

Jacopo Perego

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Place of birth: Monza

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Professional experiences

01/03/2023 – today	Researcher (RTDA) Research project: "Nanoporous materials for selective carbon dioxide capture and hydrogen storage". Department of Materials Science, University of Milano-Bicocca.
01/04/2020 – 28/02/2023	Research Fellow Research project: "Soft porous materials: guests and light-triggered gas adsorption, separation and storage" Department of Materials Science, University of Milano-Bicocca.
01/01/2020 - 31/03/2020	Research Fellow Research project: "Functional supramolecular structures with dynamic, luminescent and gas adsorption properties". Department of Materials Science, University of Milano-Bicocca.
01/11/2016 – 31/10/2019	PhD in Materials Science and Nanotechnology (Approved <i>cum laude</i>, defense date: 21/02/2020) Thesis: "Functional Porous Materials: Tailored Adsorption Properties, Flexibility and Advanced Optical Applications". Department of Materials Science, University of Milano-Bicocca.

International experiences

01/03/2019 – 31/08/2019	Research period abroad. Visiting researcher at the University of Limerick (Bernal Institute) within the research group of Prof. M. Zaworotko with a project entitled "Synthesis and Fabrication of functional flexible MOFs".
01/10/2024 – 06/10/2024 25/04/2023 – 29/04/2023 22/02/2022 – 25/02/2022	Visiting researcher at ESRF (European Synchrotron Radiation Facility, Grenoble, Francia). Experiments HC-4781, HC-5193, and HC-5822 were performed at ID22 (high-resolution powder diffraction beamline).

Projects and grants

27/06/2022 – 31/12/2023	Principal Investigator of the industrial project "PoreUp_la plastica cattura CO2" funded under the IV call BiUniCrowd program, University of Milano-Bicocca (11730 €).
01/10/2024 – 06/10/2024	Principal Investigator of the research project "HC-5822. Modulation of global and local dynamics by gas sorption in Metal-Organic Frameworks" at ESRF (European Synchrotron Radiation Facility, Grenoble, Francia).

Awards

- **First prize "Young Talents 2020" under the patronage of the Accademia Nazionale dei Lincei** "For his creative contributions in the field of microporous organic materials of increasing sophistication hosting luminescent nanoparticles in nanometric cavities". (5000 €)
- **Degree Award "Miriam Ferrari"** in recognition of the quality of the study carried out to promote the continuation of training, 2013. (2000 €)
- **Best presentation award.** Contribution title: "Light-responsive Porous Aromatic Frameworks: generation of photon up converted emission and modulation of porosity by bulk photoisomerization". Materials Chemistry 2020. Global Virtual Summit on Advances in Materials, Physics and Chemistry Science. 11-12/09/2020.

Teaching activities

Perego has co-supervised 10 bachelor students in Materials Science, 3 master students in Materials Science, and 4 master students in Chemical Science and Technology at the University of Milano-Bicocca, following and coordinating the internship activities in the laboratory.

Teaching assignments at foreign research universities and international schools.

- **8 hours course about "Porous materials"**, related to the synthesis, preparation and characterization of nanoporous materials and their industrial applications at Stellenbosch University, Stellenbosch, South Africa from 18/07/2024 to 21/07/2024.
- **2 hours lesson**: "Development of Metal-organic frameworks (MOFs) nanocrystals with high luminescence and scintillating properties: design, preparation and characterization". International school "SPARTE School: Scintillating nanostructures & aerogels". 02/11/2022. Czech Technical University (CTU), Prague.

Teaching activity and didactic responsibilities at the University of Milano-Bicocca.

- 2024/2025 **Professor** of the course of MACROMOLECULAR CHEMISTRY WITH LABORATORY (1 CFU, 12 hours, exercises) and **Professor** of the course CHEMISTRY & TECHNOLOGY OF POLYMERS & INDUSTRIAL APPLICATIONS (3 CFU, 24 hours, Lectures).
- 2023/2024 **Professor** of the course MACROMOLECULAR CHEMISTRY WITH LABORATORY (3 CFU, 36 hours).
- 2022/2023 **Professor** of the course MACROMOLECULAR CHEMISTRY WITH LABORATORY (4 CFU, 48 hours).
- 2021/2022 **Professor** of the course MACROMOLECULAR CHEMISTRY WITH LABORATORY (4 CFU, 48 hours).
- 2020/2021 **Professor** of the course MACROMOLECULAR CHEMISTRY WITH LABORATORY (4 CFU, 48 hours).
- 2019/2020 **Professor** of the course MACROMOLECULAR CHEMISTRY WITH LABORATORY (40 hours).
- 2017/2018 **Tutoring** of the course of MACROMOLECULAR CHEMISTRY WITH LABORATORY (course code E2701Q041M) (40 hours).
- **Lecture** entitled: "Plastic: history and fortune of an (almost) perfect material" (3 hours)
Summer camp school "Knowing to change (the planet): plastic and sustainable development. 13-17/06/2022. University of Milano-Bicocca, Milan.

Patents

- "FAST, LOW-RESORPTION COMPOSITE SCINTILLATOR AND PROCESS FOR THE DETECTION OF HIGH-ENERGY PARTICLES AND/OR ELECTROMAGNETIC RADIATION"
Italian Patent No 102021000012347 of 13/05/2021 and application for the extension at the international level in 2022.
- "COVALENT ORGANIC FRAMEWORK NANOPOROUS MATERIALS FOR HIGH PRESSURE GAS STORAGE" Brevetto Internazionale UK n° GB2402414.3
In cooperation with Bluewave Co SA Luxemburg H2 storage

Bibliometric indicators (SCOPUS)

The scientific production and bibliometric indicators are reported below according to the SCOPUS database (accessed on 28/06/2025).

- *H-Index*: **17**
- Citations: **962**
- Articles published: **31**

Research activities

Perego has published more than 30 articles, mostly in high-impact journals (16 times as first author), including **5** *Angewandte Chemie, Int. Ed.*, **3** *Nature Photonics*, **2** *Nature Chemistry*, **1** *Nature Communications*, **2** *Advanced Materials*, **3** *Journal of Materials Chemistry A*, **2** *Advanced Functional Materials*, **1** *Journal of the American Chemical Society* and **1** *Chem*. He has participated in numerous international conferences, contributing as a plenary (1), invited (5), and oral speaker (10).

The research activity focuses on the **synthesis of organic and hybrid nanoporous materials**, on their

characterization from a structural and morphological point of view, and on the experimental study of the gas adsorption properties of gases and vapors.

In particular, the research activity aims at the synthesis of new ligands, polymeric materials and nanoporous materials for the purification and storage of gases of industrial interest, such as CO₂, CH₄ and H₂ and the synthesis of luminescent nanoporous materials for the capture of radioactive gases and the realization of innovative nanocomposite hybrid scintillators. Perego acquired significant expertise in synthesis laboratory practices and the handling of chemical substances, even under specific conditions (inert atmosphere, low and high pressures). The characterization of materials is carried out using numerous methodologies such as: powder X-ray diffraction using laboratory and synchrotron sources (PXRD) under conditions of variable temperature and pressure, low-angle diffraction techniques (Grazing Angle, GI-XRD) and X-ray reflectometry (XRR), differential scanning calorimetry (DSC), thermogravimetry (TGA), infrared spectroscopy (FT-IR), morphological characterization (optical and electron microscopy techniques, SEM) and adsorption of gases and vapors. Specifically, the research activity focuses on the study of the gas sorption properties of nanoporous materials using advanced techniques. These techniques include adsorption measurements of N₂ and Ar at cryogenic temperatures, isotherms at temperatures close to ambient of N₂, CO₂, Kr, Xe, as well as gravimetric and volumetric high-pressure isotherms, up to 200 bar, for the study of the storage of gases of industrial interest, such as CH₄ and H₂. Calorimetry measurements, coupled with gas adsorption, allowed for the simultaneous determination of gas uptakes and heats of adsorption. These measurements were performed on a dedicated, homemade setup. Multicomponent gas separation measurements (breakthrough measurements) assessed the ability of porous materials to separate and purify gas mixtures of industrial and environmental significance, e.g. for carbon capture and separation from flue gas and from air (DAC = direct air capture).

Selected publications:

- **Perego, J.**, Piva, S., Bezuidenhout, C. X., Comotti, A., Sozzani, P. E., Bracco, S., "Direct Integration of Functionalized Bridges by One-Step Superacid-Catalyzed Reaction to Fabricate Porous Polymers for CO₂ Capture and Separation", *Angew. Chem. Int. Ed.*, 2025, e202507863.
- **Perego, J.**, Bezuidenhout, C. X., Bracco, S., Piva, S., Prando, G., Aloisi, C., Carretta, P., Kaleta, J., Le, T., Sozzani, P., Daolio, A., Comotti, A. "Benchmark Dynamics of Dipolar Molecular Rotors in Fluorinated Metal-Organic Frameworks". *Angew. Chem. Int. Ed.*, 2023, 62, 1-8.
- Orfano, M., **Perego, J.**, Cova, F., Bezuidenhout, C. X., Piva, S., Dujardin, C., Sabot, B., Pierre, S., Mai, P., Daniel, C., Bracco, S., Vedda, A., Comotti, A., Monguzzi, A. "Efficient radioactive gas detection by scintillating porous metal-organic frameworks". *Nature photonics*, 2023, 17, 672-678.
- **Perego, J.**, Bezuidenhout, C. X., Villa, I., Cova, F., Crapanzano, R., Frank, I., Pagano, F., Kratochwill, N., Auffray, E., Bracco, S., Vedda, A., Dujardin, C., Sozzani, P. E., Meinardi, F., Comotti, A., Monguzzi, A. "Highly luminescent scintillating hetero-ligand MOF nanocrystals with engineered Stokes shift for photonic applications". *Nature Communications*, 2022, 13, 3504.
- **Perego J.**, Bracco S., Negroni M., Bezuidenhout C. X., Prando G., Carretta P., Comotti A., Sozzani P. "Fast motion of molecular rotors in metal-organic framework struts at very low temperatures". *Nature Chemistry*, 2020, 12, 845-851.
- Castiglioni F., Danowski W., **Perego J.**, Leung F. K. -C., Sozzani P., Bracco S., Wezenberg S. J., Comotti A., Feringa B. L. "Modulation of porosity in a solid material enabled by bulk photoisomerization of an overcrowded alkene". *Nature Chemistry*, 2020, 12, 595-602.

Participation in research projects

Perego is co-proponent and has participated in several national and international research projects, including 2 PRIN projects (NEMO-20173L7W8K, SHERPA-2020EZ8EPB), 1 European project (Grant n° 899293, HORIZON 2020 - SPARTE FET OPEN), 1 Lombardy Region project "Enhancing photosynthesis" Award, n° H45F21002830007, 1 industrial project INSTM ID 2082 "Gas storage in Nanoporous Materials" and 1 Fondazione Cariplo Project 2018-2019 "Balance Biomethane Low Impact Production and Carbon Dioxide Bio-Capture for Circular Economy".