GreenSolRes

Deliverable 4.4

Final report on comparative LCA of LVA, GVL, MeBDO and 2-MTHF and fossil-based reference products

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.The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio-based Industries Consortium.

BBI JU

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation

About GreenSolRes

The need to establish economic and sustainable large-scale conversion processes of renewable resources to chemical building blocks is becoming increasingly urgent in the context of climate change and depleting fossil fuel reservoirs. Pathways for the 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 γ-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.

Project Coordinator

RWTH AACHEN UNIVERSITY

Project Office

SYNCOM

Consortium

RWTH AACHEN UNIVERSITY

Henkel

Catalysis LIKAT Leibniz-Institut für Katalyse e.V.

SYNCOM

Hybrid Catalysis Custom Synthesis & Screening

vito

BASF We create chemistry

Lenzing Innovative by nature

About this document

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Publishable Summary

The present report describes the results of the life cycle assessment (LCA) for the GreenSolRes bio-based value chain.

The task of the LCA is to assess the potential environmental impacts of upscaled levulinic acid production with the GreenSolRes process and its derivatives, 2-methyl tetrahydrofuran (2-MTHF) gamma-valerolactone (GVL), and methylbutandiol (MeBDO), as well as potential further derivatives for adhesive applications. Furthermore, the environmental impact of bio-based products is compared to fossil-based reference products. Bio-based products often have lower global warming impacts than fossil-based production but also shift the environmental burden towards other impact categories. Thus, this study aims to assess a wide range of environmental impact categories to identify burden shifting.

Results indicate that the upscaled GreenSolRes products would reduce global warming impacts compared to fossil-based reference products but increase the impacts in the categories acidification, eutrophication, photochemical ozone creation, and particulate matter. These increases are mainly linked to NO_x or particular emissions from biochar combustion and SO_2 emissions from ruthenium refining for catalyst production. Since the plant location is still undecided, transportation distances and modes are still unknown and could impact the results.