EBIO: Sustainable Electrochemistry from Lab to Demonstration Scale

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Lab-scale electrolyser

An electrochemical process involves the chemical reaction directly or indirectly driven by electric current and a set of electrodes integrated in an electrochemical cell. All parts are interconnected and for a successful implementation of an electrochemical process all those parts must be optimised iteratively to achieve the highest process performance and durability.

"For a successful implementation of an innovative process, the adoption of scalable electrolyser concepts is a crucial point to be performed as early as possible in the overall conceptual process."

CONDIAS' current State-of-the-Art platform for electrochemical syntheses is a fully scalable electrolyser platform utilizing BDD electrodes, which can cover a wide range of Technology Readiness Levels starting from individual very small lab scale cells, up to full industrial scale cell stacks.

The EBIO project has demonstrated the development of a specific divided cell from lab-scale to demonstrator-scale. The lab version can easily be operated in undivided and divided configuration.

[VIDEO: Electro-synthesis: the CONDIAS Synthesis Starter Kit with DIACHEM(R) BDD anode]

Assembly, design and scale-up

Through-out the last three years of research the EBIO electrolyser design has been developed and optimised to enable paired electrolysis using lignin & pyrolysis oil streams to be performed and hence, utilizing both cathode and anode producing valuable products.

Different physical implementations of reactor concepts have been done to achieve different hydrodynamic and thermal regimes which are crucial for the efficiency of producing specific oxidants at high yields and high current efficiency.

EBIO has been designed to provide a scalable electrolyser concept for rapid load changes of electrical energy relevant for usage of renewable energy sources, to counterbalance the natural fluctuation of renewable energy which can be provided within the grid.

Figure 1: Small pilot scale setup for continuous electrochemical lignin depolymerization.

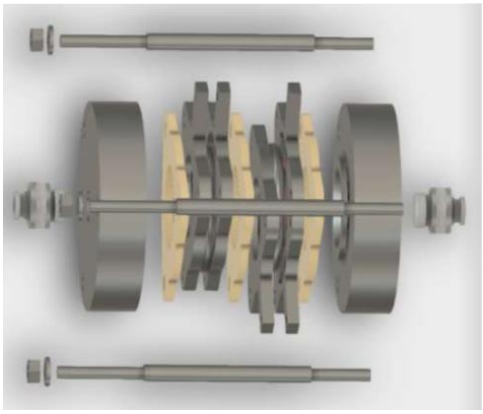

Figure 2: Through-flow cell design.

EBIO is now implementing a TRL4 technology, that should be a fully scalable technology platform, offering the possibility to fully provide a sustainable and highly innovative process accessing bio-based value streams.

About EBIO:

EBIO – *Turning low value crude bio liquids into sustainable road transport fuels* started on the 7th of December 2020 and runs for 48 months.

The consortium, coordinated by Sintef AS (Norway), counts **9 beneficiaries** from **7 countries:** B.T.G. Biomass Technology Group BV – BTG (The Netherlands), Johannes Gutenberg-Universitat Mains – JGU (Germany), Universiteit Twente - UT (The Netherlands), Condias GMBH (Germany), Turkiye Petrol Rafinerileri Anonim Sirketi – TUPRAS (Turkey), Poyry Sweden AB – AFRY (Sweden), ETA – Florence Renewable Energies (Italy), Agencia Estatal Consejo Superior Deinvestigaciones Cientificas – CSIC (Spain).

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