

## COUNTLESS readies lignin-based platform chemicals for the market

**In COUNTLESS, 13 partners, coordinated by VITO (Belgium), will take lignin processing to industrial scale, making the production of lignin-based platform chemicals cost-effective and sustainable.**

**COUNTLESS (Cost-effective production of lignin platform chemicals extending the biobased chemicals portfolio) will deliver pioneering techno-economic demonstration of the first continuous catalytic hydrogenolysis process at demo scale. Project partners will process the lignin-based platform chemicals and demonstrate their applicability and cost-effectiveness. The end-use cases will be tested by industry-leaders Braskem, Soprema, Kastamonu, and Daren Labs, with Bloom Biorenewables and Fibenol supplying the lignin.**

### Renewable products with minimal environmental footprint

Europe's ambitious sustainability and climate goals can only be achieved through a transition from fossil-based to bio-based chemical building blocks. Using lignin as a bio-based resource, COUNTLESS aims to replace high-impact, non-renewable substances used in different sectors, such as construction materials, cosmetics and chemicals industry, thus substantially reducing the climate impact and dependence on fossil resources of these sectors. COUNTLESS will deliver a sustainable process from lignin supply to platform chemicals, which will be tested in industry conditions. Importantly, it aims to ensure the overall sustainability of the bio-based end products, starting with the lignin supply, via the processing of platform chemicals, to their inclusion in the foreseen applications.

### Addressing the lignin challenge

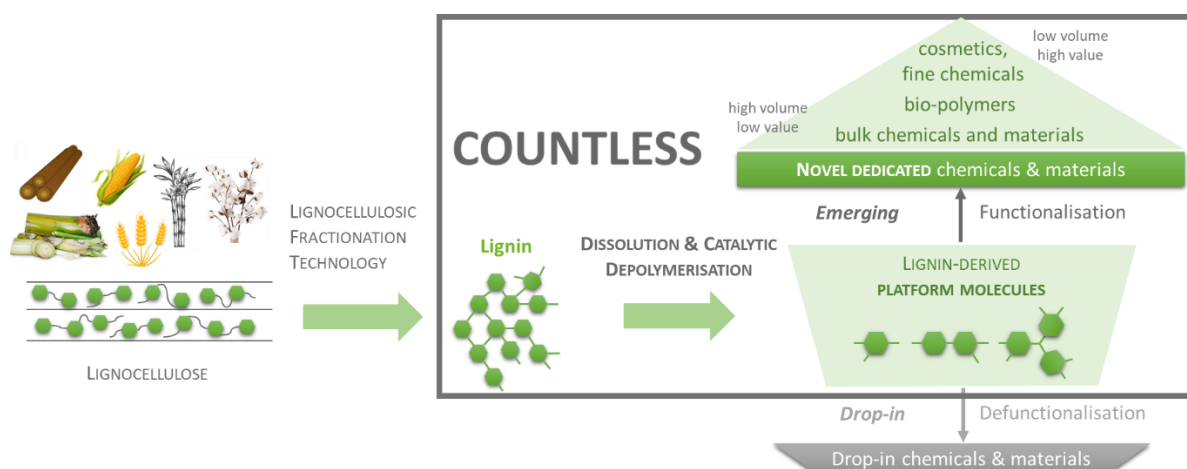
Lignin is an abundant natural polymer found in woody biomass. Although lignin has substantial potential to be a starting material to produce functionalized aromatic compounds, which make up a significant share (40%) of today's chemical building blocks, today, only 1-2% of the annual lignin production is chemically converted and utilized as a material. Lignin is a complex, heterogeneous, and recalcitrant molecule, hampering the full exploitation of isolated lignin fractions.

To address this challenge, COUNTLESS focuses on an efficient lignin depolymerization process to break the complex polymer down into smaller, more manageable molecules with improved solubility and reactivity. This way, the project unlocks the full potential of lignin as a source of monomeric and oligomeric platform chemicals, which can be used as building blocks in quite literally countless applications serving different market areas. By converting lignin in a clear, repeatable, and defined process, lignin-based materials will become better, cheaper, and more diversified.

To demonstrate this first catalytic hydrogenolysis process operated in continuous mode at industrially relevant scale, the unique LignoValue Pilot infrastructure of VITO (Belgium) will be used.

## Demonstrating the applicability and cost-effectiveness of lignin-based platform chemicals

COUNTLESS does not stop with developing technologies for lignin depolymerization. It will also demonstrate and communicate the applicability and cost-effectiveness of the resulting lignin-based platform chemicals in a variety of end-use cases, from bulk to specialty applications. Giving the right technology, bio-based products are no simple substitute for their fossil-based predecessors. In an efficient use of all-natural resources such as plants and wood, bio-based products not only help reduce greenhouse gas emissions but can also offer other advantages such as novel product characteristics and additional product functionalities. Specific examples of innovative products based on lignin include drop-in chemicals, new adhesives, flame retardants, UV absorbers for the personal care sector, polyurethane-based insulation materials and bitumen binders.



*COUNTLESS project overview.*

## The COUNTLESS consortium

To achieve this, the experienced partners in COUNTLESS cover the whole value chain including feedstock suppliers, technology development experts, well-recognized industry players in the respective application fields, experts in dissemination, communication and exploitation, and experts in integrated sustainability, environmental, and techno-economic assessments.

**Industrial partners**, both large companies serving global markets (SOPREMA (France, Belgium and Italy), BRASKEM Europe (Germany), Fibenol (Estonia) and Kastamonu Entegre Agac Sanayi (KEAS, Turkey)) and **SMEs** active as innovative technology providers (Daren Labs (Israel), associated partner Bloom Biorenewables SA (Switzerland)) are involved in R&I activities. These activities range from detailed characterization of feedstocks, via the optimization and demonstration of the production process of lignin-based platform chemicals and downstream processing into the targeted applications, to supporting the development of business plans and exploitation strategies.

**Research and technology centers** VITO (Belgium), Utrecht University (Netherlands), VTT (Finland) and IFEU - Institute for Energy and Environmental Research Heidelberg (Germany) contribute to the development of the main technological innovations in COUNTLESS, sustainability assessments and implementation of innovative, real-time process performance testing and monitoring technologies, always in close interaction with industrial partners. The consortium is complemented by CLIB (Germany), managing the dissemination, communication and exploitation activities.

If you want to find out more about the COUNTLESS project, please contact Project Coordinator Kelly Servaes ([Kelly.servaes@vito.be](mailto:Kelly.servaes@vito.be)).

You can also check the website [www.countless-project.eu](http://www.countless-project.eu) or follow us on [LinkedIn](#).



*Group picture of the COUNTLESS consortium at the LignoValue Pilot site, 12.09.2023*



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