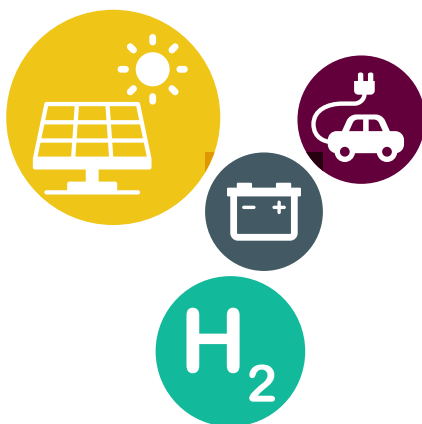


# MOLECULES AND MATERIALS FOR THE ENERGY OF TOMORROW

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](http://www.universite-paris-saclay.fr/fr/momentom)

[www.lafabrique.centralesupelec.fr](http://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 H<sub>2</sub>)

Development of low-cost, precious-metal-free catalysts, reversible fuel-cell mode / electrolysis mode systems, improvement of efficiency & lifespan

#### H<sub>2</sub> 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

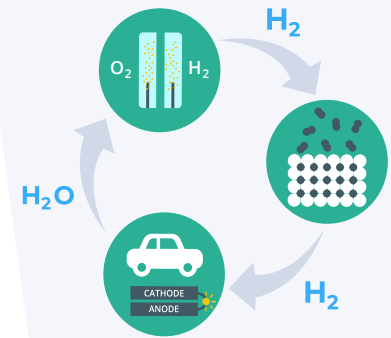
Mobility (multi-sector analysis and field study)

### OUR ASSETS

Proof of concept of highly innovative breakthroughs :  
Organometallic catalysts, mesoporous storage materials...

Research experts in all aspects of the following technologies:  
Materials development, fabrication processes, Lab cells and industrial systems testing...

Strong link between Large companies / Start-ups in the field of H<sub>2</sub> for stationary and mobile applications

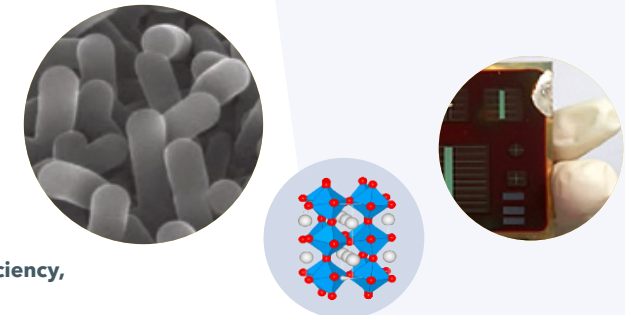


### OUR ASSETS

Developing solutions for storage of clean energies

Combining expertise in innovative PV and catalysis

Target optimization with respect to efficiency, stability and cost

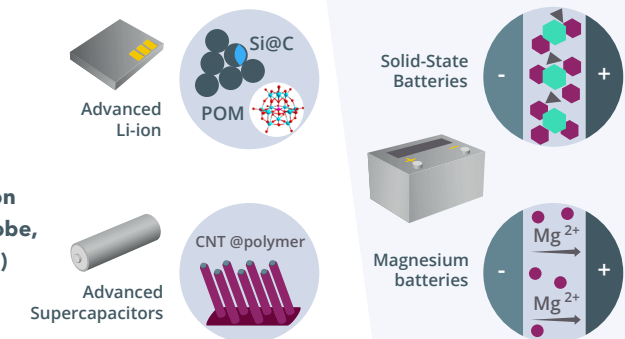


### OUR ASSETS

Possibility to open new pathways to overcome the present limitations

Development of specific instrumentation for operando analysis (nuclear microprobe, specific cells for Synchrotron facilities...)

Interaction with industrial partners



### OUR ASSETS

Switching regime from brown to green economy with solar-hydrogen complementarity

Impacting the economic growth

Rethinking the energy facilities for mobility purposes



# 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

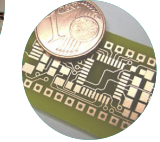
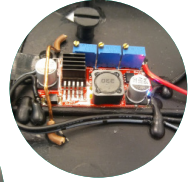
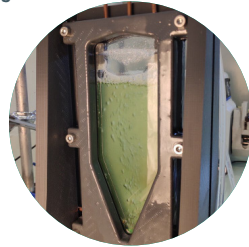
Organise Training Sessions for industrial partners

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 - IBI TecS LPS, CSNSM CEARC, EPEE, CES, EXCESS/CREST, X (Dept Economy)



### CONTACT

Hanen KOOLI-CHAABANE | Industrial relationships manager | hanen.kooli@u-psud.fr  
Hynd REMITA | scientific coordinator | hynd.remita@u-psud.fr

### JOIN US ON LINKEDIN

MOMENTOM project - Université Paris-Saclay group

