



Biofuels through Electrochemical transformation of intermediate BIO-liquids

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Deliverable – Final Event

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Description of the deliverable content and purpose

The present document aims to report on the organization, promotion and execution of the concluding event of the EBIO project, which took place on October 16th in Örnköldsvik, Sweden. The event featured a full morning session of presentations from representatives of EBIO partners, highlighting the added value of EBIO in the field of electrochemistry and its applicability and impact on the biofuel sector. The event was open to the public, including students, private stakeholders, and the press.

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1 Introduction

This report outlines the organization and outcomes of the final event of the EBIO project, held on October 16th, 2024, as part of the activities foreseen under WP5 - Dissemination, Communication, and Outreach. Specifically, it refers to Subtask 5.4.1, which focuses on the organization of scientific events aimed at engaging the international scientific community, industry stakeholders, and technology developers, as well as the general public.

The event was hosted as a side session during the 2024 edition of the Nordic Wood Biorefinery Conference (NWBC), held in Örnsköldsvik, Sweden. The conference is aimed to discuss and promote the latest innovations in bio-based materials and technologies.

This final event served as a platform for communicating both the scientific and market-exploitable results of the EBIO project. The presentations offered valuable insights into how the project's advancements in electrochemistry and biofuel production could be integrated into existing industrial supply chains, focusing on their scalability and market potential.

2 Event Preparation

The final event of the EBIO project was organized in collaboration with the Nordic Wood Biorefinery Conference (NWBC) 2024, which agreed to host EBIO's final session as a side event. The conference provided a space for distributing roll-ups and leaflets, along with a dedicated room accommodating approximately 50 attendees. The venue included a stage equipped with two screens, and full audiovisual support was available for the event. Recording equipment with a stationary camera capturing the entire session was provided.

During a consortium meeting in Hamburg in May, the partners began organizing the event by drafting the initial agenda and running order of speakers. The final agenda, including presentation topics and the schedule for the morning session, was finalized in June. It was decided that the EBIO final event would be held on the second day of NWBC (October 16th), during a morning session. « Green Chemistry Approaches for the Wood Industry » was defined as the title of the event.

To maximize visibility and promote the event, the finalized agenda was widely shared across the project's social media channels and posted on the RISE website, the official organizers of NWBC 2024.

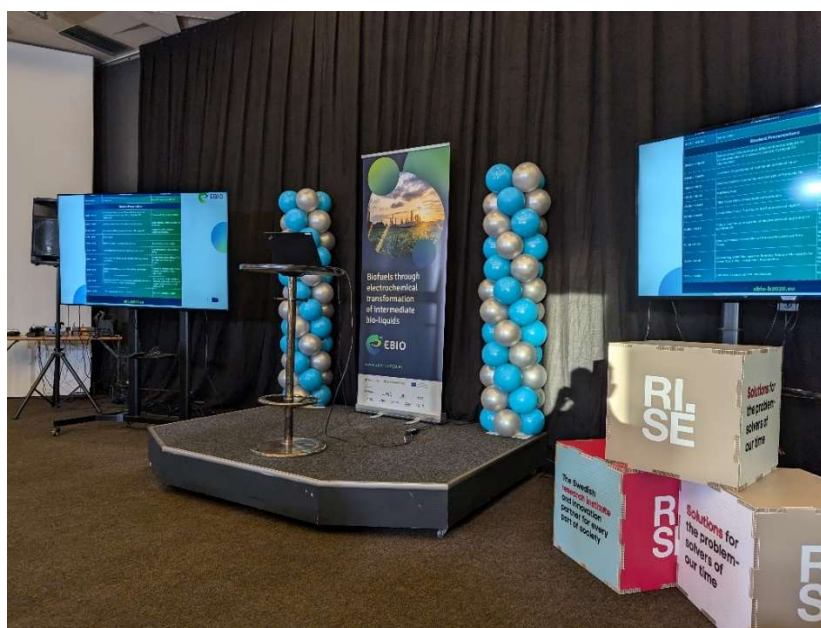


Figure 1 Stage and screens setup in the event room.

3 Overview of presentations

After a brief overview by Roman Tschentscher from SINTEF, Talal Ashraf from the University of Twente opened with the first presentation, summarizing his research on the optimization of boron-doped diamond electrodes to serve as high-performance electrocatalysts for decarboxylating carboxylic acids present in pyrolysis oil. By refining electrode materials and electrochemical parameters, Talal demonstrated a reduction in oil acidity and improvement of stability, making it compatible with refining processes.

Two representatives from Johannes Gutenberg University followed discussing their own contribution to the project. Niclas Schupp introduced innovative methods for the electrochemical degradation of kraft lignin and black liquor, targeting the production of biofuels and valuable aromatic chemicals. Using high-temperature electrolysis cells, Niclas showcased in-cell degradation techniques that returned products like vanillin and acetovanillone from black liquor, creating a sustainable valorisation route for this by-product. He also presented an ex-cell approach utilizing peroxodicarbonate (PODIC) as a green oxidizer, which selectively breaks down lignin structures while conserving caustic soda for reuse, enhancing the applicability of lignin-derived monoaromatic compounds with a broad range of applications.

Elisabeth Oehl, from the same institute, presented her work on using electrochemical reduction to enhance pyrolysis oil stability for fuel applications. By observing and quantifying the selective reduction of carbonyl groups with infrared (IR) spectroscopy, her team demonstrated how this process can reduce polymerization in bio-oils, making them more stable and suitable for fuel use.

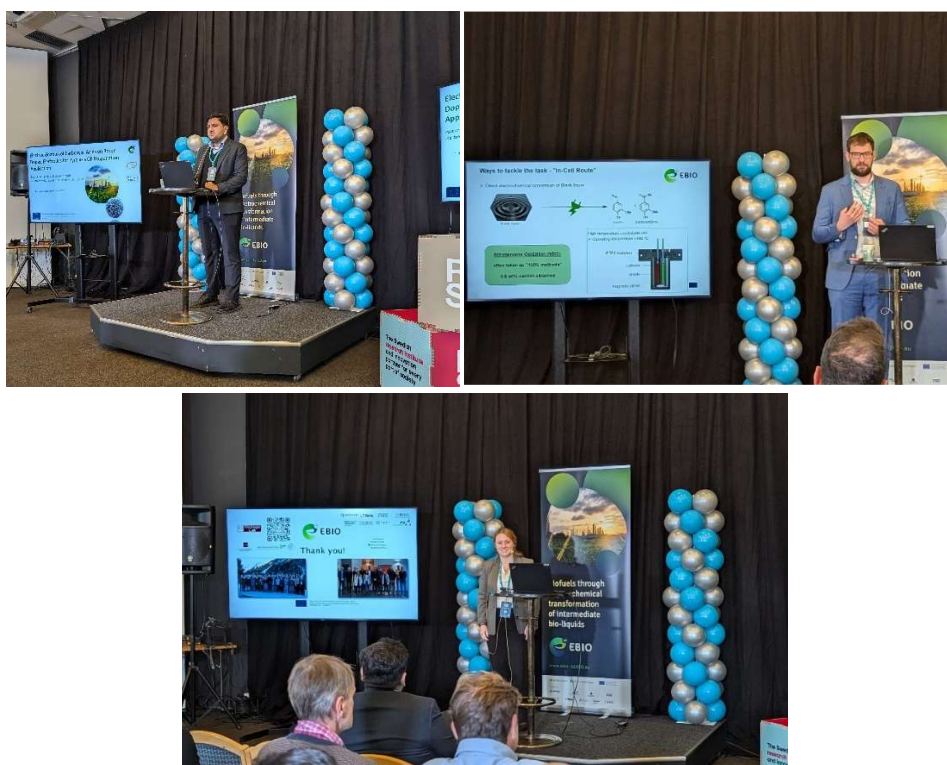


Figure 2 -Top (left to right) : Talal Ashraf, Niclas Schupp. Bottom : Elisabeth K. Oehl

The second part of the event was opened by Roman Tschentscher, who provided an introduction to the EBIO project's value chain and how the process can be scaled up, on which the following presentations focused. He summarized EBIO's strategy of developing compact, lab-scale electrochemical systems for the stabilization and fractionation of bio-liquids, using black liquor and pyrolysis oil as primary feedstocks.

Jonas Kihlman from AFRY discussed electrochemical conversion methods for lignin valorization and the potential incorporation of electrochemical cells into pulp mills. This would lead a process that could transform lignin into aromatic monomers for biofuels and other high-value products. Jonas emphasized how selective degradation of lignin could alleviate pressure on recovery boilers, enabling increased pulp production and opening up new revenue opportunities.

The focus switched to the collaborative research of Robbie Venderbosch from BTG and Prof. Guido Mul from the University of Twente. They aimed to investigate how to stabilize pyrolysis oil through electrochemical processes to enhance its refinery compatibility. They described BTG's advancements in converting biomass-derived oils by targeting reactive functional groups, such as aldehydes and acids, discussing the potential upgrade and stabilization options for bio-oils.



Figure 3 - Top (left to right) : Roman Tschentscher, Jonas Kihlman. Bottom (left to right) : Guido Mul, Robbie Venderbosch

Prof. Siegfried R. Waldvogel from the Max-Planck Institute for Chemical Energy Conversion presented advanced electrochemical techniques for valorising kraft lignin derived from side streams from production of pulp. By utilizing selective depolymerization methods and ion-exchange resins, his team developed processes that efficiently capture desired products directly from black liquor. His presentation also focused on the benefits of setting up a kraft pulping plant for obtaining value added products as vanillin and other fine chemicals.

In conclusion, Seda Karahan from Tüpraş and Yannick Mathieu from ITQ examined refinery adaptations for integrating bio-liquids, with a focus on stabilized pyrolysis oils. Seda highlighted Tüpraş's efforts to co-process pyrolysis oils in refining units, producing sustainable aviation fuel (SAF) and exploiting existing refinery infrastructure for biofuel production. Yannick addressed technical challenges, such as reducing oxygen and acidity, to meet refinery specifications.

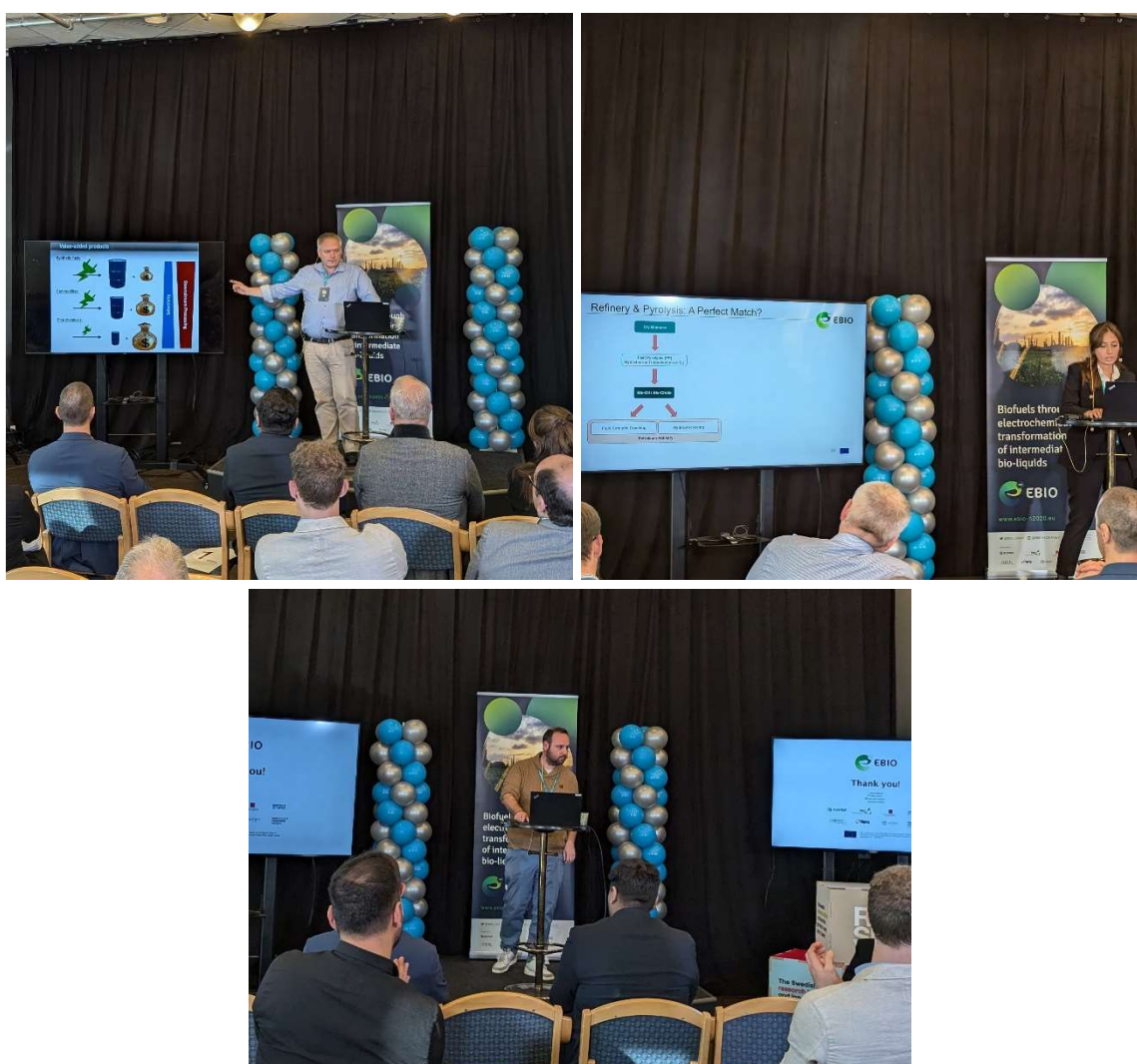


Figure 4 - Top (left to right): Siegfried R. Waldvogel, Seda Karahan. Bottom: Yannick Mathieu

The full list of speakers and presentation titles is presented in Annex B.

4 Event Promotion

Following the finalization of the agenda, event details were shared widely to ensure maximum visibility and engagement. The agenda and registration link were posted on the EBIO website and LinkedIn page, while further promotion occurred through the EBIO Newsletter #6.

Although the event was in-person only, the event was fully recorded, and the video has since been uploaded to YouTube, while the presentations have been made available on the project website.

Annex A – Final Agenda



Biofuels Through Electrochemical
Transformation Of Intermediate
Bio-Liquids



FINAL EVENT AGENDA

“Green Chemistry Approaches for the Wood Industry”

Nordic Wood Biorefinery Conference (NWBC) 2024
Örnsköldsvik, Sweden
16th Oct 09:00 – 12:30

Time	Presentation	Presenter
09:15 – 09:30	Introduction	Roman Tschentscher, SINTEF
Student Presentations		
09:30 – 09:45	Boron-Doped Electrodes as Efficient Electrocatalysts for Electrooxidation of Carboxylic Acids in Pyrolysis Oil Upgradation.	Talal Ashraf, University of Twente.
09:45 – 10:00	Selective Degradation of Kraft lignin and Black liquor.	Niclas Schupp, Johannes Gutenberg University.
10:00 – 10:15	Electrochemical Upgrading and Analysis of Pyrolysis Oil.	Elisabeth K. Dehl, Johannes Gutenberg University.
10:15 – 10:30	Coffee break	
10:30 – 10:40	EBIO Value Chain Presentation Introduction	Roman Tschentscher, SINTEF
10:40 – 11:00	Electrochemistry: The Key to the Future Use of Lignin?	Carl-Johan Hjerpe, Jonas Kihlman, AFRY.
11:00 – 11:30	Status and future prospects of electrochemical upgrading of pyrolysis oil.	Robbie Venderbosch, BTG and Prof. Dr. Guido Mul, University of Twente.
11:30 – 11:50	Electrochemical Conversion of Renewables Derived from Trees.	Siegfried R. Waldvogel, Max-Planck-Institute for Chemical Energy Conversion.
11:50 – 12:15	Converting Solid Biomass into Refinery-Friendly Bio-Liquids for Green Transition - A Refiner's Perspective.	Seda Karahan, Turkish Petroleum Refineries Corporation, and Yannick Mathieu, Instituto de Tecnología Química (ITQ).
12:15 – 12:30	EBIO event round-up and conclusions	Roman Tschentscher, SINTEF

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Annex B – Presentations and Speakers

- Introduction - Roman Tschentscher, SINTEF - Download
- Boron-Doped Electrodes as Efficient Electrocatalysts for Electrooxidation of Carboxylic Acids in Pyrolysis Oil Upgradation - Talal Ashraf, University of Twente - Download
- Selective Degradation of Kraft lignin and Black liquor - Niclas Schupp, Johannes Gutenberg University - Download
- Electrochemical Upgrading and Analysis of Pyrolysis Oil - Elisabeth K. Oehl, Johannes Gutenberg University - Download
- EBIO Value Chain Presentation Introduction - Roman Tschentscher, SINTEF - Download
- Electrochemistry: The Key to the Future Use of Lignin? - Carl-Johan Hjerpe, Jonas Kihlman, AFRY - Download
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- Converting Solid Biomass into Refinery-Friendly Bio-Liquids for Green Transition - A Refiner's Perspective - Seda Karahan, Turkish Petroleum Refineries Corporation, and Yannick Mathieu, Instituto de Tecnología Química (ITQ) - Download