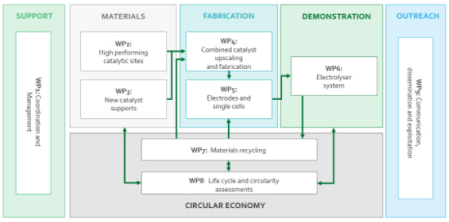
New sustainable and recyclable catalytic materials for proton exchange membrane electrolysers



RECYCALYSE corporate video

“The entire consortium is showing great commitment and enthusiasm which truly helps to simplify project management!”

Interview with Christian Kallesøe, Director of the Centre for Nano Production and Micro Analysis, at the Danish Technological Institute and coordinator of RECYCALYSE.

What challenges a coordinator faces in the management of a project like RECYCALYSE and how are they overcome?

The main management challenges within a Horizon 2020 project like RECYCALYSE are three-fold, related to Scientific, Administrative, and Financial responsibilities.

Fortunately, Danish Technological Institute has an internal financial office dedicated to the financial aspects and an internal international office that can assist with administrative issues and uncertainties. This provides more time to focus on scientific management, for which it is essential to ensure the attention, cooperation, and contribution from all the partners within the project.

Formed collaborations within RECYCALYSE are for the most part new, partners are located in different countries, and some of them are also new to Horizon 2020. On top of that, the COVID-19 pandemic situation has further hindered collaboration visits and physical meeting, which makes it even more important to be accessible and visible to all partners, and make sure that all partners are participating. This includes several online meetings a month, at consortium and work package level, and introducing the partners to each other’s facilities with visual lab tours and experiments. Luckily, the entire consortium is showing great commitment and enthusiasm in their contribution, which is a great help in simplifying the project management.

RECYCALYSE presents its advancements at an online meeting

On September 30 and October 1, RECYCALYSE held its second meeting corresponding to month 6 of the project with the presence of the consortium partners and the European Commission Project Officer.

For two days, the project partners had the opportunity to present their results and

For two days, the project partners had the opportunity to present their results and achievements to date.

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“We will manufacture single cells for extensive performance testing and characterization. The knowledge obtained will be crucial for further optimization of final MEAs assembled”

Interview with Nedjeljko Seselj, Senior Scientist at Danish Power Systems

What are Danish Power Systems' main responsibilities within RECYCALYSE?

Danish Power Systems (DPS) will use the experience and expertise in membrane electrode assembly (MEA) fabrication to:

(1) optimize the catalytic ink,

(2) produce electrodes and

(3) cells for the polymer electrolyte membrane (PEM) electrolysis stack (EC), as well as to

(4) assemble the stack itself.

The workload will span over the two consecutive generations of electrocatalysts developed within the scope of the project.

Furthermore, DPS will manufacture single cells for extensive performance testing and characterization. The knowledge obtained will be crucial for further optimization of final MEAs assembled in the stack.

How the milestones for Electrodes and single cells are going to be achieved?

All the material fabrication will be documented in form of deliverables and milestones, entailing:

(1) report on single MEA fabrication and performance,

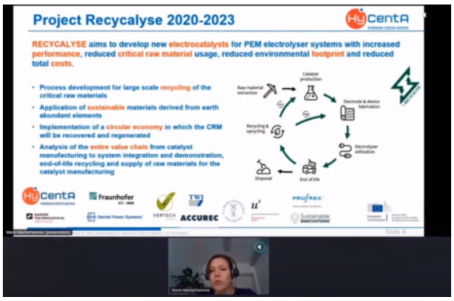
(2) PEMEC specification sheet,

(3) its requirement analysis and

(4) functional testing, as well as

(5) Balance of Plant and

(6) the basic design of the hydrogen testing infrastructure.



RECYCALYSE attends the Hyfcell international conference

On September 10, the Hyfcell international conference counted on the presence of the RECYCALYSE project.

Marie Macherhammer, Key Research & Project Manager at HyCentA, showcased, on behalf of the consortium, the project scope and approach.

Marie's presentation was part of the room dedicated to Hydrogen Research in the world.

The f-cell+HFC conference features international keynote speakers as well as more technical parallel sessions offering valuable knowledge and best practices for the main application areas: Logistics, Ports and operations, Power-to-Gas with Hydrogen solutions, Heavy-duty vehicles, large-scale HRS. Interactive workshops offer room to explore applications in ports and buses in more detail.

“In the first months of the project, Fraunhofer ICT has performed extensive literature research on support materials for oxygen evolution catalysts in Proton Exchange Membrane (PEM) water electrolysis. Observation of the acidic conditions is important as they aggravate possible corrosion issues”

Interview with Carsten Cremers, Manager of the Fuel Cells and Electrolysis Group at Fraunhofer ICT

What is expected for the work package related to New catalyst supports Fraunhofer ICT is leading?

The principle of a catalyst is to reduce the activation energy of a reaction by offering an alternative reaction pathway. For heterogeneous catalysts, as most electro-catalyst including the oxygen evolution catalyst investigated in RECYCALYSE, means that the starting reactant can respond with the surface to form an intermediate that can further react towards the final product. This way, the bind to the catalyst surface is lowered, so the reacted substance can leave the surface it in its original state for the next reaction.

The rate at which this can occur depends on the number of surface sight. Thus, increasing the active surface area is an important tool to raise the activity of a reactor or here an electrode.

Catalyst supports help in achieving this goal by stabilizing very small particles of the actual active ones. This is necessary as nanoparticles like the iridium oxide or iridium ruthenium oxide nanoparticles investigated here tend to be unstable coalescing into larger particles once their diameter is reduced to few nanometres.

Supports are an established tool in the development of heterogeneous catalysts. A special requirement of supports for electro-catalyst is now that they need to be electronically conductive in order not to block the required exchange of electrons at the catalytic active sights.

In fuel cells, high surface area carbon materials are used for this purpose. However, even there the intrinsic instability of carbon at potential exceeding 0.201 V is a known factor limiting the lifetime of fuel cells. For oxygen evolution electrodes operating at potentials between 1.5V and 2.5 V, the use of carbon is not realistic. Alternatives can be found in metal carbides where carbon is stabilised by the binding with a metal, or in certain conductive oxides. Oxides are of particular interest as they may intermittently store oxygen atoms further supporting the reaction.

Check full interview

“Close cooperation with project partners is key to reduce the risks and lead to an efficient system”

Interview with Marie Macherhammer, Key Researcher, and Project Manager at HyCentA.

What is the main innovation Electrolyser system will bring?

The goal here is to develop a new generation of electrolyser systems. At RECYCALYSE, we are designing the system around the newly developed stack to reduce the overall power loss and increase the system efficiency. Based on existing knowledge, the components needed to run the stack, the so-called Balance of Plant components, will be selected, tested, and evaluated at the HyCentA test infrastructure. The stack and the overall system are evaluated due to a specially adapted test protocol and further improvement potentials can be identified.

How HyCentA is planning to overcome the risks?

Close cooperation with project partners and the possibility to test Balance of Plant components at the HyCentA test rig will reduce the risks and lead to an efficient and most forward way to ensure an optimised system.

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