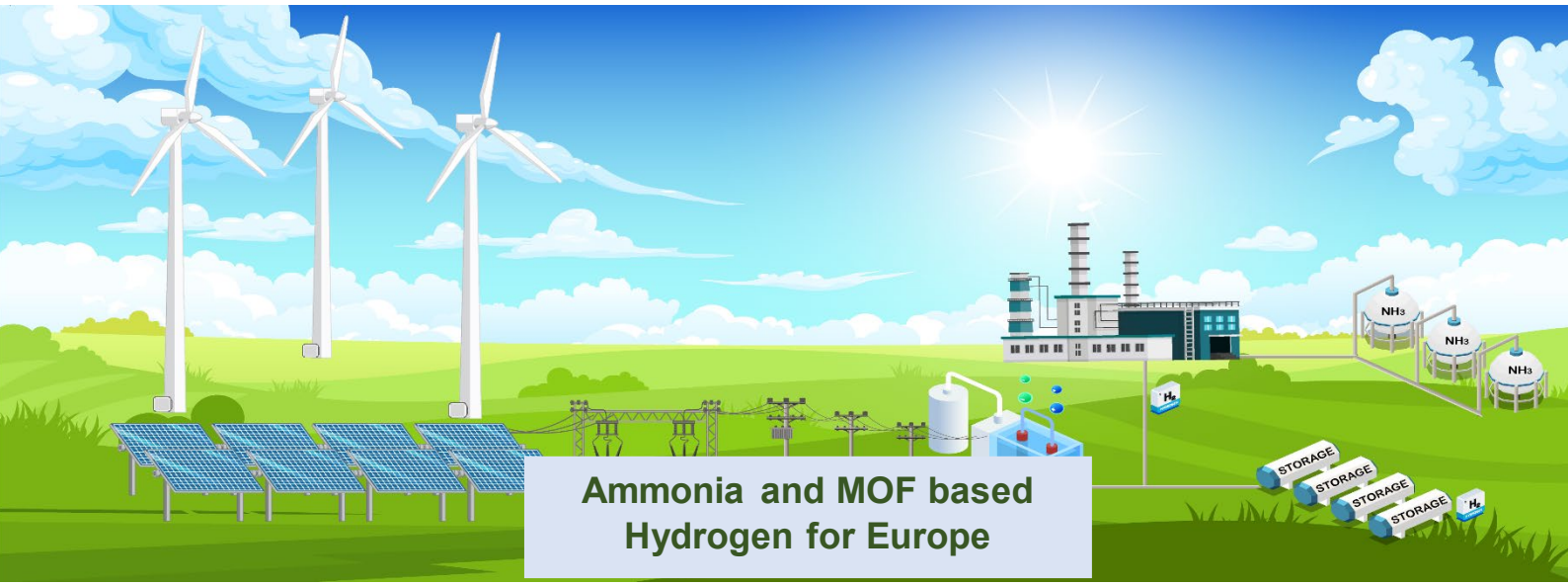


Welcome to this fourth AMBHER newsletter. AMBHER is a four-year project targeting the development of high-performance, cost-effective hydrogen storage technologies. Two different technologies are addressed: novel nanoporous metal organic frameworks (MOFs) for the short time hydrogen storage in vessels for transport applications and membrane reactors integrating new catalysts and membranes for ammonia synthesis for long term hydrogen storage media.

The present newsletter is the fourth release of the biannual letter that will be published by AMBHER presenting the progress on the project and highlighting information related to the R&D fields addressed. Hope you will find the info in this newsletter interesting. On our website www.ambherproject.eu you will find public presentations, all the public deliverables of the project and many other interesting news. Stay tuned!

In this number

About the Project

AMBHER (Ammonia and MOF based Hydrogen for Europe) is a European project providing a holistic approach to tackle the short- and long-term energy storage challenges raised by the high degree of electrification our society is aiming for. Firstly, AMBHER is addressing the main societal, economic and technological questions coming together with the use of green ammonia as seasonal renewable energy storage. Simultaneously, AMBHER is developing and demonstrating innovative and cheaper compressed hydrogen storage potentially solving the gap toward local and economically relevant power-to-hydrogen hub.

AMBHER will thus increase the number of applications in the energy and transport sectors and the possibilities for success and industrial adoption by key players. For short-term hydrogen storage, novel nanoporous MOFs (Metal Organic Frameworks) of high surface area (>2.500 m^2/g) and low-cost synthesis will be developed following an original shaping process (3D printing). Furthermore, AMBHER will develop a conformable cryo-vessel that can accommodate stacks of MOF bodies of tailored-made shape.

A capacity of 40 g/L of usable space at 100 bar is achieved at competitive cost with respect to current high-pressure cylinders. For long-term storage, advanced materials (both catalysts and membranes) and their combination in an intensified 3D-printed intensified periodic open cell structured reactor will be developed to allow hydrogen storage in the form of ammonia (NH3) in a cost-efficient and resource-effective process at lower temperatures and pressures compared to conventional systems. AMBHER project is validating both solutions at TRL 5 addressing the positioning of the solutions developed in relevant business cases.

- **Impacts:**

AMBHER project will contribute to the objectives of the European Green Deal towards making the European Union (EU) climate neutral in 2050. It will play an important role in addressing some of the key challenges facing today's global society, such as the cost of energy, energy security and climate change. It will not only reduce the EU's energy dependence, but also make its energy system more resilient by balancing the energy generation and consumption curve facilitating the integration of the renewable energy in the grid through long-term storage hydrogen technologies.

The use of renewable energy storage solutions in the short and long term enables the decarbonisation of many sectors that would otherwise be difficult to decarbonise, such as transport sector. These innovations will have an impact on the entire value chain of these sectors and improve the overall competitiveness of the European economy. AMBHER will also contribute to the generation of wealth by creating around 20,000 jobs (direct, indirect and induced) accumulated (2030-2035). It will connect material developers with key players in the hydrogen economy, additive manufacturing companies, chemical companies and end-users of ammonia, matching existing needs and new products with the essential link provided by innovative organizations that are capable of developing advanced technologies that will meet the challenges of the coming years.

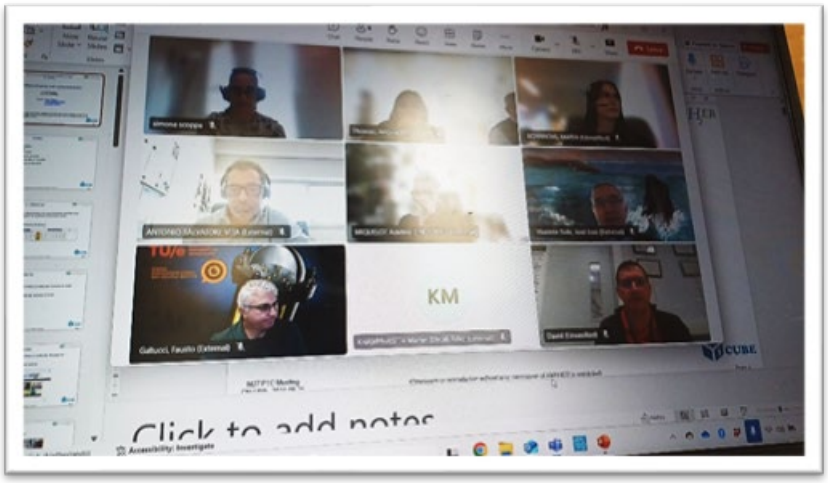
The AMBHER project held on June its General Assembly, bringing together all project partners for two days of insightful discussions and collaborative planning.

It was two intensive days of M24 Consortium meeting, that the forst day took place at Johnson Matthey in Reading (UK). Partners gathered to review the project's progress, share updates, and discuss the next steps in our collective efforts. It was a fantastic opportunity for networking and strengthening our partnerships.

For the second meeting all the partners moved to UKRI in Swindon (UK) where the focus shifted to strategic planning and aligning future goals for the project's success. The meeting provided a platform for deepening collaborations and exploring new opportunities within the project scope.

The M24 General Assembly was a great success, marking a significant milestone for the AMBHER project and setting the stage for even greater achievements in the future.

After a well-deserved summer break, the PTC Committee was back in action with an online meeting in September. The M27 PTC meeting was a great opportunity for committee members to reconnect, discuss upcoming events, key developments and the next steps in the project.



Dissemination activities :

Looking back over the last few months, the partners of the AMBHER project have been hard at work driving progress and engaging in impactful activities. It's been an exciting period of growth and achievement, where all the partners make significant contributions to the dissemination and promotion of the AMBHER project at various public events.

- **GOLD SPONSOR at Hyceltec**:

First of all The AMBHER (Ammonia and MOF Based Hydrogen storagE for euRope) project proudly participated as a **Gold Sponsor** at the IX Symposium on Hydrogen, Fuel Cells, and Advanced Batteries, (HYCELTEC) held from June 30th to July 3rd 2024 in Milazzo, Sicily

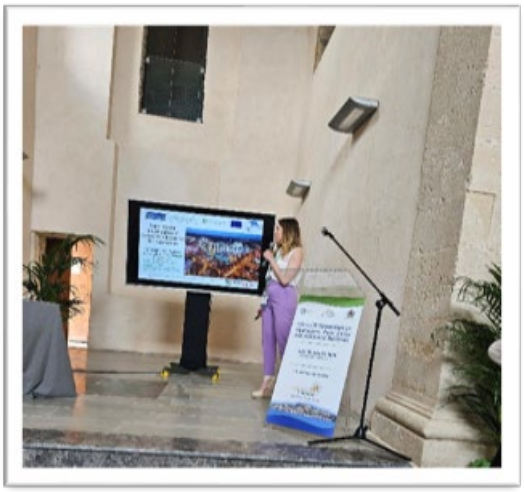
This prestigious event brought together leading experts, researchers, and industry professionals from around the world to discuss the latest advancements and innovations in the field of hydrogen energy and related technologies.

As a Gold Sponsor, AMBHER had a significant presence at the symposium, highlighting our commitment to advancing hydrogen energy research. Our involvement included:

AMBHER's booth was a focal point for attendees, offering in-depth insights into our project, research findings, and innovative materials designed to enhance hydrogen production, storage, and utilization. Our team of experts, such as CNR-ITAE, TU/e and Tecnalia was on hand to engage with visitors, answer questions, and explore potential collaborations.

Moreover, 1Cube gave a special drawstring bags and our brochure about AMBHER project to all the visitors came in our stand.

Two significative presentations by our coordinator José Luis Viviente from Tecnalia



and Iolanda Gargiulo from University of Eindhoven showed and explained the AMBHER project at the audience.

On the last day of the Hyceltec, it was a special session dedicated at the Posters.

Young researchers and students presented their work through over their posters, showcasing the next generation of innovations in hydrogen and battery technologies.

Among of 41 posters presented, Gabriele Marino from our partner CNR-ITAE won a Poster session with "Catalytic activation of Periodic Open Cellular Structures (POCSs) for intensification of ammonia synthesis in membrane reactors"

It was a great experience. We had a lot of interactions with people and received positive feedbacks.

If you are more curious about our 3 full days at the Hyceltec, you can also watch our video's at 1Cube You-Tube channel: https://www.youtube.com/@1CubeBV

- **AMBHER at 6th ISPCEM**

The 6th International Symposium on Plasmas for Catalysis and Energy Materials (ISPCEM), took place in Eindhoven from 10th to 12th July, 2024.

ISPCEM served as a platform for experts in plasma technologies for energy, environmental catalysis, and energy materials to convene.

It offered a valuable opportunity for researchers, industry professionals, and academics to exchange knowledge, discuss innovations, and explore the latest advancements in plasma applications.

The symposium covered various topics, including plasma-catalysis, energy materials synthesis, environmental applications and more

1Cube prepared special drawstring bags and block notes of AMBHER project for all 56 attendees of the 6th *ISPCEM*.

Moreover, in the bag they could find the brochure with the information of our AMBHER project.

- **AMBHER at 3rd SOAE**

Iolanda Gargiulo from University of Technology had the opportunity to join the third Symposium on Ammonia Energy in Shanghai, in which she had the pleasure to share her recent work focused on developing a two-dimensional mathematical model of a membrane reactor for ammonia synthesis aimed at identifying optimal conditions for the design and scale-up of the process, within AMBHER project.

"I *would like to extend my thanks to the people who gave their contribution in helping me to carry on this project: Bram Simpelaar, Frank Peters and Fausto Gallucci.*

I also want to express my sincere appreciation to the organizers of this event.

Also a special thanks to everyone who attended, shared insights and made the event a truly inspiring experience. Together we are making significant strides toward improving ammonia synthesis and its applications!"-she said.

FOLLOW US

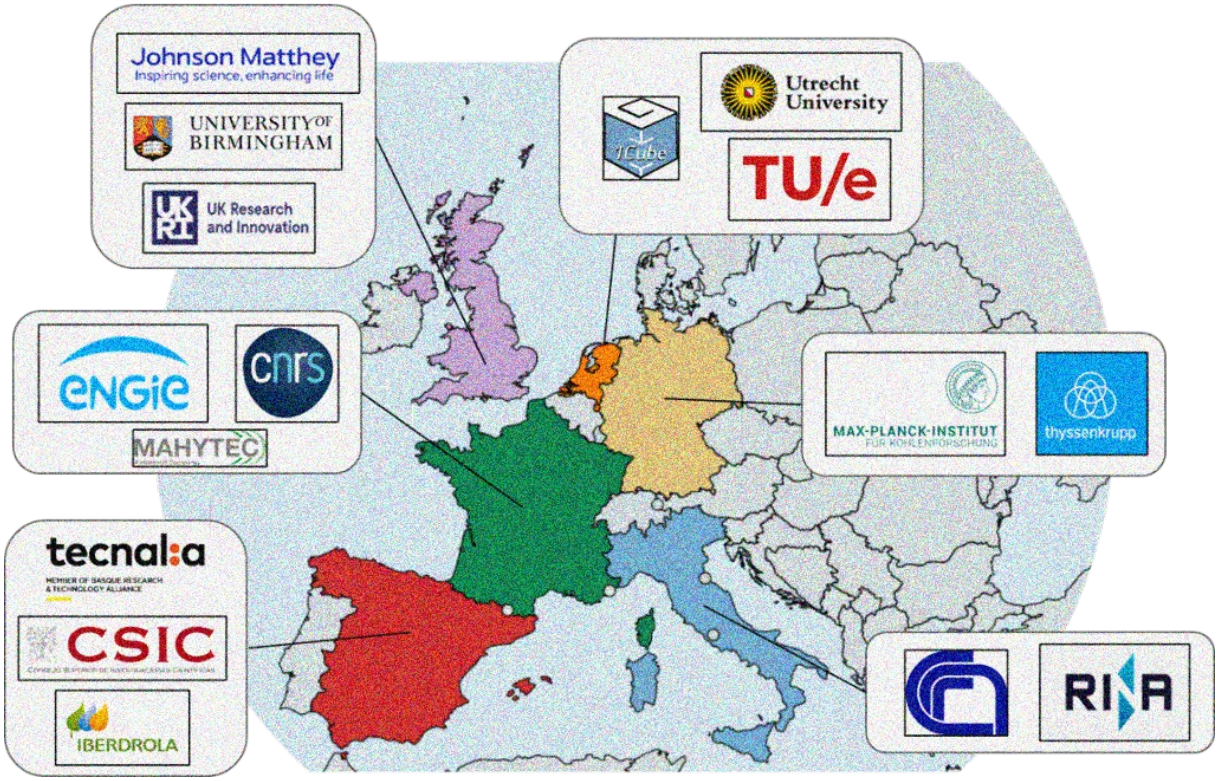
AMBHER partners are delighted to invite you to follow us on our social media platforms.

By connecting with us, you'll gain access to the latest updates, industry insights, and opportunities to engage with our growing community.

Find us on Facebook, and Instagram for a closer look at our event highlights through visual and stories, on LinkedIn for a professional insights and networking opportunities and on X (formerly Twitter) Real-time announcements and key discussions.

Your continued engagement strengthens our partnership.

We look forward to seeing you online!



Project details:
Project number: 101058565
Project name: Ammonia and MOF Based Hydrogen storagE for euRope
Project acronym: AMBHER
Call: HORIZON-CL4-2021-RESILIENCE-01
Topic: HORIZON-CL4-2021-RESILIENCE-01-17
Starting date: June 1st 2022
Duration: 48 months

UE funding: 4,915,870 Euro
COORDINATOR: Fundación Tecnalia Research & Innovation
Project Coordinator: José-Luis Viviente

Funded by the European Union

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