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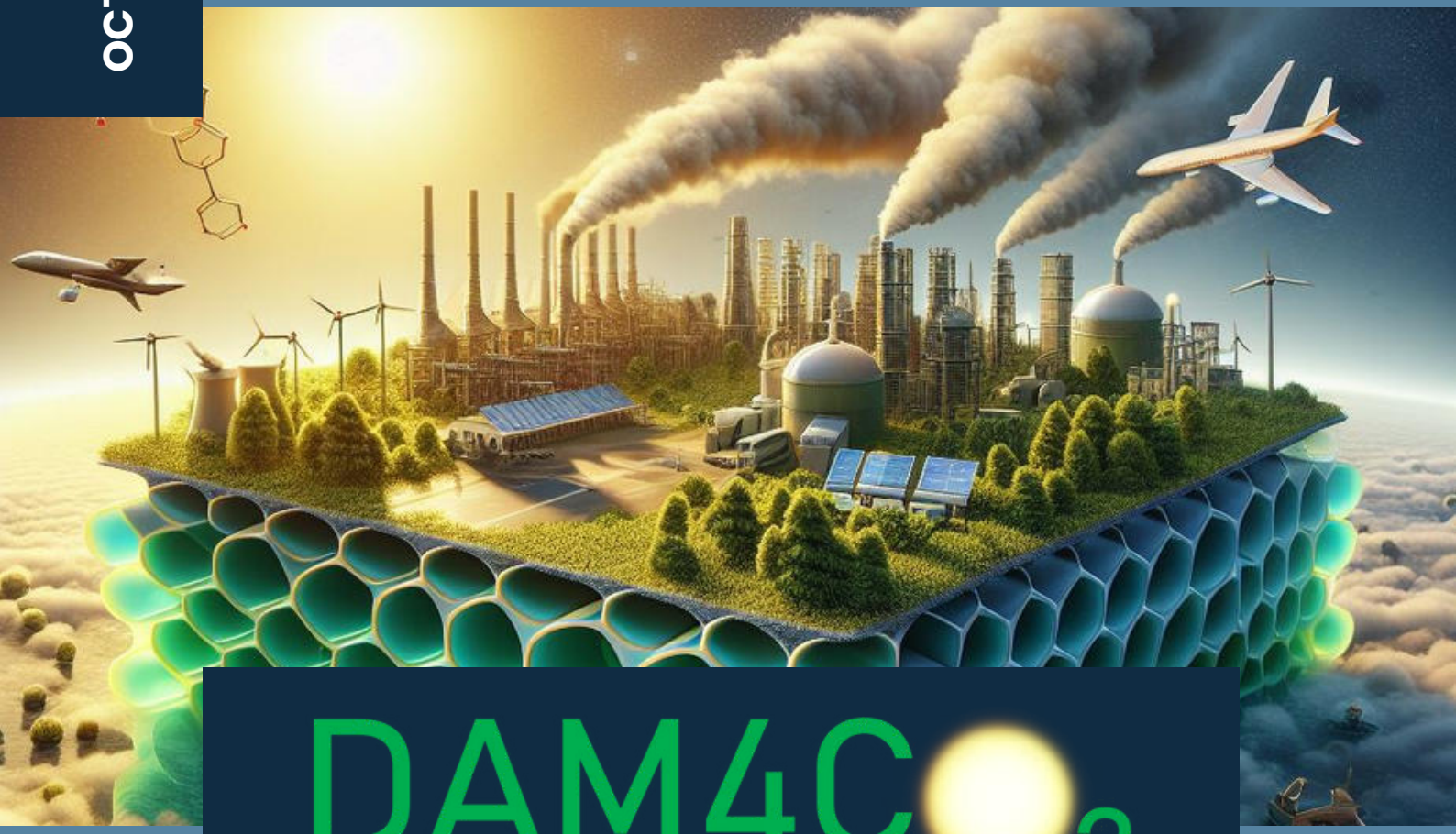
NEWSLETTER



DAM4CO2

Double-**A**ctive **M**embranes **for** a sustainable CO_2 cycle

PARTNERS

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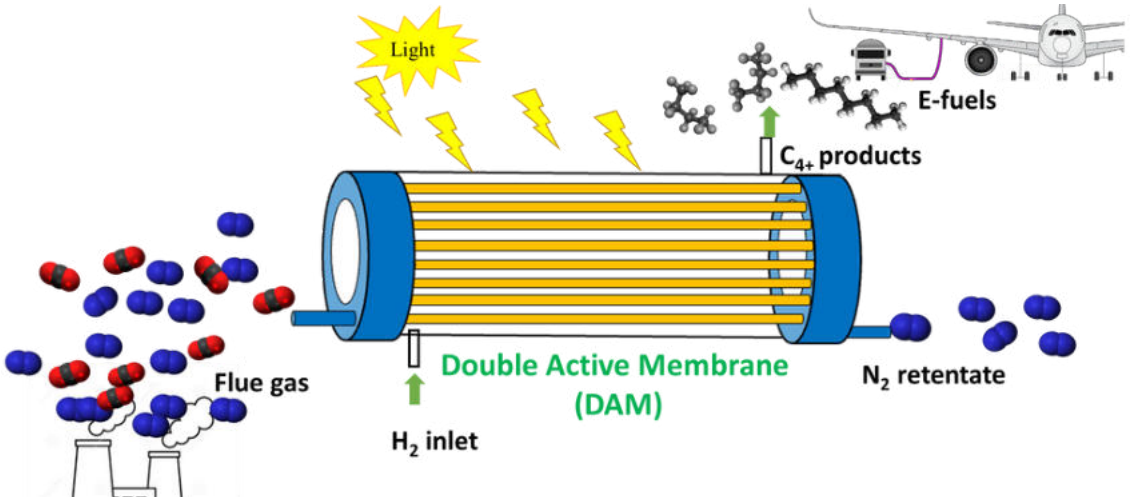
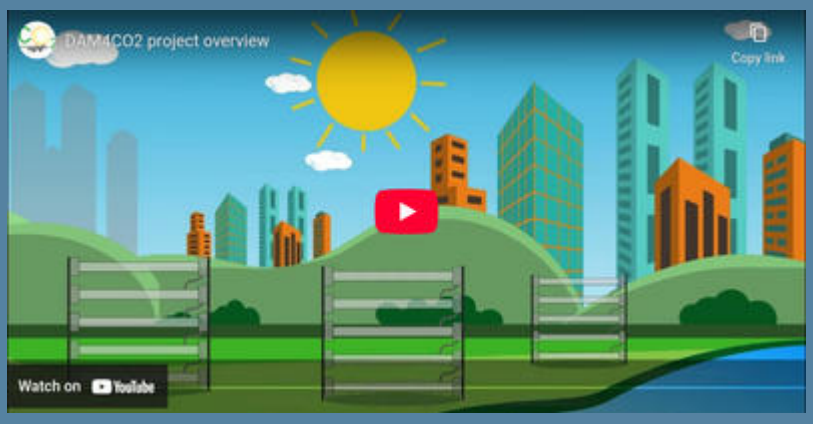
ABOUT DAM4CO2



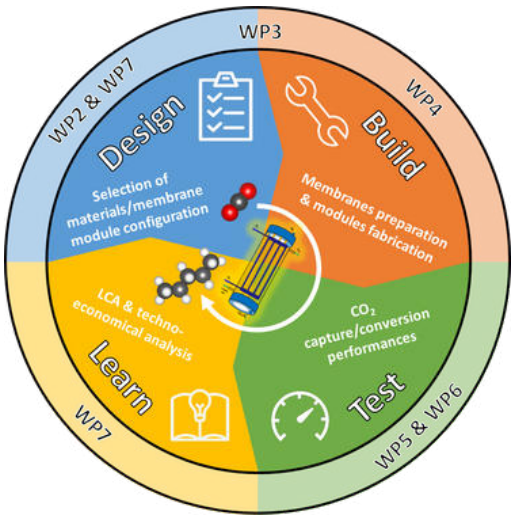
The project "Double-Active Membranes for a sustainable CO_2 cycle" (DAM4CO$_2$) aims to investigate possible ways to convert the carbon dioxide emitted by industries into renewable fuels. It is one of the eight projects, among hundred proposals submitted, funded by the European Innovation Council in the framework of the call "EIC Pathfinder Challenge: Carbon dioxide and Nitrogen management and valorisation" and it is coordinated by the Institute on Membrane Technology of the National Research Council.

The aim of DAM4CO$_2$ is to develop a novel membrane technology, for the simultaneous CO_2 separation and its photocatalytic conversion to C_{4+} molecules, as renewable fuels. The project will deliver a prototype, designed using the design-build-test-learn approach, for a proof-of-concept validation that will be tested in lab-conditions. Close attention is paid to the use of non-critical raw materials at any stage of the process, and the carbon-neutrality in order to reverse the increase of greenhouse gases emissions to mitigate the serious consequences on the global climate and to achieve the goals of the European Green Deal.



Watch the video to have a full overview of the project and follow our YouTube channel.

See on YouTube



Graphical representation of the design-build-test-learn approach that will be used in DAM4CO$_2$

4th PROJECT MEETING

The 18-month Meeting Agenda for the DAM4CO$_2$ project, held on May 6th–7th, 2025, at the King's Buildings campus in Edinburgh and online, was comprehensive and highly focused on the project's work packages. The first day began with registration and a welcome from M.C. Ferrari and N.B. McKeown (UEdin), followed by an intensive afternoon dedicated to specific work packages. Attendees received updates on WP7 (M. Buaki-Sogó), WP2 and WP3 (M. Carta and V. Crocellà), and later reviewed WP4, WP5, and WP6 (J.C. Jansen, M.C. Ferrari, and H. Garcia Baldovì), with dedicated coffee and lunch breaks separating the sessions. The day concluded with a social dinner.

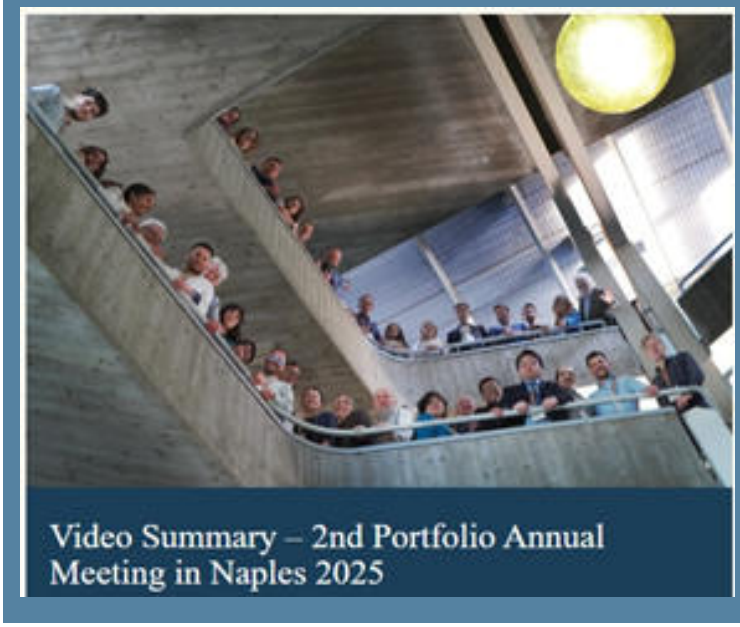
The second day focused on presentations for WP1, WP8, and WP9 by A. Fuoco (CNR). The core business concluded with a General Discussion, planning of the next meeting, and a General Assembly, all led by A. Fuoco. The meeting formally wrapped up after lunch, with an optional session for lab visits and informal face-to-face discussions

5th PROJECT MEETING

11-12 November 2025 - Valencia(Spain)

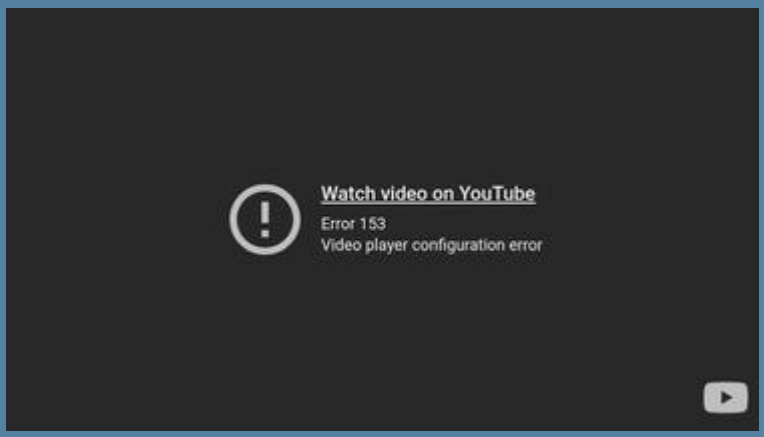
The 24-Month Meeting of our project will be organized by UPV-ITQ and will take place in Valencia, Spain, on November 11–12, 2025. Leveraging a hybrid setup, the meeting will facilitate essential direct and virtual collaboration between all partners, allowing for both in-person and remote participation.

2nd Annual Portfolio Meeting



DAM4CO$_2$ participated in the EIC CO$_2$ and N Portfolio Annual Meeting in Naples, where partners used the project as a "guinea pig" to test and customize the Technology Performance Level (TPL) framework.
The TPL is a comprehensive assessment tool (developed by Jochem Weber of Liberal Synergies) used to analyze emerging technologies across five key categories: Acceptability, Performance, Availability, Capital Expenditure (CapEx), and Operational Expenditure (OpEx).
This workshop aimed to adapt the TPL approach for the portfolio, highlighting its differences and synergies with the standard TRL (Technology Readiness Level)

During the 2nd Portfolio Annual Meeting, the EIC Junior Scientist Meeting (JSM) community also convened. This specific JSM gathering was notable as it marked the community's first face-to-face meeting.
Siria Bertolozzi participated in the meeting as a Young Researcher from the DAM4CO$_2$ project. The event served as a crucial opportunity for Early-Career Researchers (ECRs) to present their work, exchange critical feedback, and engage in collaborative discussions regarding emerging scientific and technological advancements in the field. The day's activities also included an engaging team-based challenge and subsequent presentation pitches



This meeting was documented by a video titled 'EIC CO$_2$ and N Portfolio - Annual Meeting 2025' reported on youtube. The video highlights how the eight projects (ECOMO, ICONIC, CONFETI, DAM4CO$_2$, HYDROCOW, MINICOR, MI-HY and SUPERVAL) are collaborating to build an ecosystem of sustainable solutions under the CO$_2$ and N Portfolio.

EVENTS

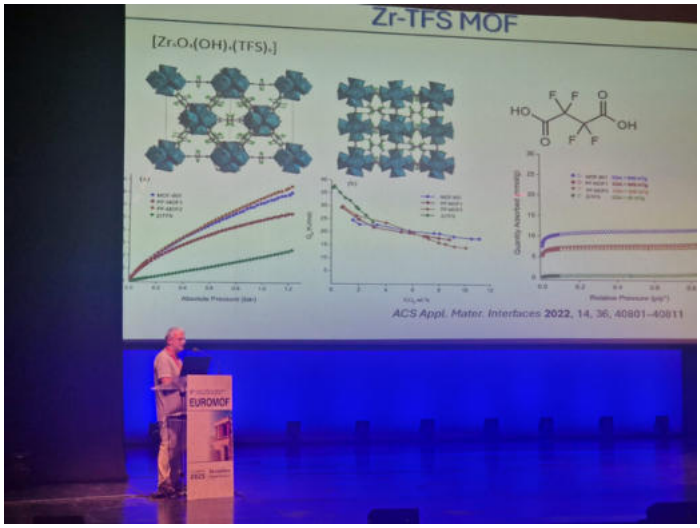
We are pleased to announce that DAM4CO$_2$ is a key partner in organizing a major upcoming event: the International Workshop on Sustainable & Circular Technologies.
Scheduled for November 26–27, 2025 in Eindhoven, The Netherlands, this two-day workshop will bring together twelve of the most forward-thinking EU-funded projects that are driving innovation in circular systems.

Free registration
CLick here

COMMUNICATION ACTIVITIES

The INSTM research team attended EuroMOF 2025 in Crete in full force! This major event for the Metal-Organic Frameworks (MOF) community provided a fantastic platform to showcase our latest advancements, exchange cutting-edge ideas, and strengthen connections with researchers from around the world.

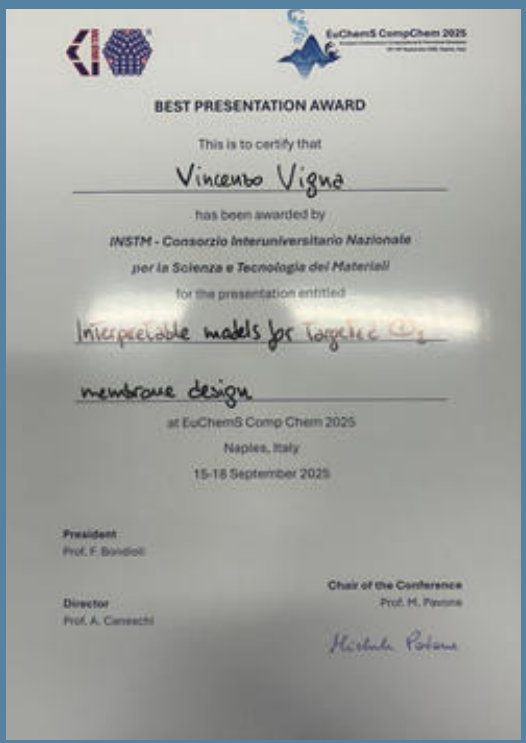
Our strong representation at the conference included: Valentina Crocellà, Ferdinando Costantino, Marco Taddei, Letizia Trovarelli, Giulio Bresciani, Silvia Bordiga. The team's expertise was prominently featured through a plenary speech delivered by Silvia Bordiga, entitled: "Combining spectroscopies and molecular modelling to disclose complexity in MOFS". We are proud to announce that Valentina Crocellà and Ferdinando Costantino both delivered compelling oral presentations, sharing significant results and driving discussion within the MOF community. Their contributions highlighted the impactful work being conducted under the DAM4CO2 project.



COMMUNICATION ACTIVITIES

John Jansen was invited to the 105th IUVSTA workshop, organized by the International Union for Vacuum Science, Technique and Applications from 21 to 24 October 2025 in Santa Margherita Ligure, with a presentation entitled "analysis of pure and mixed gas transport in advanced gas separation membranes". The talk, aimed to build a bridge between the membrane community and the community of vacuum scientists, focused on the opportunities and critical issues related to the of the transport of light gases and hydrocarbons in polymeric membranes, by a versatile mass-spectrometric device.

Vincenzo Vigna gave an Oral Presentation at CDCF50 & 5th ECPC in Pisa, from June 29 to July 3, 2025. He presented at the EuCompChem2025 European Conference in Computational & Theoretical Chemistry, held in Naples, Italy (September 15-18, 2025), where he also won the Best Oral Presentation Award a distinguished recognition officially conferred by the INSTM (National Inter-University Consortium of Materials Science and Technology)



COMMUNICATION ACTIVITIES

Lucia Calucci, Elisa Carignani, and Siria Bertolozzi attended the 52nd National Conference on Magnetic Resonance, held in Verona from September 10 to 12, 2025. Their contributions to the scientific program were significant, featuring one invited talk presented by Lucia Calucci and one poster presented by Siria Bertolozzi. We are absolutely delighted to announce that Siria Bertolozzi secured the 3rd best poster prize for her presentation—a fantastic recognition of her work

Szymon Dutczak and Krzysztof Trzaskuś represented the project at FiltraTECexpo, which was held in Warsaw, Poland, from May 13-15, 2025.

Their participation at this specialized trade fair for filtration technology and filter applications was a valuable opportunity to prominently promote the DAM4CO$_2$ project.

It was an excellent occasion to increase the project's visibility and effectively introduce it to a wide audience, including potential stakeholders from the industrial, scientific, and business sectors. This direct engagement is crucial for establishing valuable connections and exploring future collaboration opportunities

The Me-sep group participated in the 15th International Conference on Membrane and Separation Processes & 10th Membrane Conference of Visegrad Countries – MEMSEP & PERMEA 2025 in Chorzów, Poland, from June 24–26, 2025, presenting a poster titled: *"Development of a CFD model for a membrane module designed for the separation of CO_2 and its photocatalytic conversion into C_4+ molecules."*

COMMUNICATION ACTIVITIES

Lucia Calucci, Elisa Carignani, Carmen Rizzuto, Virginia Guiotto, Margherita Cavallo, Siria Bertolozzi, and Francesco della Croce participated in the Joint 50th Congress of the Physical Chemistry Division of the Italian Chemical Society and 5th European Conference on Physical Chemistry (CDCF50&5thECPC).
Held in Pisa from June 29 to July 3, 2025, the team's contribution to the scientific program consisted of a total of three posters and two oral presentations.

The oral presentation was given by Carmen Rizzuto, who presented the latest findings from the DAM4CO$_2$ project in a talk titled: "A Study of the Transport Properties of MMMs Based on Triptycene PIMs."

On 26 September the CNR-ITM was involved in the European Researchers' Night 2025 edition, and through meetings with students, the CNR-ITM group had the opportunity to present the DAM4CO$_2$ concept to students from various schools and university students, also engaging them with practical experiments to foster their involvement and inspire their future studies in STEM disciplines

COMMUNICATION ACTIVITIES

On June 24th, Alessio Fuoco participated (on-line) as invited speaker to the workshop on "Carbon Recycling in in EU Projects". This workshop was co-organised with CIRCC and the EU DESIRED Project in Lisbon as a satellite event of the 22nd ICCDU.

On May 20, Alessio Fuoco and Maria Concetta Carnevale, participated in the first edition of the Science Festival organized by IIS Lo Piano in Cetraro (CS), an event dedicated to curiosity, learning, and the future. Students, professors, and guests immersed themselves in a series of engaging activities that transformed classrooms and laboratories into true research centers. Alessio presented the different activities that are running under the umbrella of DAM4CO$_2$ on the separation of CO$_2$ and its valorisation, demonstrating how science can make a fundamental contribution to the fight against climate change.

Alessio Fuoco attended the 14th World Filtration Congress that was organized in Bordeaux, France. It was the right place to show the latest DAM4CO$_2$ progresses to a large audience of researchers and industrial players.

On august 27th-29th, Alessio Fuoco and Elena Tocci participated to the Summer School organized in the framework of the. Erasmus Mundus Joint Master "Membrane Engineering for Sustainable Development". Alessio presented his scientific (and not only) journey from a Erasmus PhD student to being Senior Researcher at CNR, including the journey of being the DAM4CO$_2$ coordinator, while Elena showed the latest outputs of her research, including the DAM4CO$_2$ results.

COMMUNICATION ACTIVITIES

In the July/August 2025 issue (Year IX, Number 4) of the online journal La Chimica e l'Industria, within the "CHIMICA & AMBIENTE" section, Alessio Fuoco and Valentina Crocellà, for the DAM4CO$_2$ project, authored an article titled "CO$_2$, From Waste to Fuel" (The full article is available here).
The piece highlighted the critical importance of effective carbon dioxide cycle management, stressing the urgent need to transform CO$_2$ from an environmental pollutant into a valuable resource to combat climate change and realize a sustainable circular economy.
This ambitious goal is being pursued collectively by the EIC CO$_2$ and Nitrogen Portfolio, established under the EIC Pathfinder Challenge "Carbon dioxide and nitrogen management and valorisation."
The portfolio consists of eight projects, all working together to develop scalable, economically viable solutions for the valorization of both CO$_2$ and nitrogen.
The strength of the portfolio lies in its technological diversity, with each project contributing a unique piece to the puzzle, ensuring a broad spectrum of challenges can be addressed simultaneously.


CHIMICA & AMBIENTE

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http://dx.medra.org/10.17374/CI.2025.107.4.20

CO$_2$, DA SCARTO A COMBUSTIBILE

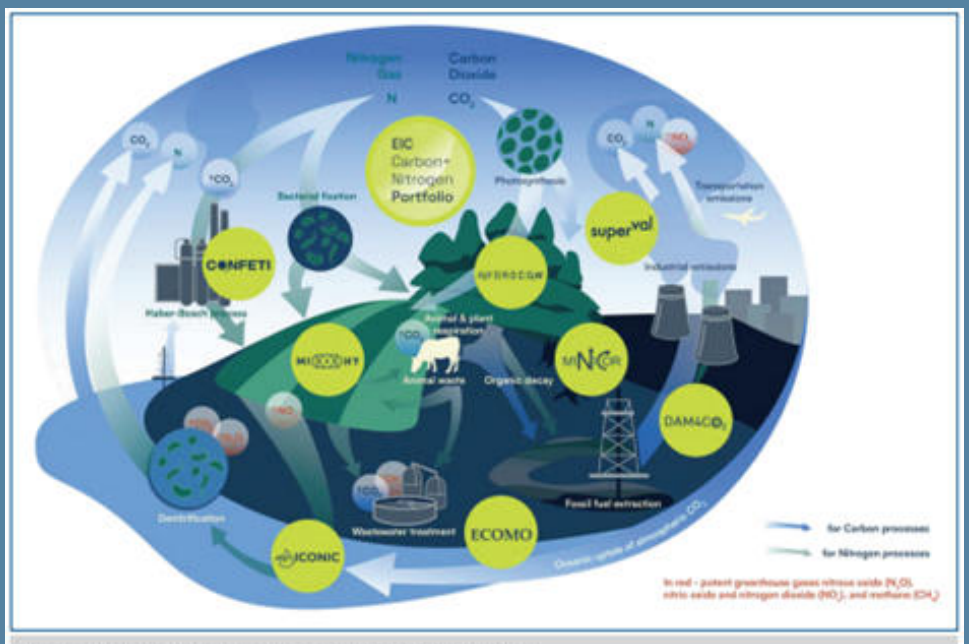


Fig. 1 - Schematizzazione dei cicli della CO$_2$ e dell'azoto e posizionamento dei progetti afferenti al EIC-CO$_2$ and Nitrogen portfolio [2]

COMMUNICATION ACTIVITIES

40th European Membrane Society Summerschool

From July 6th to 11th, 2025, Martina Vaccaro participated in the 40th European Membrane Society Summer School at the University of Twente (UT) in Enschede, the Netherlands. Titled "From Basic Principles towards Industrial Membrane Applications," the event served as an excellent platform for her to present the DAM4CO$_2$ project and hold stimulating discussions with diverse working groups. The school hosted over 80 participants from around the globe, benefiting from the expertise of leading academic and industrial specialists and offering exciting industry visits to Pentair and NX Filtration

TEACHING

The Swansea labs had the pleasure of hosting two bright undergraduate students, Sophie Wilks and Archie Sullivan, this summer supported by DAM4CO$_2$. For three months, they made a real impact, helping to create new compounds. Their work is essential for our next WP2 Deliverable 2.3.

EVENTS PAST& FUTURE

CONGRESS & SEMINARS

- MC Ferrari gave an invited seminar at SINTEF Industry in Oslo, Norway, in August 2025. Title: "Advanced Membranes and Membrane Processes for Carbon Capture."
- Kamran Ghasemzadeh delivered an invited talk at the 9th International Hydrogen Technologies Congress (IHTEC-2025) in May 2025. Talk Title: "In situ Hydrogen Production, Utilisation and CO2 Valorisation for Fuel Production by Membrane Reactor Technology."
- Hermenegildo García Baldoví participated as an invited speaker at the Materials for Sustainable Development Conference (MATSUS Fall '25), held in Valencia, Spain from October 20th to 24th,
- Siria Bertolozzi participated in the 3rd Chemistry for Future (CFF2025) conference, which was held in Pisa from July 7 to 9, 2025.
- 15th International Conference on Membrane and Separation Processes & 10th Membrane Conference of Visegrad Countries – MEMSEP & PERMEA 2025; Poland, Chorzów, 24–26 June 2025.
- The Swansea team participated to an invited seminar in Cagliari the 20th of June 2025, with a talk titled " Polymers of Intrinsic Microporosity (PIMs): Versatile Materials for Advanced Applications"
- The PhD student Afaf ALRUWAILI participated to the conference UKPorMat 2025 in Birmingham (UK), with a poster titled "Enhanced gas separation performance from quaternised triptycene TB-PIMs"
- May 2025: Virginia Guiotto (INSTM-University of Turin) attended the 15th Fundamental of Adsorption Conference in Porto (Portugal) presenting an oral contribution entitled: "Optimizing Fillers for Next-Generation Mixed Matrix Membranes: A Comparative Study of MOFs and PIMs for Enhanced CO_2 Separation"
- May 2025: Federico Panagini (INSTM-University of Turin) attended the School "Frontiers of Photochermistry" held in Pisa (Italy).
- June 2025: Letizia Trovarelli (INSTM-University of Perugia and Turin) attended the 2nd Summer School on Energy of the CH4.0 in Bardonecchia (Italy), presenting a flash oral Ø contribution entitled "Zirconium-based MOFs for CO2 separation: synthesis and characterisation".
- June 2025: Federico Panagini (INSTM-University of Turin) attended the 2nd Summer School on Energy of the CH4.0 in Bardonecchia (Italy), presenting a flash contribution entitled "Metal and metal-oxides for photothermal reductions".
- June 2025: Valentina Crocellà (INSTM-University of Turin) gave an invited lecture at the 2nd Summer School on Energy of the CH4.0 in Bardonecchia (Italy), entitled "Next-generation materials for CO_2 capture: towards a sustainable future".
- July 2025: Margherita Cavallo (INSTM-University of Turin) attended the 50th Congress of the Physical Chemistry Division of the Società Chimica Italiana, presenting a poster entitled: "Copper based metal-oxide catalysts for photothermal CO2 reduction"
- From July 6th to 11th, 2025, Martina Vaccaro attended the 40th Summer School of the European Membrane Society.

EVENTS PAST& FUTURE

- July 2025: Virginia Guiotto (INSTM-University of Turin) attended the 50th Congress of the Physical Chemistry Division of the Società Chimica Italiana, presenting an oral contribution entitled: “Advanced characterisation of organic and inorganic fillers for CO2-selective mixed matrix membranes”
- September 2025: Margherita Cavallo attended the 9th International Conference on Semiconductor Photochemistry (SP9) in Madrid, where she presented a flash oral communication entitled: “IR characterisation of powder and membrane-based metal oxide catalysts for photothermal CO2 reduction”
- September 2025: Margherita Cavallo took part in “CIG 2025 – Catalisi In Gioco”, a contest held in Reggio Calabria (Italy) designed for young researchers who want to test their skills in drafting project ideas related to the world of catalysis, with a particular focus on green chemistry and sustainability.
- September 2025: Virginia Guiotto participated to the International Workshop on Powder Diffraction organized by Momentum Transfer in Bari (Italy).
- October 2025: Valentina Crocellà (INSTM-University of Turin) gave an invited lecture at “UCT Catalytic fall 2025 seminars” at University of Chemistry and Technology, Prague (CZ), entitled “A Multitechnique Insight Into Catalyst Surfaces: In Situ Infrared Spectroscopy and Beyond”.
- John Jansen was invited to the 105th IUVSTA workshop, organized by the International Union for Vacuum Science, Technique and Applications from 21 to 24 October 2025 in Santa Margherita Ligure

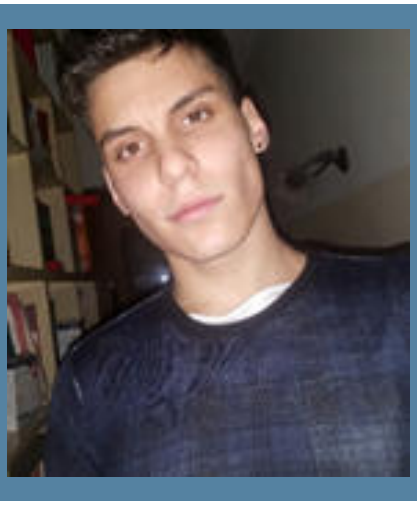
WHERE YOU WILL FIND US

- International Workshop on Sustainable & Circular Technologies Eindhoven, The Netherlands: November 26–27, 2025.
- Lucia Calucci will participate in the ICCOM Days Workshop in Bari on October 9–10, 2025
- Lucia Calucci and Alessio Fuoco will attend the GIDRM Day on Porous materials for gas separation and ion exchange membranes: insights from NMR. This event, organized by Elisa Carignani, will be held in Pisa, Italy, on November 17, 2025.
- MC Ferrari will attend the IMSTEC2025 (International Membrane Science and Technology Conference) in December 2025, Crowne Plaza, Surfers Paradise, Australia
- Me-Sep colleagues will go to FiltraTECexpo; 16-18.06.2026, Warsaw, Poland.
- October 2025: Naples will host the 'INSTM Young Researchers' Forum', organised by the Consortium in collaboration with the Italian Chemical Society's (SCI) Youth Group. Margherita Cavallo will attend the Forum and present a contribution entitled “Exploring photocatalytic and electrocatalytic CO_2 conversi on via IR characterization”
-

PEOPLE HIRED ON THE PROJECT

Andrea Scarperi graduated in Chemistry (with honors) in 2021 and obtained his PhD in Chemistry and Material Science in 2025 at the University of Pisa. During his PhD, he spent six months at the University of Warwick (UK) and collaborated with Bruker Italia Srl on the development of NMR instrumentation. Since 2025, he has been a research fellow at the Department of Chemistry and Industrial Chemistry, University of Pisa. His research focuses on the structural and dynamical characterization of inorganic and hybrid organic/inorganic materials, in particular perovskites, by SSNMR and Nuclear Quadrupole Resonance (NQR) spectroscopy, including experiments with in situ illumination to study photoinduced effects.

Simone Trastulli Colangeli graduated in Chemical Sciences at the University of Perugia in 2022, is pursuing his PhD in Chemical Sciences within the research group of Professor Luigi Vaccaro. His current research focuses on the development of green and sustainable electrochemical synthetic processes, using reusable media and recyclable electrodes. Starting from November 2025, he will join the European project “Double Active Membranes for a sustainable CO2 cycle” (DAM4CO2) as a Junior Researcher, under the supervision of Professor Luigi Vaccaro.



Dr Jorge Castellanos Soriano received his PhD in Chemistry from Universitat Politècnica de València (2024). His PhD work is based on photoredox catalysis by Triplet Fusion Up-conversion. He also joined Instituto de Biologia Molecular y Celular de Plantas IBMCP (UPV-CSIC, 2023-2024) for the synthesis of novel fertilizers for sustainable agriculture. He is currently part of the DAMCO2 project. His research is focused on synthetic organic chemistry, photochemistry and photocatalysis.

ARTICLE PUBLISHED& UNDER REVIEW

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Issue 27, 2025 Previous Article Next Article

From the journal: Journal of Materials Chemistry A

π-Extended dihydrophenazine based redox responsive polymers of intrinsic microporosity†

Check for updates

Grazia C. Bezzu, Beatrice Bartolomei, Yue Wu, Martina Vaccaro, Mariagiulia Longo, Maria Penelope De Santo, Alessio Fuoco, Maurizio Prato, Mariolino Carta and Jacopo Dosso

Author affiliations

"π-Extended Dihydrophenazine Based Redox Responsive Polymers of Intrinsic Microporosity"
J. Mater. Chem. A, 2025,13, 21683-21691 DOI (https://doi.org/10.1021/acsapm.4c02952)

Tuning flexibility in metal–organic frameworks via linker per-fluorination: revisiting the adsorption-induced breathing of MIL-53(Al)

J. Mater. Chem. A, 2025,13, 32446-32459 (https://doi.org/10.1039/D5TA04373E)


Issue 38, 2025 Previous Article Next Article

From the journal: Journal of Materials Chemistry A

Tuning flexibility in metal-organic frameworks *via* linker per-fluorination: revisiting the adsorption-induced breathing of MIL-53(Al)

Check for updates

Virginia Guiotto, Maria Sole Notari, Jacopo Perego, Diletta Morelli Venturi, Francesca Nardelli, Alberto Ricchebuono, Silvia Bordiga, Susana Garcia, Marco Taddei, Matteo Signorile, Angiolina Comotti, Lucia Calucci, Ferdinando Costantino and Valentina Crocellà


membranes

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Review of Hollow Fiber Membranes for Gas Separation: Exploring Fundamentals and Recent Advancements

by Valentina Grosso, Carmen Rizzuto, Elena Tocci, Alessio Fuoco, Mariagiulia Longo, Marcello Monteleone, Pegah Hajivand, Johannes C. Jansen and Elisa Esposito

"Review of Hollow Fiber Membranes for Gas Separation: Exploring Fundamentals and Recent Advancements"
Membranes 2025, 15(8), 246 (doi.org/10.3390/membranes15080246)

"A water-based synthetic route to metal-organic framework UiO-66 starting from PET-derived terephthalate esters" submitted to the Journal RSC Sustainability. A preprint version is available at ChemRxiv: 10.26434/chemrxiv-2025-b7q8c


ChemRxiv

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Materials Chemistry

A water-based synthetic route to metal-organic framework UiO-66 starting from PET-derived terephthalate esters

01 August 2025, Version 1

Working Paper

Pietro Agola, Marco Taddei

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Separation and Purification Technology

Enhancement of the gas separation performance of mixed matrix membranes (MMMs) with functionalized triptycene hypercrosslinked polymers of intrinsic microporosity (HCP-PIMs)

Enhancement of the gas separation performance of mixed matrix membranes (MMMs) with functionalized triptycene hypercrosslinked polymers of intrinsic microporosity (HCP-PIMs)
Separation and Purification Technology (doi.org/10.1016/j.seppur.2025.135814)

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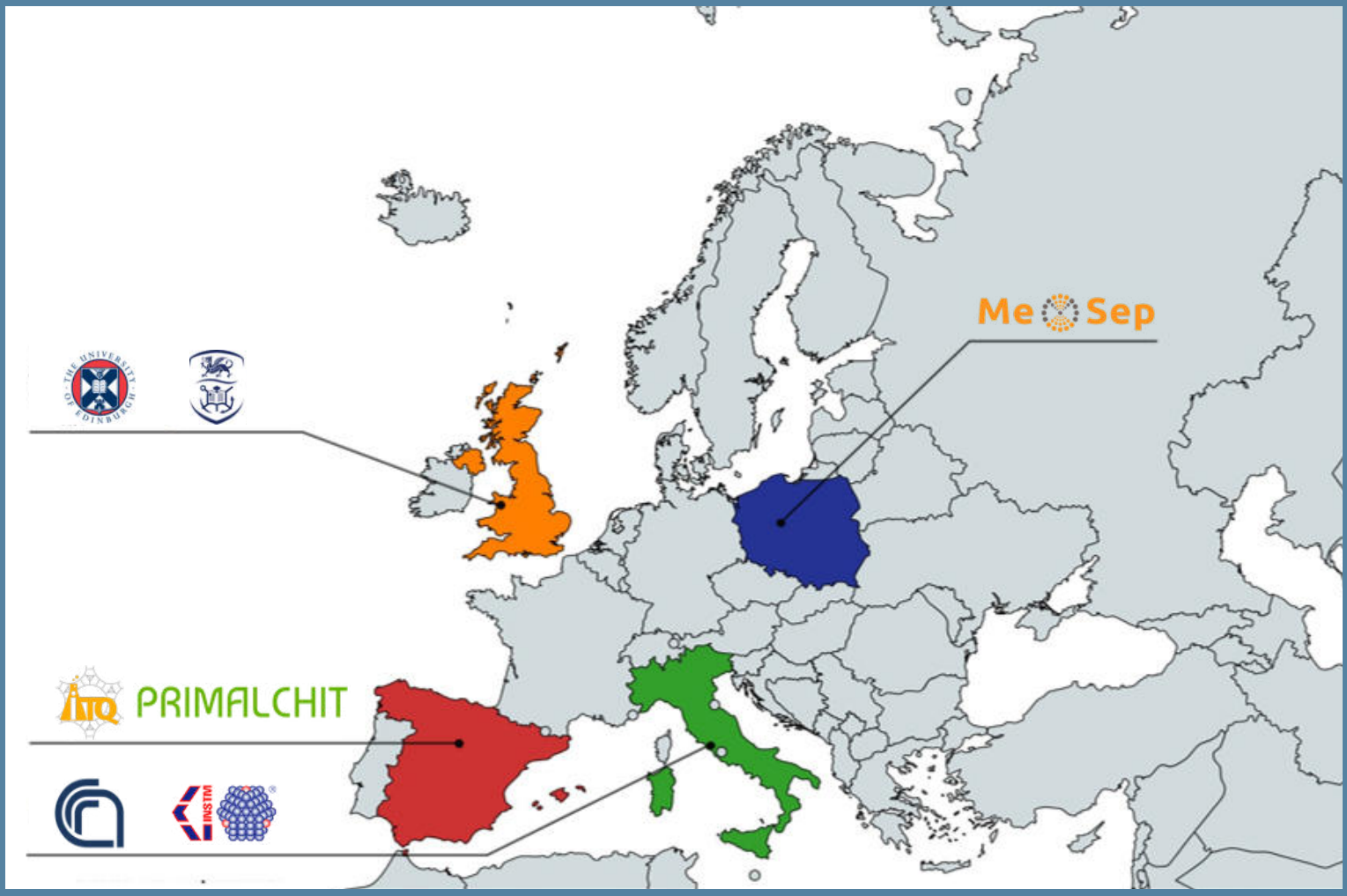

European Innovation Council
Funded by the European Union

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UK Research and Innovation

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