
➤ **Incorporation of POSS** (polyhedral oligomeric silsesquioxanes) and MFC to tailor performance

Modular Approach for the PERFE COAT Coatings Development and Validation



- ❖ Basic and advanced testing (feedback loop)
- ❖ Coating formulation, compatibility, performance
- ❖ Demonstration for UV-curable and waterborne paints and coating applications

Biobased raw materials



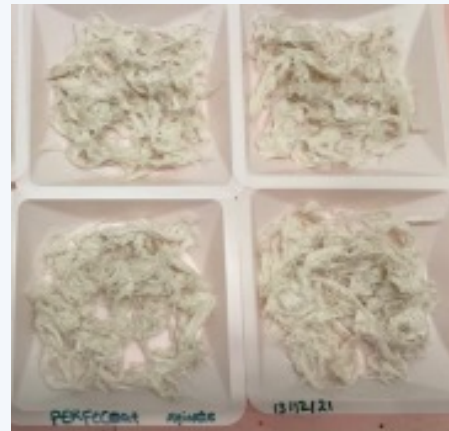
Source: <https://www.intechopen.com/chapters/69882>

Using biotechnology to produce bio-based paint ingredients

Examples from PERFE COAT



Microbial alginate production

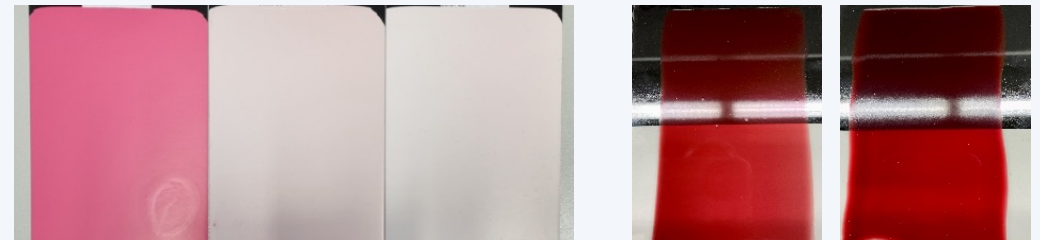
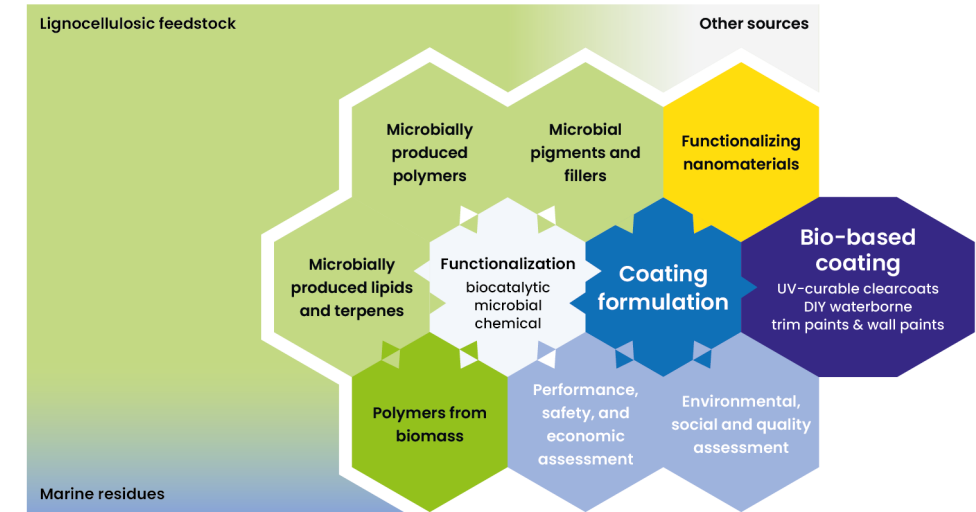


Microbial lipids production



A new generation of red pigments from microbial fermentation

Modular Approach for the PERFE COAT Coatings Development and Validation





Summary and Conclusions

- ✓ The **PERFE COAT** project develops and validates a **new generation of bio-based paint ingredients for enabling industrial wood and decorative coatings with at least 25% bio-based content** while meeting current quality and sustainability standards.
- ✓ This is achieved by building a **flexible technology platform** to produce innovative bio-based binders, fillers, and pigments from a range of biotechnologically produced biopolymers, lipids, and functionalized materials, and assemble and test them in new coating formulations.
- ✓ Technical developments are guided by rigorous **performance testing and validation** of ingredients and formulations, supplemented by **assessment of safety, as well as environmental and social sustainability**.

Learn more about PERFE COAT results:

- Next webinar issues (April 8, May 13, June 10, 2024)
- Final webinar on August 26, 2024, dedicated to PERFE COAT results
- Exploitation workshop in Brussels (BIP Meeting Centre) on April 24, 2024
- Website: www.perfeccoat-project.eu
- Social media: LinkedIn - #PERFE COAT



Acknowledgements

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Industry partners:



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Thank you for your attention !

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