Duration

48 months



Redox-Mediated economic, critical raw material free, low highly efficient green hydrogen production capex and technology

Start date

1 January 2024

project can create a new possibility for

REDHu newsletter!

Dear reader,

the production of green hydrogen and are pleased to to give you a little insight

Welcome to the first edition of the

We believe that the research in this

into our project with this newsletter. International institutes and companies are involved in this project and have the goal of making Europe cleaner and safer and are not afraid to successfully implement even more ambitious approaches. **News**



and Antonio Requena Fernández from Clean

the Hudrogen kick-off Partnership attented the meeting and explained the different interactions with the EU and the rules of the project implementation. This event was mostly dedicated to introducing project's the keu components. Work Package leaders had the opportunity to present their respective work packages, outlining the

tasks and responsibilities. All partners

had the opportunity for real life face-

to-face interactions, engage productive conversations to identify potential challenges and discussions on the project's objectives. The day concluded with a delightful networking dinner. In summary, the kick-off meeting at DLR in Brussels was successful, thanks to the active participation of all involved parties. The REDHy project is

off to a promising start as it endeavors Redox-Mediated economic, critical raw

material free, low capex and highly

efficient green hydrogen production

technology.



The German Aerospace Center (<u>DLR</u>)

provided flyers for the REDHy project

and discussed the technology with

Morawietz, the coordinator of REDHy,

attended the fair. Additionally, DLR

showcased several other projects,

Overall, more than 500 companies and institutes presented at the Hannover

to

Pemtastic,

stakeholders

awareness of the project.

HyScale,

relevant

including

SUSTAINCELL.

fair, which attracted a total of 130,000 visitors. **Preliminary results** Partner CNR-ITAE started the synthesis of the heterogeneous catalysts by coprecipitation method and hydrothermal treatment. These will be used to operate outside the cell in specific catalytic-bed reactors as catalytic

enhancers to regenerate the base

redox species while producing oxygen

and hydrogen gases from water.

Images hydrothermal synthesis of CRM free heterogeneous catalyst.

Tobias Morawietz is the coordinator of the REDHY project and has already gained a lot of experience in the field of hydrogen and electrolysis in the past. Starting at Esslingen University of Applied Sciences together with DLR, in the and changes during operation. Alternative electrolysis technologies, such as urea electrolysis, were and are still of interest to him. The development of large electrolysis AEM

step forward to a sustainable European future."

What is your (main) research area today?

be responsible for coordination."

and - more in general - for your organisation?

production.



DINAMHySE Club Meeting The DINAMHuSE club invited its members to a day of meetings and exchanges, with a visit on Wednesday, April 24, from 8:30

Events

am to 5:00 pm. This club brings together the hydrogen industry and academia in

During the event, Mathieu Etienne, Director

of Research at the Centre National de la

the Grand Est region of France.

Recherche Scientifique (CNRS), gave a general presentation on redox flow technologies and more а detailed presentation on the application of redox flow technology to hydrogen production, using the example of REDHy innovation.

8th **ERTL** Symposium fundamental to scale-up Electrochemistry The Ertl Symposium, honoring Nobel Laureate Gerhard Ertl, took place from June 26 to June 29, 2024. Hosted by the ERTL Center and the University of Stuttgart in Esslingen, Germany. This

Key topics included basic research on electrolysers, fuel cells, catalysts, and analysis techniques. Presentations were delivered by invited scientists, providing detailed insights into the structure and development of electrolysers and fuel

cells.

highlighted

electrochemistry.

AEM 2024

AEM2024 is

year's theme was laying the foundations

for upcycling within electrochemistry.

The German Aerospace Center (DLR) provided extensive contributions and support. Tobias Morawietz from DLR showcased the REDHy project with a poster and gave a presentation on analyzing electrolyser materials using Atomic Force Microscopy (AFM). The symposium emphasized advancing sustainable solutions energy and

innovative

Upcoming event

research

premier conference

in

series (22nd series) on advanced energy materials which will be held from 9-11 October 2024 at London focusing on the following sessions: Advanced Energy Materials Hydrogen Energy • Advanced Nanomaterialsals

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• Polumer Energy Materials

• Crystalline Porous Materials

Catalysis and Energy Materials

Advanced Graphene Materials

The objective of this premier conference is

to promote the gathering of scientists,

academics, industry experts and students

The Consiglio Nazionale delle Richerce

(CNR) will be present and give a oral

presentation about the REDHy project

to exchange and enhance their knowledge and vanguard ideas for future energy applications.

(see image below). We hope to meet you there! Please register here.

A highly efficient green hydrogen production technology Fausta Giacobello, Stefania Siracusano, Antonino Salvatore Aricò CNR – ITAE, Institute of Advanced Energy Technologies, National Rese Via Salita S. Lucia sopra Contesse 5, 98126 Messina, Italy fausta.giacobello@itae.cnr.it Green hydrogen has become an important factor in the energy revolution because to its ability to decarbonize several industries, including transportation, electricity generation, and carbon-intensive industries including the manufacturing of steel, cement, glass, and fertilizer. Unfortunately, most hydrogen production still depends on fossil fuels, and although environmentally friendly alternatives. heterogeneous catalysts [1,2]. This improves cell performance and safety during electrolysis. In general, electrolysis is more widely accepted and safe when the gas evolution is isolated from the system itself. This allows for the synthesis of hydrogen outside the building. This technology bypasses the slow electrochemical water splitting process by concentrating on the kinetically preferable water-dissociation step and redox although environmentally friendly alternatives although environmentally friendly alternatives are developing, they are not progressing quickly enough to address our climatic problems. The technology here presented, reported in Fig. 1, offers an interesting substitute to the conventional electrolysis process for the green hydrogen production. The method, here described, maintains a separation between anode and cathode reactions by using pinolar (BPM) or mediator reactions. This leads to a lower overpotential and the use of inexpensive materials (CRM). These developments open the door to nearly 100% catalyst use and the removal of the conventional hot-pressed membrane-electrode assembly, which simplifies manufacturing processes. Interestingly, the

and cathode reactions by using bipolar (BPM) or anionic exchange (AEM) membranes, redox

mediators, 3-D electrodes and nano-engineered

Fig.1 Scheme of the technology

approach also makes it possible to produce green

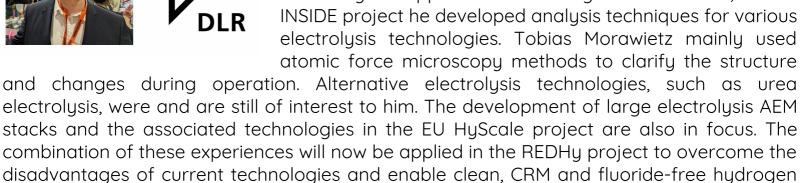
hydrogen from saltwater rather than ultra-pure

[2] Wolf RD, Rop MD, Hereijgers J. Effects of Structured 3D Electrodes on the Performance of Redox Flow Batteries. Chemelectrochem. 2022;9(22).

[3] Debruler C, Wu W, Cox K, Vanness B, Liu TL. Integrated Saltwater Desalination and Energy Storage through a pH Neutral Aqueous Organic Redox Flow Battery. Adv Funct Mater. 2020;30(24):2000385.

[1] Zhang F, Wang Q. Redox-Mediated Water Splitting for Decoupled H₂ Production. Acs Mater Lett. 2021;3(5):641-651.

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Get to know Tobias Morawiets from DLR

very interested in structural elucidation with the atomic force microscope and development of new analysis methods in these technologies." What is the main focus of your team in REDHy?

"DLR will take over the design and operation of the stack in cooperation. This will deviate from standard designs in order to develop a cost-effective and stable variant that offers clear advantages over electrolysis technologies that correspond to the current state of the art. The system around the stack is also being developed by DLR. This system will then be investigated and modeled at DLR for performance and continuous operation. DLR will also

"My main area of research is all kinds of electrolysis technologies, with AEM technology and alternative technologies being particularly important. PEMWE and alkaline electrolysis are already mature enough that research in the other technologies is more relevant. I am also

What was your original motivation to become a researcher/project manager?

"My motivation to become a scientist has always been the urge to develop new materials or functions to make people's lives safer and independent from technologies that destroy the earth. Starting with a combination of bio- and nanotechnology, my further path turned completely to hydrogen technologies, which should have the biggest impact on our everyday life. With the REDHy project and especially as coordinator in the project, I am pleased to present a further development of electrolysis technologies, which should be a big

of this exciting project was the most enjoyable for me. I am looking forward to further cooperation with the best project partners for this project." How do you expect REDHy results will affect your organisation and the energy storage "The results that can be expected from this project will have a lasting influence on future research at our institute, as further research will be carried out in this direction."

Get to know Davide Rovelli from De Nora

sustainability principles within the company. De Nora has a pivotal role in the industrial green hydrogen production chain and I've started my journey with the company by focusing on the alkaline water electrolysis. In this way, I could combine both my background

competences,

in energy engineering and the my competences on sustainability assessments."

"I'm an energy engineer. Since I was studying, alongside performance, I always wanted to delve deeper into the environmental and social effects of our technologies. After

graduation, I worked for 3 years as a researcher at the National Research Council of Italy, to gain competences on sustainability assessment within the industrial sector. After this experience, I moved to De Nora to apply my

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deeper

The following deliverables are available

on the website to read:

<u>D1.1 - Quality management &</u> knowledge management plan

<u>D1.2 - Data Management Plan</u> D8.1 - Project's corporate identity

D8.2 - Plan for DEC activities

integration

towards

Could you describe your favourite moment/satisfaction when working for the project

"For now, the meeting with the project partners and the further elaboration of the work plan

What was your original motivation to become a researcher/project manager? "I wanted to know more on what sustainability is, how it can be practically measured and which contribution research could provide to our society."

soon during the design phase, and at the end of the project."

and - more in general - for your organisation?

backgrounds."

sector?

the

clustering

activities among the projects.

communication

projects click here.

What is your (main) research area today?

DE NORA

company's product portfolio, together with developing sustainability guidelines for product development. In particular, I'm leading one of the key initiatives of De Nora's ESG plan, which is related to designing sustainability assessment scorecards for products, which will enable us to raise awareness on the market about the environmental sustainability of our products." What is the main focus of your team in REDHy? "My team will be dedicated to carrying out a Life Cycle Assessment, coupled with a technoeconomic and circularity assessment of REDHY technology. This assessment will be based on a data collected from other partners, related to consumptions and emissions associated

to the technology. It will be both carried out in the middle of the project, to inform partners

Could you describe your favourite moment/satisfaction when working for the project

"I'm looking for challenging my own point of view by working with colleagues with very different backgrounds. I'm proud of having multidisciplinary collaborations, which give me the opportunity to share my expertise while learning from my colleagues' skills and

How do you expect REDHy results will affect your organisation and the energy storage

"The REDhy-project will help De Nora's mission to continue scouting new technologies and to keep alive the network with European R&D institutes and partners. I expect that the energy sector will be greatly improved by researching into innovative approaches for green

"Within De Nora, I'm in charge for Life cycle assessments and circularity assessment of the

hydrogen generation."

the

UNIRESEARCH

Linked projects **Deliverables**

REDHy partners

The REDHy project will cluster their

activities with the other projects granted

in the same call (SEAL-HYDROGEN, EXSOTHyC, X-SEED, AEMELIA). The aim of

is

For an overview of REDHY's sister

and

to

alian

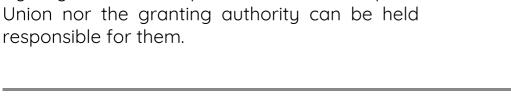
dissemination







Consiglio Nazionale





Please add <u>projectsupport@uniresearch.com</u> to your address book to ensure our emails continue to reach your inbox.

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responsible for them.

opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Clean

