

# Hydrogen-related activities at the University of Milano-Bicocca

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# Main Players in the topic



Prof. Piercarlo Mustarelli  
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Prof. Carlo Santoro  
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In Chemical Engineering

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# MAIN COMPETENCES AT UNIMIB

**Anion exchange Membrane (AEM) and Proton Exchange Membrane (PEM) research, development and characterization:**

- New Ionomers;
- New Polymeric chemistries;
- Tuning of the properties.

**Electrocatalyst synthesis, testing and characterization for a plethora of reactions:**

- Oxygen reduction reaction (ORR) – PGM-free
- Hydrogen Evolution Reaction (HER) – PGM-free or low PGM
- Oxygen Evolution Reaction (OER) – PGM-free

**Fuel Cells and Water Electrolyzers:**

- Integration of components and testing



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# OTHER RELATED COMPETENCES

## Electrocatalysis

- Ultra low IrO<sub>x</sub> OER
- CO<sub>2</sub>RR
- NO<sub>3</sub>RR
- Urea electrosynthesis
- Microbial Fuel Cells
- Microbial Electrolysis Cells

## Other activities

- Plastic to Fuel/Syngas
- Plastic upgrading
- Biochar
- Biochar to bacteria interaction
- CO<sub>2</sub> to methanol
- Bioelectrochemistry



# FACILITIES AT UNIMIB

## ELECTROCHEMISTRY

Rotating Ring Disk Electrode facilities

Membrane Electrode Assemblies Fabrication

Fuel Cell Test Station

Electrolyzer Test Station

## CHARACTERIZATION

SEM, TEM, XRD, XRF, Raman, FTIR, NRM, membrane thermal analysis, rheology, mechanical analysis

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# PROJECTS AT UNIMIB



**(PROJECT WE-CAT) Development of PGM-free Electrocatalysts for AEM and alkaline electrolyzers (2023-2024)**  
**Bilateral Israel-Italy 2023-2024**



**(PROJECT AMPERE) Development of PGM-free and F-free materials for AEM fuel cells & electrolyzers (2020-2023)**



**(PROJECT PERMANENT) Development of improved membrane electrode assemblies in PEM fuel cells (2023-2026)**



**Mapping of hydrogen refueling station within the Alpine Region (2023-2026)**  
**SUBCONTRACTOR**

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**Joint doctorate on developing materials for electrolyzers and electrolyzers integrations into hard to abate industrial sector. (2023-2025)**



**(PROJECT TESLA) Development of PGM-free Electrocatalysts for AEM fuel cells and electrolyzers starting from waste plastic (2023-2025)**



**Two doctorate funded on the development of PGM-free Electrocatalysts for AEM electrolyzers (2024-2026)**



**Development of PGM-free Electrocatalysts for AEM electrolyzers and their integration in Membrane electrode assemblies (2023-2025)**



**Piperanion – PNRR partenariato NEST Spoke 4**

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# Collaborators (past 3 years)



Per individuare il laboratorio affine alle proprie necessità è possibile procedere navigando la mappa interattiva che indica l'ubicazione dei diversi enti, oppure inserendo nella barra di ricerca una o più parole chiave legate all'ambito di applicazione o alle caratteristiche specifiche del progetto. È inoltre possibile filtrare la ricerca restringendola esclusivamente ai campi tematici desiderati spuntando le caselle riferite ai singoli elementi elencati.

#### RICERCA TESTUALE

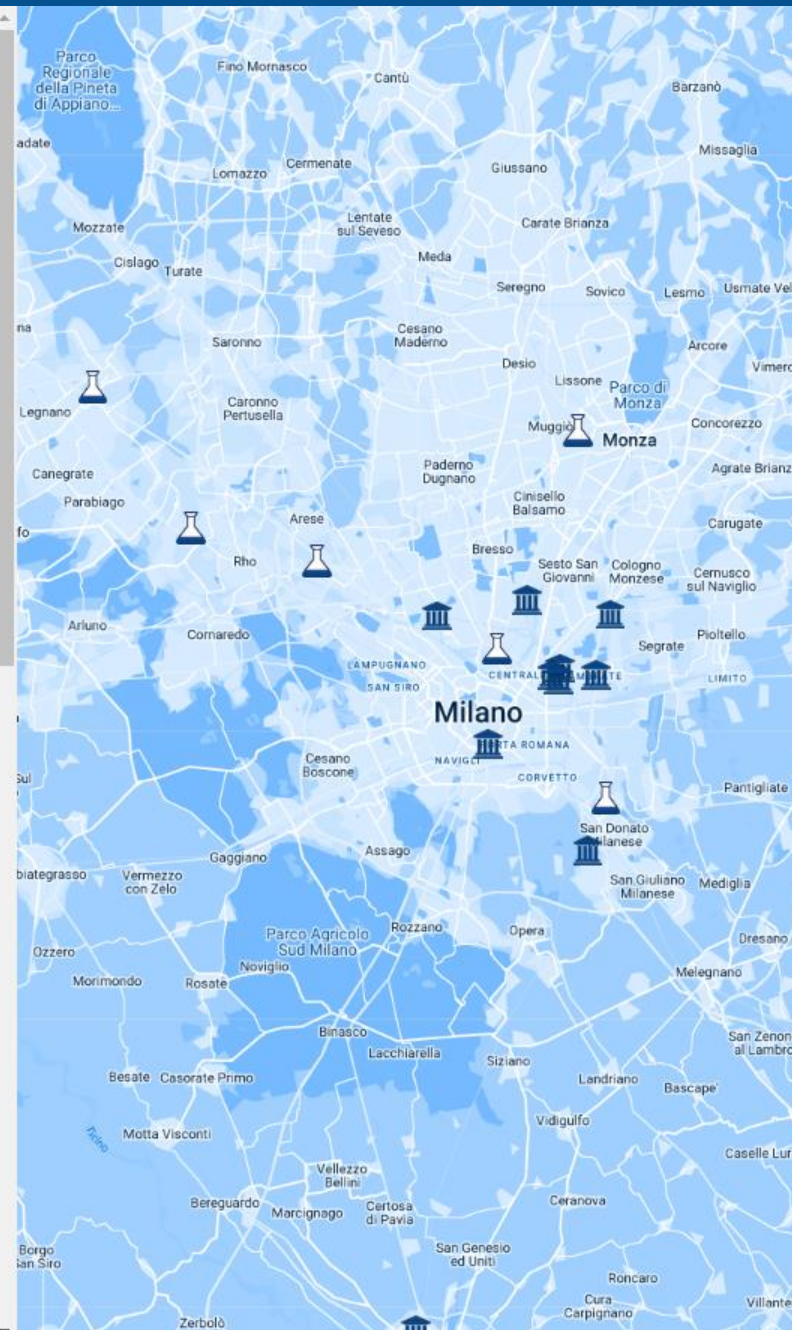
Premi Invio per cercare

#### PRODUZIONE

- Elettrolisi
  - ALK
  - AEM
  - PEM
  - SO
  - Altro
- Altri metodi di produzione
  - Reforming combustibili fossili con CCS
  - Steam reforming del biogas
  - Gassificazione rifiuti e biomassa
  - Pirolisi
  - Produzione biologica
  - Fotocatalisi tramite CSP
  - Altro

#### STOCCAGGIO, TRASPORTO, DISTRIBUZIONE

- In superficie
  - Serbatoi di stoccaggio
  - Idrucci metallici
  - Altro
- Nel sottosuolo
  - H<sub>2</sub> in rete
    - Blending con gas naturale
- Vettori liquidi
  - Liquefazione
  - Vettori liquidi organici (LOHC)



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