

RfP DELICARE

## Request for Industrial Partners to join the Industrial Advisory Board

**Project title: Depolymerization of hydrolysis lignins for conversion to acrylic resins**

**Acronym: DELICARE**

Project ID	
Type	Strategic Basic Research for clusters (cSBO), bio-economy, intercluster project with the spearhead cluster SIM
Period	3 years
Starting date	January 1 <sup>st</sup> , 2023
Total project budget	€ 1.500.000
Subsidy percentage	according to SBO regulations
Industrial partners (Advisory Board)	Current partners not disclosed at the moment
Applicants (Knowledge partners)	Ghent University, VITO
Catalisti contact	Aron Deneyer (adeneyer@catalisti.be)

### Project description

#### Introduction

Aromatic chemicals make up a significant share (40%) of today's chemical building blocks for a wide array of day-to-day products and applications. Given its molecular structure, lignin, as a renewable resource, presents itself as a promising bio-based alternative to fossil-based crudes for aromatics production. In this DELICARE project the transition to sustainable value chains will be created by the production of acrylic resins derived from hydrolysis lignin via catalytic reductive depolymerization. Hydrolysis lignins produced in biorefineries have great potential. While as much as 60 million tonnes of lignin are potentially available/recoverable from biorefineries, today only 0.3 % of this potential is realized. The main challenge to go beyond the mere energy use for hydrolysis lignin, arises from its heterogeneity, substantial saccharide content, limited solubility and reactivity. Hence, to fully exploit the potential of hydrolysis lignin as a source of platform molecules to replace their fossil-based counterparts, there is an urgent need to find suitable technologies allowing to 'liquify' this type of lignin, by efficient solubilization and depolymerization strategies.

The growing need for process intensification, combined with the huge advances in catalyst support manufacturing technologies, are the driving forces behind the development of a new generation of catalyst designs through additive manufacturing or 3D-printing technologies.

In DELICARE acrylates are selected for the product development, because of their huge valorization potential in Flanders with many companies active in this field.

#### Goals

This project aims at the incorporation of hydrolysis lignin in two types of acrylics, i.e., (1) antioxidative polyacrylates for suncreams and anti-aging creams and (2) acrylic resins for coatings and films. For this purpose, the hydrolysis lignin will be solubilized, while preserving its integrity using newly developed strategies. Afterwards, the hydrolysis lignin will be cleaved using a catalytic reductive depolymerization. Therefore, novel (bi)metallic powder and 3D-shaped catalysts will be developed. The intrinsic reaction kinetics will be experimentally mapped and an innovative microkinetic model able to predict the behavior of a pilot-scale reactor, optimize reaction conditions and guide the catalyst design, will be developed. Within this project, the transition from lignin depolymerization in batch reactors towards continuous flow reactors will be made. Subsequently, the obtained depolymerized lignin oils will be enzymatically acrylated and polymerized into polyacrylates or chemically acrylated with biobased acrylic acid for the

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synthesis of lignin-based acrylic resins. Finally, the economic feasibility of the full value chain will be evaluated and a roadmap will be developed to define what is needed in terms of follow-up research trajectories and to ensure market success.

### Main valorization goals in the various work packages

- (1) Making hydrolysis lignin available for new applications through suitable solubilization and lignin pretreatment strategies, and through new analytical method development/implementation for hydrolysis lignin characterization
- (2) Innovative 3D shaped catalyst production for lignin depolymerization purposes
- (3) From batch towards continuous depolymerization technologies
- (4) Process intensification through kinetic, reactor and process models
- (5) Valorization of new lignin-derived acrylics as bulk materials and high-value additives
- (6) Value chain assessment (incl. evaluation of economic feasibility and road map development)

In the context of the SBO project, once optimal process specifications for the solubilization and subsequent metal-catalyzed depolymerization of the lignin are established, scale-up, demonstration and validation of the process for hydrolysis lignin at the LignoValue pilot plant will be possible in an industrially relevant environment in the after SBO trajectory.

### Request

**To foster interaction with the industry, the project partners are looking for companies that wish to be involved in this cluster strategic basis research (cSBO) project as part of an advisory committee.**

**More specific, the project partners are searching for industrial partners along the value chain, among others lignin producers/suppliers, raw materials suppliers, analytics developers, catalyst producers, additive manufacturing developers, process and product developers, technology providers, end users, acrylics (resins, coatings, additives, films, inks) producers.**

The primary role of companies during the pre-project phase is to tailor the project proposal to the actual needs of the companies and thereby maximise the likelihood of future utilisation of the results. During the project execution, a two-way dialogue between the researchers and the user field involved remains essential to achieve the targeted knowledge transfer from scientific research to concrete applications.

The primary role of companies during the implementation phase is:

- to assist the research from an economic point of view;
- to assist in designing and preparing the translation of the results into concrete economic applications.

During the cSBO project execution, companies may contribute as member of the advisory committee. In addition, they may prefer to undertake parallel R&D activities that are related to the subject of the SBO project at their own expense. In the latter option, the parallel R&D activities are not part of the SBO project. Companies may explore the possibility to obtain funding from the Agency for Innovation and Entrepreneurship.

The Advisory Board is open to all interested companies, including companies established outside the Flemish region.

*Important notice: Companies that wish to be involved in this cSBO project, will need to be (at least) member of Catalisti and/or a member of SIM. For more information on membership and membership fees, please contact Aron Deneyer (adeneyer@catalisti.be). In compliance to SBO regulations, the following requirements apply during the project implementation:*

- *All commercial members of the advisory committee are required to make a monetary contribution of minimum € 250/year in the case of an SME or minimum € 1,000/year in the case of a large enterprise or another organisation.*
- *A commitment to a substantive contribution and a time investment to participate in bilateral consultations with the project executors and/or meetings of the advisory committee.*

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### **How to reply to this request**

Please send an **email before 01 July 2022** to Aron Deneyer ([adeneyer@catalisti.be](mailto:adeneyer@catalisti.be)) with Linsey Garcia-Gonzalez ([lgarciagonzalez@catalisti.be](mailto:lgarciagonzalez@catalisti.be)) in CC, and **briefly describe your interest and potential contribution** to the project. After submission of your offer, you will be contacted for more information on the project contents, and a [Letter of Intent](#) and [Questionnaire](#) will be provided to join the Advisory Board of the project. Feel free to contact Aron Deneyer ([adeneyer@catalisti.be](mailto:adeneyer@catalisti.be); +32 472 375 260) for any further questions you might have related to this request.

*Important notice: Partners that wish to participate in spearhead cluster-supported projects are required to be member of one of the spearhead clusters. For more information on membership and membership fees, please visit our [website](#) or contact Aron Deneyer ([adeneyer@catalisti.be](mailto:adeneyer@catalisti.be)).*

### **Contact**

Please contact Aron Deneyer ([adeneyer@catalisti.be](mailto:adeneyer@catalisti.be); +32 472 375 260) if you have questions concerning this RfP.

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