



Deliverable 1.10

**Report on basic technoeconomic  
evaluation of levulinic acid and ester  
route via Furfural**

**Demonstration of solvent  
and resin production  
from lignocellulosic biomass  
via the platform chemical  
levulinic acid**

*The project leading to this application has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 720695*



## About GreenSolRes

The need to establish economic and sustainable large-scale operations for the conversion of renewable resources to chemical building blocks is becoming increasingly urgent in the context of climate change and depleting fossil fuel reservoirs. Pathways for manufacturing of bio-based fuels and chemicals have been developed but most of them rely on sugar and starch crops for feedstock. GreenSolRes aims at a sustainable and competitive industrial production of the platform chemical levulinic acid (LVA) from non-food lignocellulosic biomass. Further, the conversion of LVA and LVA esters into industry relevant building blocks  $\gamma$ -valerolactone (GVL), 1-methyl-1,4-butanediol (MeBDO) and 2-methyltetrahydrofuran (2-MTHF) will take place by new catalytic methods developed during the course of this project. Finally, these chemicals will be upgraded to solvents and resin monomers for the production of high added value adhesives and consumer products. This project was started in September 2016 and has a duration of five years.

### Project Coordinator



### Project Office



### Consortium



## About this document

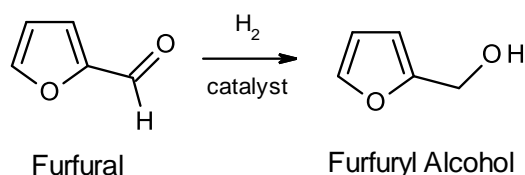
|                          |  |            |
|--------------------------|--|------------|
| Deliverable N°:          | 1.10   |            |
| Title                    | Report on basic technoeconomic evaluation of levulinic acid and ester route via Furfural |            |
| Workpackage:             | 1  |            |
| Responsible beneficiary: | BASF   |            |
| Author:                  | Steffen Mader, Veit Stegmann   |            |
| Reviewer:                | Andreas Jupke (RWTH)   |            |
| Version:                 | 1  |            |
| Due date of deliverable: | 30.09.2020   |            |
| Version date:            | 28.12.2020   |            |
| Contact:                 | Veit Stegmann  |            |
| Nature:                  | Report   |            |
| Review status            | WP leader accepted   | 04/01/2021 |
|                          | Reviewer accepted  | 04/01/2021 |
|                          | SC accepted  | 07/01/2021 |
|                          | Coordinator submitted  | 08/01/2021 |

| Dissemination Level |  |   |
|---------------------|--|---|
| PU                  | Public   |   |
| CO                  | Confidential, only for members of the consortium (including the Commission Services) | X |

## Publishable Summary

The present report describes the work on the route from furfural via furfuryl alcohol to levulinic acid and levulinic alkyl ester respectively.

According to market reports, both furfural and furfuryl alcohol are existing commodities on an industrial scale of several 100 kilotons per year. Thus, a literature survey has been conducted to assess the current state of the art for the reaction of furfural to furfuryl alcohol. Experimental confirmation is planned for the coming reporting period.



The transformation of furfuryl alcohol to levulinic acid and alkyl levulinate has been examined in more detail in discontinuous as well as continuous mode. It could be demonstrated that variation of reaction parameters like solvent, acid type, concentration and temperature have significant influence on the extent of side-product formation. With beneficial combination of parameters very high product selectivities can be achieved.

