MOLECULES AND MATERIALS FOR THE ENERGY OF TOMORROW

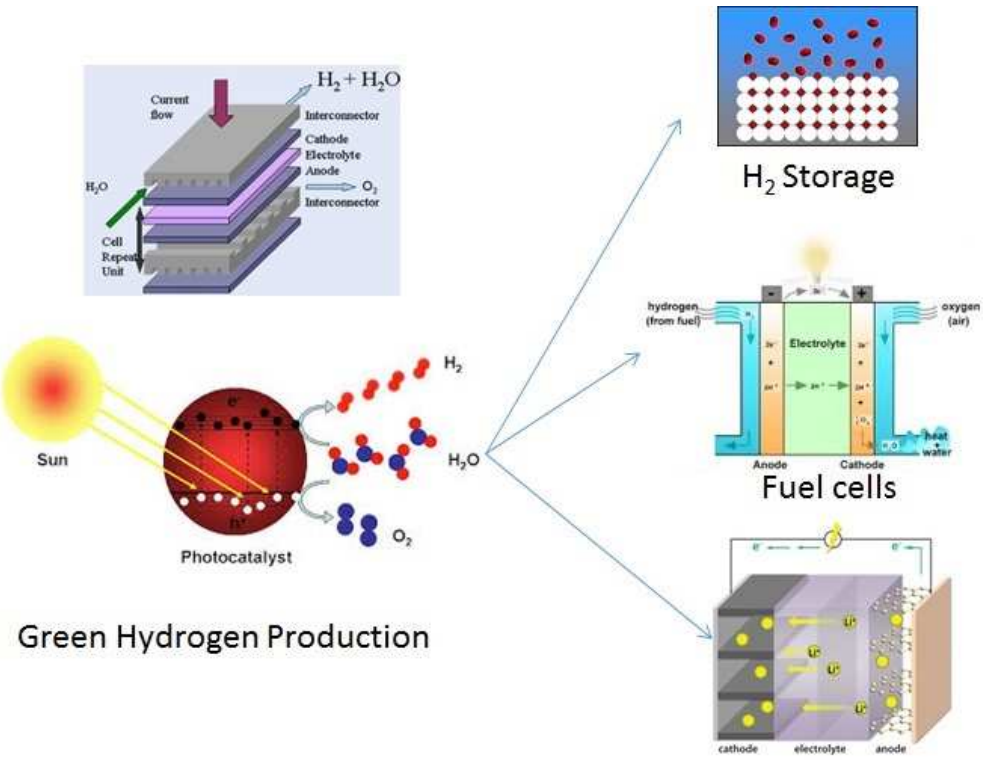
⇒ Strategic Research Initiative (IRS)

MOMENTOM Objectives

⇒ **Ambitious challenges (capture, conversion, catalysis, storage) that are crucial for the energy transition**

⇒ **Economic and social issues of these new energy technologies**

⇒ **Promoting future appealing collaboration towards industrial partners**



MOMENTOM in a global and local Energy context:

⇒ Located at the heart of the 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 H2020

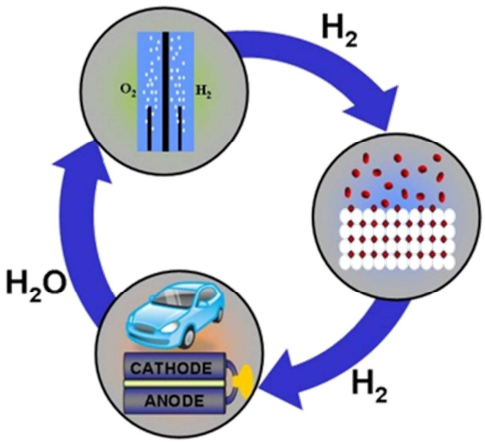
Axis 1: Hydrogen production, storage and use (Challenges)

⇒ **Develop breakthroughs for a faster implementation of hydrogen technologies**

Challenges

- **Low/high temperature Fuel/electrolysis Cells (production/use of H_2)**
- Development of low-cost, precious metal-free catalysts
- Reversible fuel-cell mode/electrolyser mode systems
- Improvements of efficiency & lifetime

- **H_2 storage at moderate temperature and pressure**
- Adsorption in mesoporous materials



Our assets

- **Demonstration made of highly innovative breakthroughs :**
Organometallic catalysts, mesoporous storage materials…

- **Research actors in all aspects of the technologies:**
Materials development, fabrication processes, Lab, cells and industrial systems testing, sociological aspects, economical stakes of hydrogen economy, policy recommandations

- **Strong link with Large companies/Start-ups in the field of H_2 for transport**

Axis 3: Disruptive materials for (electrochemical) energy storage

⇒ **Towards higher energy, more stability and safety**

Challenges

- **Explore new electrode materials and electrolytes for batteries**
- **Take benefit of carbon nanostructures and their composites to enhance the stored energy and power of supercapacitors**
- **Elucidate the mechanism at the microscopic level and find correlations with the performances**

Our assets

- Possibility to open new pathways to overcome the present limitations
- Development of **specific instrumentation for in operando analysis** (nuclear microprobe, specific cells for Synchrotron facilities…)
- Interest of industrial partners

Axis 2: Hybrid and multifunctional materials for solar energy conversion

⇒ **Integrate photovoltaic (PV) and electrolyzer functions for production of solar fuels**

Challenges

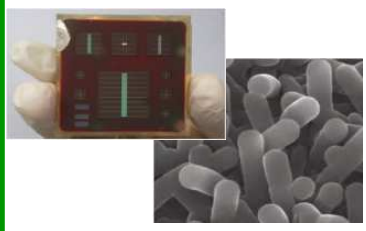
- **Development of silicon nanowires (SiNW) / catalysts based photoelectrodes**
- **Low cost**, high absorption SiNW photoelectrodes
- Deposition of passivation layers
- Deposition of **noble-metal free catalysts** for oxidation and reduction
- **Building and test of complete photoelectrochemical devices**

- **Development of photoelectrodes based on hybrid perovskites**
- Understanding the mechanisms governing the phase properties of the perovskite itself
- Modifying and controlling the hybrid perovskite itself and its interface with other layers in order to increase their stability

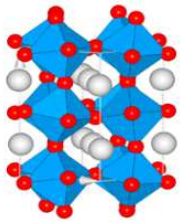
Our assets

- Developing **solution for storage** of renewable energy
- **Joining existing expertise** in innovative PV and catalysis
- Availability of broad range of **characterization** techniques
- Target **optimization** with respect to **efficiency, stability, cost**

Si-nanowires solar cells



Photoactive Hybrid perovskites



Axis 4: New Energies and Society

⇒ **Tackles new energy issues from a macro and a microeconomic perspectives**

Challenges

- Energy transition (macroeconomic approach): sustainable growth models with regime switching
- Complementarity between renewable energies and hydrogen
- Simulations and policy recommandations
- Mobility (multi-sector analysis and field study)

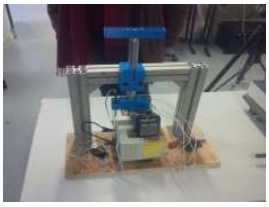
Our assets

- Switching regime from brown to green economy with solar-hydrogen complementarity
- Impacts on economic growth
- Thinking the energy mobility system

MOMENTOM RESOURCE CENTER

- Facilitate **exchanges** between academic and industrial partners and establish links for future **partnerships**
- Support the **design and fabrication** of unique devices for scientific training or outreach purpose, and to favour the sharing of equipment
- Organise **Training Sessions** for industrial partners
- **Outreach activities**

LA FABRIQUE Located at CentraleSupélec



Prototyping

3D Printing

Multiphysics CAD

MOMENTOM through its actors

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, EPEE, CES, CEARC, X (Dept Economy).

10 Institutions: cnrs, cea, Université Paris Sud, Université de Versailles St-Quentin-en-Yvelines, université d'évry, École Polytechnique, école normale supérieure paris-saclay, ENSTA ParisTech université, CentraleSupélec, Soleil Synchrotron

Industrial Partners, SMEs & Start-Ups :
Air Liquide, PSA, Renault, EDF, IFPEN, NanoE, NextMat, TERA Environnement,…

Support from Moveo (pôle de compétitivité)

And you ?

For more information, please contact

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⇒ MOMENTOM project – Université Paris-Saclay group

Web sites

⇒https://www.universite-paris-saclay.fr/fr/momentom
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⇒https://www.universite-paris-saclay.fr/fr/actualite/les-initiatives-de-recherche-strategiques-2016-de-luniversite-paris-saclay