



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

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## **MATERIALS FOR ENERGY**

*Materials are central and often critical to accelerate the evolution and future impact of new energy technologies. Whether dealing with energy conversion, harvesting or storage, the development of new materials with improved functionalities plays a pivotal role in efficiency, reliability, cost-effectiveness, and sustainability.*



Research at the University of Bologna covers a wide range of issues:

- Design and characterization (electrochemical, physico-chemical) of new (nano)materials (porous and nanostructured materials, transition metal oxides, electronic conductive polymers, organic electrolytes and ionic liquids) for efficient energy transport, storage and conversion electrochemical systems (Li-ions and Li/O<sub>2</sub> batteries, fuel cells, etc.)
- New materials for next-generation lithium metal and lithium-ion batteries
- Design of new blends for efficient charge separation and charge transport in photovoltaics
- Materials for new electrodes in efficient energy systems: photocathods/ photoanodes in photovoltaics, etc.
- Design of nanomaterials and catalysts for CO<sub>2</sub> photoreduction, capture, hydrogen generation and storage
- Materials for (solar, (thermo)mechanical, thermal) energy harvesting
- Innovative materials (bio inspired, nano, super-molecular, polymeric, hybrid perovskites thin films) and devices for high efficiency, low cost and sustainable energy (solar, light, wave, etc.) conversion
- Materials (Nanofibers, adapted Thermo Chemical Materials, Metal Foams and Functional Surface Technologies) for Thermal Energy Storage
- Design and development of (nano)materials and (nano)composites for energy saving, low consumption, insulation and low carbon buildings
- Materials for low and high energy superconductivity
- Design of materials for thermonuclear fusion power stations
- Materials for sustainable, energy efficient chemical separation processes
- Materials for high-voltage supercapacitors
- Novel thermoplastic polymer composite materials to enhance performance of essential components of smart grid infrastructure
- Catalysts for the transformation of biomasses into chemicals and fuels, both in the liquid and in the gas phase

## HIGHLIGHTS

### European Projects

**HyFlow** - Development of a sustainable hybrid storage system based on high power vanadium redoxflow battery and supercapacitor – technology, H2020-LC-BAT-2020

**NANOMEMC2** - NanoMaterials Enhanced Membranes for Carbon Capture. H2020 - SC3

**LEAPS** - Light effected autonomous molecular pumps: Towards active transporters and actuating materials, H2020-ERC Adv.

**GRIDABLE** - Plastic nanocomposite insulation material enabling reliable integration of renewables and DC storage technologies in the AC energy grid, H2020 LEIT NMP.

**PhotoSi** - Silicon nanocrystals coated by photoactive molecules: a new class of organic-inorganic hybrid materials for solar energy conversion, FP7-ERC starting grant.

**PolyWEC** - New mechanisms and concepts for exploiting electroactive Polymers for Wave Energy Conversion, FP7-Energy.