

# Biofuels Through Electrochemical Transformation Of Intermediate Bio-Liquids

Issue 4 / July 2023

EBIO is a four-year project that is part of the European Union's Horizon 2020 Research and Innovation Programme. It is set to be a game changer in the field of biofuel production with the aim to generate energy dense biofuels through electrochemical transformation of intermediate liquified biomass.

The project launched in December 2020 with a budget of around 4 million euros. After some Covid-19 pandemic related start-up challenges, all PhD students have started their research and the project is now and running and in full-swing and has brought together partners from all over Europe all with the same goal: to turn low value crude bio liquids into sustainable road transport fuels.

The consortium is built on strong foundations of research, innovation, and industrial knowledge. It consists of nine beneficiaries from seven different countries, among them some of the world leaders in the field.

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## 1. EBIO Animation Series!

The EBIO project has produced three animation videos to explain the three parts of the research process. The first video explains how the feedstock, black liquor, is produced, the second video shows us how the black liquor is electrochemically valorised, and the last video in the series explains the intended output for the upgraded black liquor as a drop-in or coprocessed advanced biofuel.

All three videos can be watched here: EBIO animation series



Faraday Discussions Journal Cover.





## 2. EBIO first scientific paper published

The EBIO project has published a new study that presents significant findings on the electrochemical decarboxylation of acetic acid using boron-doped diamond and platinummodified electrodes to treat pyrolysis oil. According to the study, BBD electrodes facilitate decarboxylation without competitive OER, forming methanol and methyl acetate. Moreover, the performance of the process is not significantly affected by the applied current density, concentration, and pH of the solution, particularly at current densities exceeding 50 mA/cm2.

On the other hand, the study showed that the ethane-selectivity of platinum-modified BDD electrodes heavily relies on the particles' shape and geometry. Specifically, 3D porous nanoparticles have high selectivity towards OER, whereas nano-thorn Pt particles have a faradaic efficiency of 40%. Thin platinum layers on BDD have a high faradaic efficiency towards ethane of >70%. The research provides crucial guidelines for electrode fabrication, particularly for the electrochemical upgrading of biomass feedstocks through acid decarboxylation. The process involves various techniques such as (non) Kolbe electrolysis, electrodeposition, insitu electrochemical mass spectrometry and Raman spectroscopy. The study's findings have significant implications for the treatment of pyrolysis-oil, a low-value biogenic liquid that requires harsh conditions for processing.

The full paper can be downloaded <u>here</u>.



Faraday Discussions Journal Cover.

### 3. EBIO welcomes a new member to the team

We are thrilled to announce that Wiktoria Kowalczyk, an international exchange student from Łódź University of Technology, has recently joined the EBIO project team here at the University of Twente. Wiktoria brings a wealth of knowledge and experience to the project, having studied Advanced Bio-based and Bioinspired Materials at her home university. Her field of study focuses on mimicking biological processes through engineering, as well as making existing processes more bio-based. Her background in this area makes her a valuable addition to the EBIO project team, and we are delighted to have her on board.



Wiktoria Kowalczyk, University of Twente



## **4. EBIO Interview Series**

During the project M18 consortium meeting, held in Mainz, Germany, EBIO partners were given the opportunity to introduce themselves and their work package.

In this short interview series we hear from:

- Roman Tschentscher , SINTEF Project Coordinator
- Serdar Çelebi, Tüpraş
- Guido Mul, University of TWENTE



Roman Tschentscher, EBIO Interview

## 5. Events

This year EBIO has presented at some of Europe's biggest conferences, a summary of recent and upcoming events are listed here:

- RRB 2023, held in Riga, Latvia, 31 May 2 June: PhD candidate Elisabeth Oehl presented the abstract: Electrocatalytic kraft lignin conversion dissolved in industrial black liguor.
- EUBCE 2023: Electrochemical conversions from biobased compounds - EBIO workshop including presentations from Liberate, PERFORM, and ABC Salt.
- GREN 2023 7th Green & Sustainable Chemistry Conference in Dresden, Germany, from May 22-24, 2023. PhD candidate Talal Ashraf presented his work on electro oxidation of acetic acid/sodium acetate.
- World Sustainable Energy Days Biomass Research Conference in Wels, Austria,

28 Feb 2023-3rd March 2023. PhD candidate Talal Ashraf presented the challenges of working with pyrolysis liquid for electrochemical decarboxylation and the significant obstacles involved in Kolbe electrolysis.

- Bunsen-Tagung 2023 Physical Chemistry of the Energy Transition, June 5
  - 7, 2023, Berlin. 122nd Annual Conference of the German Bunsen Society for Physical Chemistry.
- Electrosynthesis Faraday Discussion, 12 14 July 2023, Edinburgh , United Kingdom.

Upcoming events

- 14th ECCE and 7th ECAB, 17 21 September 2021, Berlin/Germany
- ECS Biannual Meetings 244th ECS Meeting, October 8-12, 2023 Gothenburg, Sweden.



Talal Ashraf, presenting at the World Sustainable Energy Days Biomass Research Conference

















**O** Tüpra<u>s</u>







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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006612.