MOLECULES AND MATERIALS FOR THE ENERGY OF TOMORROW

Developing innovative molecules and materials for the production and the storage of clean energies taking into account the societal and economical aspects of the energy transition

OBJECTIVES

1. Facing ambitious challenges that are crucial for the energy transition
2. Identifying economic and social issues of these new energy technologies
3. Promoting future appealing collaboration towards industrial partners
4. Initiating transverse educative actions

WEBSITES
www.universite-paris-saclay.fr/fr/momentom
www.lafabrique.centralesupelec.fr

A GLOBAL AND LOCAL ENERGY CONTEXT

- Located at the heart of the research strategy of the Université Paris-Saclay
- Transverse actions “Energy” and “Materials” of Université Paris-Saclay
- Contributes to the National Strategic Area “Energie propre, sûre et efficace”
- Contributes to the European Energy Challenge “Secure, Clean and Efficient Energy” in Horizon Europe
Hydrogen production, storage and use
Breakthrough developments for faster implementation of hydrogen technologies

Low/high temperature Fuel/electrolysis Cells (production/use of H₂)
Development of low-cost, precious-metal-free catalysts, reversible fuel-cell mode / electrolysis mode systems, improvement of efficiency & lifespan

H₂ storage at moderate temperature and pressure
Adsorption in mesoporous materials

Hydrogen production from Biomass

Hybrid and multifunctional materials for solar energy conversion
Integrated photovoltaic (PV) and electrolysis functions for production of solar fuels

Development of silicon nanowires (SiNW) / catalyst-based photoelectrodes
Low-cost, high-absorbing SiNW photoelectrodes, deposition of passivating layers, functionalisation of noble-metal-free catalysts for oxidation and reduction of water, building up and testing of complete photoelectrochemical devices

Development of photoelectrodes based on hybrid perovskites
Understanding of the mechanisms governing the phase properties of the perovskite itself, modifying and controlling hybrid perovskites and their interfaces with other functional layers in order to increase their stability

Disruptive materials for (electrochemical) energy storage
Towards higher energy, improved stability and safety

Explore new electrode materials and electrolytes for batteries
Take benefit from carbon nanostructures and their composites to enhance the stored energy and power of supercapacitors

Elucidate mechanisms taking place at the microscopic level and identify correlations with the performances

New Energies and Society
Tackles new energy issues from micro and macroeconomic perspectives

Energy transition (macroeconomic approach): sustainable-growth models with regime switching
Complementarity between renewable energies and hydrogen network

Simulations and policy recommendations
Mobility (multi-sector analysis and field study)
THE RESOURCE CENTER
Favor exchanges between academic and industrial partners and establish links for future partnerships
Support design and fabrication of original devices for scientific training or outreach purposes, and favours the sharing of equipments
Organise Training Sessions for industrial partners
Outreach activities

LA FABRIQUE
Fab Lab located at CentraleSupélec
Prototyping, 3D Printing and multiphysics CAD

EDUCATIVE ACTIONS
Massive Open Online Course (MOOC)
Tailored courses on materials for energy focused on materials for hydrogen (production, use and storage), solar-energy conversion, materials for electrochemical energy storage and new energies and society. They will include theoretical and practical approaches to provide background to Bachelor and Master students as well as professional trainings

10 INSTITUTIONS

INDUSTRIAL PARTNERS, SMES & START-UPS / Non-exhaustive list
Air Liquide, PSA, Renault, EDF, IFPEN, NanoE, NextMat, TERA Environnement, SIG Energy Technology, Symbio, ZnR Batteries

SUPPORT FROM MOVEO (pôle de compétitivité)

MORE THAN 120 RESEARCHERS IN 26 LABORATORIES
LCP - SPMS - ICMMO (ERIEE, LCI) - ISMO - PPSM - LAC - LLB - NIMBE - LCM - I2BC - LAMBE PICM - PMC - UCP - ILV (EPI ECHO) - Soleil - MSSMat - SCBM - IRDEP - IBiTecs LPS, CSNSM CEARC, EPEE, CES, EXCESS/CREST, X (Dept Economy)

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