




ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

FUEL CELLS & HYDROGEN

Fuel cells, as an efficient conversion technology, and hydrogen, as a clean energy carrier, have a great potential to help fight carbon dioxide emissions, to reduce dependence on hydrocarbons and to contribute to economic growth.



Fuel Cell and Hydrogen research at the University of Bologna is conducted through a multidisciplinary approach that involves general and inorganic chemistry, physics of matter, microbiology, biotechnology, chemical engineering and industrial engineering.

As regards **Fuel Cells**, the following activities are developed:

- Electrochemistry, chemical physical characterization and synthesis of **polymeric, inorganic and carbonaceous materials** for proton exchange membrane fuel cells and for microbial fuel cells for water treatment. Considered materials are: electronically conducting polymers; organic electrolytes, including room temperature ionic liquids; transition metal oxides and alloys; nanostructured and porous carbons
- Development and testing of **polymeric bioelectrodes** for the realization of biofuel cells transforming **agro-industrial wastes** in electric energy
- Characterization and modelling of **perfluorosulphonate ionomeric materials** for proton exchange membrane fuel cells
- Design, preparation and characterization of hydrogen bonded **hybrid inorganic-organometallic acid** salts for application in solid fuel cell technology
- Experimental analysis of small **low-temperature fuel cells** for **stand-alone and/or cogenerative applications**

As regards **Hydrogen**, the University of Bologna is active in:

- **Metal hydrides** for solid-state hydrogen storage: synthesis, structural/chemical analysis, and characterization of hydrogen sorption properties
- Membranes and membrane separation processes for **hydrogen purification**: fabrication and testing of Pd-Ag based membranes and of polymeric membranes
- **Hydrogen and syngas production** by catalytic partial oxidation, steam-reforming and autothermal reforming of natural gas and gasification of biomass applied to plants of different size using structural catalyst and membrane integrated reactors
- Study and development of processes for the solar and **bio-production of hydrogen** and of organic compounds for the chemical industry from **agro-industrial wastes and other organic wastes** using solid catalysts either suspended-cell and attached-cell bioreactors

HIGHLIGHTS

European Projects

GREENAIR: Generation of hydrogen by Kerosene Reforming via efficient and low emission new alternative, innovative, refined technologies for aircraft application FP7.

GREENSYNGAS: Advanced cleaning devices for production of Green Syngas FP7.