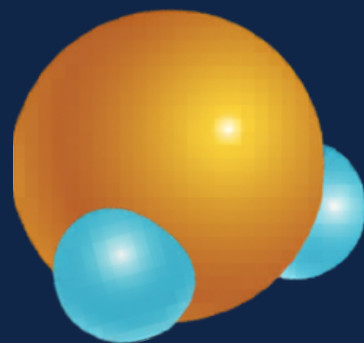


MOF2H2



GAME CHANGER FOR WATER SPLITTING



42 months of research across 5 European and non-EU countries. MOF2H2 has pushed the boundaries of light-driven hydrogen production using Metal-Organic Frameworks, bringing clean energy one step closer to reality.

FINAL NEWSLETTER APRIL 2026



INTRODUCTION

A JOURNEY COMING TO ITS CONCLUSION

The MOF2H2 project's journey is coming to an end. After testing carried out in multiple laboratories across Europe, the final demonstration phase is underway, with results expected shortly.

What began in November 2022 as an ambitious bet on Metal-Organic Frameworks as photocatalysts has evolved into a functioning outdoor prototype, a body of published science, and a network of researchers who have spent three and a half years pushing the boundaries of light-driven water splitting.

MOF2H2 investigated photocatalytic water splitting as a route to clean hydrogen production. MOFs absorb light energy and generate charge carriers capable of driving the separation of water into hydrogen and oxygen. This light-driven mechanism, both elegant and technically demanding, was the scientific core of what the project set out to achieve.



PROJECT TIMELINE



November 2022

PROJECT LAUNCH

The consortium is launched under CINEA funding. Early efforts focus on MOF synthesis, identification and selection, enabling initial laboratory-scale demonstrations. Preliminary findings are presented before the French National Committee on Chemistry the following year.



June 2023

FIRST CONSORTIUM MEETING, CAEN, FRANCE

Partners gather for the inaugural meeting. Rigorous characterisation ensures selected MOFs meet the project's high standards of purity, structural integrity and photocatalytic performance.



December 2024

NEW PARTNER VIA HORIZON EUROPE HOP-ON INITIATIVE

The National Hellenic Research Foundation (Theoretical and Physical Chemistry Institute) joins the consortium. Key milestones achieved in parallel: MNP co-deposition on the first generator MOF, advances in electronic property studies, and progress toward greener Cu-MOF synthesis.



2025

SCALE-UP, REACTOR TESTING & INTERNATIONAL CONFERENCES

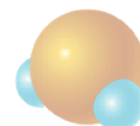
The project scales from laboratory exploration to controlled reactor testing. Live hydrogen production demonstrated at solar reactors during the Consortium Meeting in Valencia, in October. The team presents the project several conferences around the world: EMES 2025 (Chennai, India), EuroMOF 2025 (Crete-Greece), IWEPMN 2025 (Austria), NT25 (Kyoto, Japan) and the Nature Net-Zero Chemistry Conference (Tianjin, China).



30–31 March 2026

FINAL CONSORTIUM MEETING & DISSEMINATION WORKSHOP, ESPCI PARIS

The final meeting covers scale-up strategies, pilot testing and exploitation planning. Immediately followed by the Final Dissemination Workshop, gathering four internationally recognised keynote speakers and a junior researchers poster session at ESPCI Paris.



FINAL DISSEMINATION WORKSHOP · 31 MARCH 2026 · ESPCI PARIS

Following the last Consortium Meeting, the Workshop on **Photoactive MOFs and Nanomaterials for Solar Fuel Production** brought together leading experts from across the international MOF community and a new generation of junior researchers for a full afternoon of keynotes, short presentations and a closing poster session.

Held on 31 March 2026 at ESPCI Paris, the event provided a dedicated forum for presenting and discussing the latest advances in MOF-based photocatalysis for hydrogen production and solar fuel generation, both within the MOF2H2 consortium and across the broader research community.

SPEAKERS

The programme featured presentations from **Dr. Christian Serre** and **Dr. Georges Mouchaham** (ESPCI Paris / CNRS), alongside guest keynotes by **Prof. Dominik Eder** (TU Vienna) and **Dr. Valérie Keller** (CNRS / University of Strasbourg).

POSTER SESSION



Junior researchers from across the consortium and beyond presented work on topics ranging from copper-based photocatalysts and Ti-MOF optimisation to COF nanosheets and electrocatalytic systems for water splitting. The online broadcast further extended the reach of the event, allowing participants from outside Paris to follow the programme live.

FINAL CONSORTIUM MEETING

LAST GATHERING OF THE CONSORTIUM

Hosted by ESPCI Paris, the final two-day meeting brought together all consortium partners for one last time to take stock of everything MOF2H2 had built, and to chart what comes next.

The first day was devoted to science: the latest research advancements on copper and titanium MOF materials, covering synthesis, characterisation, structural modelling, surface treatment and photocatalytic experiments comparing in-situ and ex-situ samples.

Partners also discussed scale-up strategies and the ongoing pilot testing of the prototype, delayed slightly by adverse weather conditions earlier in the year.



On the second day, the agenda dealt with the remaining tasks. Dissemination activities were reviewed and final exploitation strategies agreed upon collectively.

Partners aligned on approaches to valorise the project's results at a larger scale and across diverse applications. The meeting also included a guided visit to the IMAP laboratories on the ESPCI premises.

PROJECT RESULTS

WHAT MOF2H2 DISCOVERED & BUILT



THE BEST MOFS FOR OVERALL WATER SPLITTING

Titanium and copper-based MOFs were synthesised, modified and tested under simulated solar irradiation. MIP-177(Ti) demonstrated stable hydrogen evolution and strong structural integrity across repeated cycles, while MIP-818 showed high and reproducible hydrogen production rates. Copper-modified systems further improved charge transfer and catalytic efficiency. All materials confirmed both photostability and repeatability under laboratory conditions, providing a solid foundation for prototype integration.

LABORATORY-SCALE PHOTOCATALYTIC SYSTEM

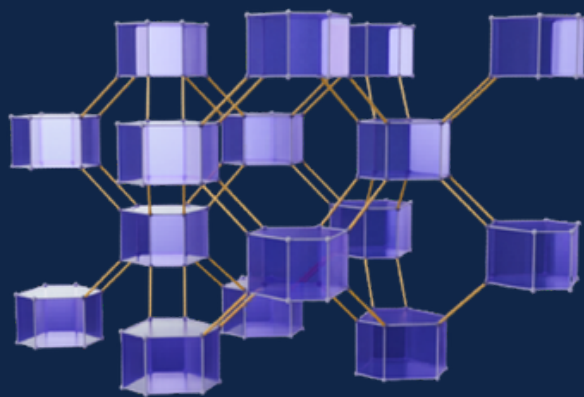
A functional laboratory-scale photocatalytic prototype was developed to validate performance beyond material-level testing, integrating each optimised MOF into a six-module system covering 1 m² overall. The reactor operates under simulated solar irradiation and enables direct measurement of hydrogen production under precisely controlled parameters.

Three prototypes were built and demonstrated at lab scale, confirming operational stability and reproducibility. Scale-up and pilot testing of the outdoor prototype is still ongoing.

PROCESS FOR MANUFACTURE OF MOF-BASED PHOTOCATALYSTS

An optimised synthesis protocol was developed for upscaled MOF production under less toxic and resource-intensive conditions. MOFs were deposited as thin films on suitable substrates, ensuring homogeneous coatings, strong adhesion and preserved crystallinity.

Polymer-modified composites, including aniline-derived materials integrated within MIP-177-LT, were developed to enhance durability, charge transport and catalytic performance. Together, these advances provide a direct pathway toward scale-up and industrial deployment.

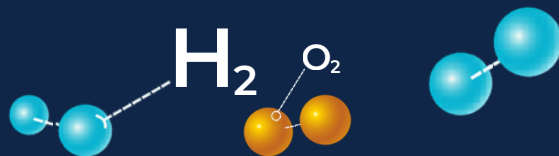


POST-SYNTHETIC MODIFICATION OF MOFS

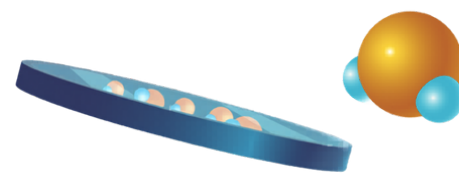
Functionalized nanocarbon materials, including fullerene derivatives and carbon nanotubes, were successfully integrated into MOF frameworks using post-synthetic modification strategies. This yielded structurally stable hybrid materials with improved charge transfer properties, opening new avenues for enhancing the photocatalytic performance of MOF-based systems.

SUSTAINABILITY ANALYSIS & ECONOMIC POTENTIAL

A comprehensive sustainability and economic assessment was conducted alongside the scientific work. It covered environmental impact, social sustainability, hydrogen minimum selling price, and public acceptance. This positions MOF2H2 as one of the few photocatalytic hydrogen projects to have paired scientific results with rigorous techno-economic grounding.



LEGACY & RECOMMENDATIONS



WHAT THE PROJECT LEAVES BEHIND

Over more than three years of collaborative research, MOF2H2 generated not only scientific results but hard-won practical knowledge about what it takes to advance a photocatalytic concept from the laboratory bench to a working outdoor prototype. What follows is a synthesis of the lessons learned and the forward-looking recommendations that emerged from that journey. The full legacy documentation will be available on the MOF2H2 legacy page upon its publication.

As project coordinator, ESPCI Paris notes that MOF2H2 should be understood as a meaningful step forward in photocatalysis rather than a direct competitor to established hydrogen technologies such as electrolysis. The project opens and validates an alternative pathway, one that may prove complementary to existing approaches as the energy transition matures.

A SCIENTIFIC LEGACY BEYOND HYDROGEN

MOF2H2 showed that performance in MOF photocatalysis is governed by charge separation dynamics and interfacial charge transfer, not by radiative lifetime alone. This understanding opens a broader horizon: the design principles validated here are directly applicable to CO₂ reduction, pollutant degradation and biomass valorisation, meaning the project's scientific contribution extends well past its initial scope.

THE DISCIPLINE OF SCALE-UP

Reaching a fully operational 1 m² outdoor prototype demanded rigour at every earlier stage. The experience confirmed that standardising laboratory protocols is not a bureaucratic exercise but a technical necessity. Materials and operating conditions validated under controlled lab conditions translate far more reliably to prototype scale, and the cost of skipping that discipline is felt acutely when working outdoors under real solar irradiation.

STABILITY AS THE REAL MEASURE OF PROGRESS

The consistent finding across the project was that chasing peak activity figures is less productive than building material stability from the outset. Interfacial design and thorough multi-technique characterisation are not refinements to be added later; they are the foundation on which reliable performance is built. Future projects in this space would do well to make stability a primary selection criterion from day one.

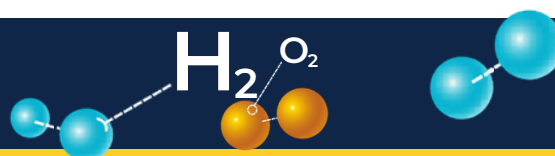
THE VALUE OF A BROAD CONSORTIUM

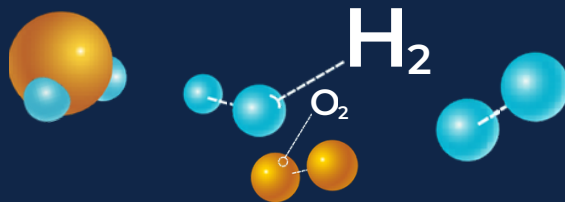
Spanning synthesis, advanced spectroscopy, reactor engineering and sustainability assessment, the consortium's breadth was simultaneously its greatest asset and its most complex management challenge. What made the difference was keeping communication open and direct between the groups responsible for making materials and those responsible for making them work in a device. The mid-project addition of a partner through Hop-On also showed the value of remaining structurally open.

ROADMAP FOR MOF2H2 FURTHER UPTAKE

A detailed exploitation roadmap was developed to define the pathway from the current TRL4 achievements toward full commercialisation. The roadmap to TRL9 identifies the key technical and commercial milestones ahead, and partners have aligned on final exploitation strategies to ensure the project's results are valorised across diverse applications in the European energy sector.

Follow-on projects are already in preparation at several consortium institutions, including new European proposals that build directly on MOF2H2's materials knowledge and prototype experience.





LOOKING AHEAD - RECOMMENDATIONS

BROADEN THE APPLICATION SCOPE

The materials knowledge built within MOF2H2 is not hydrogen-specific. Researchers who engage with these materials only through the lens of water splitting risk missing the broader photocatalytic potential the project has helped unlock, from CO₂ reduction to pollutant degradation.

MOVE TOWARD HYBRID OPERATION

Combining photocatalysis with electrolysis, and transitioning reactor configurations toward continuous operation with improved catalyst immobilisation, represents the clearest pathway from current TRL4 to TRL 6-7. The prototype foundation is in place; what follows is as much an engineering challenge as a scientific one.

PLAN FOR VIABILITY FROM THE START

Techno-economic and sustainability assessments integrated into the research workflow from the beginning allow material choices and process decisions to be shaped by real-world constraints, not just laboratory performance. This is how fundamental science becomes applicable technology.

9 PARTNERS, 5 COUNTRIES

MOF2H2 brought together a genuinely multidisciplinary consortium spanning materials science, coordination chemistry, reactor engineering, sustainability assessment and project communication, from across Europe and beyond. Coordinated by ESPCI Paris, the project united academic institutions and research organisations from France, Spain, the Netherlands, Greece and Israel, with the National Hellenic Research Foundation joining mid-project through the Horizon Europe Hop-On initiative.

Check out the website to know more about the project results!



ESPCI PARIS | PSL



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