MOST-H2

Novel metal organic framework adsorbents for efficient storage of hydrogen

PRESS RELEASE

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REVOLUTIONIZING SUSTAINABLE HYDROGEN STORAGE FOR A GREEN ENERGY FUTURE

Through the development of innovative Metal-Organic Frameworks (MOFs) and the use of cutting-edge methods and tools, MOST-H2 aims to provide cost-effective, efficient, and environmentally friendly hydrogen storage solutions critical to achieving EU climate and energy transition goals. At 2.5 years into its 4-year journey, the project has made significant progress towards advancing cryo-adsorptive hydrogen storage technologies.

Key Achievements to Date

A key highlight of the project lies in the advancements made in material development, also building on the power of artificial intelligence (AI) to accelerate progress. An AI-driven design tool has been developed, enabling precise predictions of MOF structures optimized for hydrogen storage. By combining machine learning with advanced simulations, the project has established a robust database of high-performing materials. This work has also been featured in recent publications, which showcase how computational methods can reshape MOF synthesis and enhance their application potential in gas adsorption processes.

By analysing computationally more than 10,000 MOF structures in combination with rigorous experimental research, the team has identified novel MOF compounds that have impressive performance, surpassing the widely accepted targets for both gravimetric and volumetric hydrogen storage capacities. These breakthroughs have been secured through patent applications.

Building on this foundation, the project has also made strides in hydrogen storage system modelling and analysis. Using advanced simulations, detailed heat and mass transfer models for cryo-adsorptive hydrogen storage tanks have been developed. These insights are crucial for optimizing tank design and charging efficiency, which are key to achieving scalable, practical storage solutions.

By refining life cycle assessments and techno-economic models, the project has also been able to evaluate both the environmental and economic benefits of the proposed storage technology. These analyses are instrumental in scaling production and reducing costs, while informing end uses such as hydrogen-powered rail systems. Case studies in Austria and Italy highlight the project's relevance to sustainable transportation.

As the project enters its next phase, the focus will shift to integrating these advancements into a fully realized lab-to-tank solution. This includes addressing challenges related to scalability, enhancing system design, and exploring pathways for commercial applications in hydrogen-powered mobility.

ABOUT MOST-H2

MOST-H2 is a multidisciplinary research initiative funded under the European Union's Horizon Europe research and innovation programme under grant agreement No. 101058547, aiming to revolutionize hydrogen storage through advanced MOF technologies. By bridging laboratory-scale innovations and industrial-scale applications, the project supports the transition to sustainable energy systems across Europe.

For more information, visit: https://most-h2.eu/ and follow us on LinkedIn and X.

MOST-H2 CONSORTIUM

MOST-H2 gathers 16 partners from Greece, the UK, France, Germany, Spain, Austria, Italy and Morocco working together since 1st June 2022 until 31st May 2026: National Centre for Scientific research "Demokritos" (coordinator), University of Cambridge, University of Crete, Université du Mans, Friedrich-Alexander Universität Erlangen-Nuernberg, Universidad de Alicante, Max-Planck-Gesellschaft, Immaterial LTD, Mohammed VI Polytechnic University, Lapesa Grupo Empresarial SL/Laguens y Perez SL, FEN Research GmbH, Italferr SPA, Greendelta GmbH, Steinbeis 2i GmbH, Hiden Isochema Ltd.

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