

NEWELY PROJECT: Next Generation Alkaline Membrane Water Electrolysers with Improved Components and Materials have been created.

June 29, 2023

The final public event of this European Project in which FBK participated, took place in Bad Zwischenahn (Germany) with the poster exhibition opening the EMEA Workshop 2023.

Last June 20th, 2023, the final event of [NEWELY Project](#) took place in Bad Zwischenahn (Germany) in the form of a poster exhibition. The event aimed to show the main results of activities carried out during the NEWELY Project.

NEWELY is a European project funded by the **Clean Hydrogen Partnership** and coordinated by DLR – the German Aerospace Center (Germany).

The NEWELY **consortium** consists of seven renowned R&D centers – **Fondazione Bruno Kessler (Italy)**, Institute of Macromolecular Chemistry (Czech Republic), Korea Institute of Science and Technology (South Korea), University of Chemistry and Technology Prague (Czech Republic), Westfaelische Hochschule University of Applied Sciences (Germany), CEA Liten (France), three SMEs – Membrasenz (Switzerland), ProPuls (Germany), CENmat (Germany), and one global player and world leader in the gases industry – Air Liquide. Together the consortium covers every aspect of water electrolysis and green hydrogen production, paving the way to a sustainable future.

The project developed and tested components for the next generation of **anion exchange membrane water electrolysers** (AEMWE). These can reach twice the performance of the state of the art of AEMWE operating with very low concentration KOH feed. Additionally, a **5-cell stack** with elevated **hydrogen output** pressure was designed and constructed.

The poster exhibition of NEWELY Project opened this year's edition of [EMEA Workshop](#), a high-level event which attracts top-class speakers from the field of alkaline ion exchange membranes for energy applications. It is organised annually by DLR Institute of Engineering Thermodynamics (Germany) with the support of the Korea Institute of Science and Technology (KIST, South Korea) and the Jagiellonian University in Krakow (Poland).

The final public event of NEWELY started with the joint presentation of the Project Coordinator Aldo Gago, (group leader at DLR) with the support of Jelena Stojadinovic (founder and CEO of Membrasenz), Miriam Goll (researcher at CENmat), and Jeffrey Roth (project engineer at ProPuls and WHS). The presentation gave an overview of the main technical results focusing on the development of membrane and ionomer, of the electrodes package, and on the single cell test and stack development. The presentations were followed by a lively discussion and questions of the audience.

Then, the floor was given to NEWELY representatives who presented the activities in more details through the utilisation of posters.

Jelena Stojadinovic (Membrasenz) presented the activities related to the Membrane/ionomer development and explained the synthesis routes taken as well as the membrane and ionomer characterisation process before concentrating on the achievements reached: among others, the partner KIST filed 3 patent applications, 6 scientific publications resulted from the collaboration of partners in this field, and a start-up called TailorMem was created. It is worth mentioning that the poster of Malikah Najibah (KIST) entitled "Pre-swelling of AEM with water-based ethylene glycol solution to minimize dimensional changes in a water electrolyser" won the *Best Poster Award 2023* at the EMEA workshop.

Miriam Goll (CENmat) presented the activities related to the electrode package development and highlighted the achievements reached such as (i) the development of a highly performing catalyst with $\eta @ 10 \text{ mA/cm}^2 = 215 \text{ mV}$ for oxygen evolution reaction (OER) and 116 mV for hydrogen evolution reaction (HER), (ii) the reduction in potential $> 300 \text{ mV}$ through the application of Nickel porous transport layer on stainless steel substrates, (iii) the performance of $1.5 \text{ A/cm}^2 @ 2 \text{ V}$ by a single cell thanks to the use of electrodes prepared via the sonicated spraying device in a catalyst coated substrate (CCS) mode, and (iv) the upscaling of electrodes to 200 cm^2 for the stack.

Jeffrey Roth (ProPuls) outlined the process that led to the design and realisation of the AEM test bench, which provided a suitable environment for testing of the novel materials with homogenous pressurization and smooth cell tempering. Jeffrey Roth also described how a 5-cell 200 cm^2 AEMWE stack for the NEWELY materials was manufactured and pre-tested for the use in long-term tests.

Frédéric Fouda-Onana (CEA Grenoble) concentrated more on the testing phase and reported that the combination of conductive membranes/ionomers and active non-platinum group metal (PGM) catalysts developed in the project leads to high-performance AEMWE, surpassing the NEWELY target (above $1 \text{ A/cm}^2 @ 2 \text{ V}$ at 50°C and 0.1 M KOH).

Finally, Nicolas Richet (Air Liquide) reported the main results from the techno-economic analysis and the life-cycle assessment. He reported that the compact design and minimal corrosion of AEMWE provide it with an advantage over AWE and that the NEWELY AEMWE system, with its pressure vessel, can deliver hydrogen at higher pressures compared to the alkaline water electrolysis (AWE) system analysed in this study, which operates at atmospheric pressure.

NEWELY AEMWE system is successful in substituting tradition PGM based catalyst and AEMWE system benefits from non PGM materials unlike proton exchange membrane water electrolysis (PEMWE) system, which is also reflected in the lower H₂ costs as the lower initial capital costs.

Almost 100 stakeholders from academia and industry sectors participated in the event. The poster session stimulated the interest of the participants and encouraged the dialogue on electrolyzers and membrane among different stakeholders and experts in the field.

“AEMWE technology has a lot of potential for changing the market of green hydrogen” – says the Project Coordinator Dr. Aldo Gago, of the German Aerospace Center – “Contrary to PEMWE technology, AEMWE does not require precious metals to be used as catalysts for the electrochemical reactions and the membranes and ionomers do not contain fluorine, thus their synthesis is environmentally friendly. The project NEWELY has proven in the laboratory that the AEMWE can deliver high performance and durability. The next step is upscaling the developments to demonstrate that AEMWE can indeed compete with the existing electrolysis technologies.”

Matteo Testi, Head of Hydrogen Technology Area at the [Center for Sustainable Energy](#) states that *“As **FBK**, we are glad to have contributed to the NEWELY project and development of AEM technology. In the coming weeks, the 2-kW stack developed by the project is going to be tested in the laboratories of FBK to validate its performance. The expertise acquired in test bench development, cell, and component characterization will be soon available for further activities”.*



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DLR – the German Aerospace Center (DE)

Reference Materials

NEWELY Project – <https://newely.eu/>

The German Aerospace Center, DLR – <https://www.dlr.de/tt/en/>

Air Liquide – <https://www.airliquide.com/>

Membrasenz – <https://www.membrasenz.com/>

ProPuls – <https://www.propuls.de/>

CENmat – <https://cen-mat.com/>

Fondazione Bruno Kessler- <https://www.fbk.eu/en/> | Centre for Sustainable Energy – <https://energy.fbk.eu/>

Institute of Macromolecular Chemistry IMC-CAS – <https://www.imc.cas.cz/en/>

Korea Institute of Science and Technology, KIST – <https://eng.kist.re.kr/eng/index.do>

University of Chemistry and Technology Prague, UCTP – <https://www.vscht.cz/?jazyk=en>

Westfaelische Hochschule University of Applied Sciences, WHS – <https://www.en.w-hs.de/>

CEA Grenoble – <https://www.cea.fr/Pages/le-cea/les-centres-cea/grenoble.aspx>

EMEA Workshop 2023 – <https://emea2023.welcome-manager.de/>

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<https://magazine.fbk.eu/en/news/newely-project-next-generation-alkaline-membrane-water-electrolysers-with-improved-components-and-materials-have-been-created/>

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