



Hydrogen as storage vector for energy storage

éMa – Materials for energy & electronics

*Start up located within the IES -
Institut of electronics and systems of Montpellier*

Company presentation

• **2014 January :** Creation



Béatrice Sala
CEO

- **More than 30 years of experience** in materials for the energy field :
 - **Oil & Gas:** Ugine Aciers, Vallourec, Elf/Total
 - **Nuclear Industry:** Framatome, AREVA
 - **Hydrogen technologies**
- **17 Patents deposited**
- **80 publications**
- **Creation of 2 R&D centres within Areva**
- **Management of R&D budgets of several M€**



Marie Guillot
PhD Engineer



Florian Avril
PhD Student
**Graphene based
Supercapacitor/Flexible
solar cell**



Andrea Micheletti
PhD Student
**Mineral protonic conductor
200-300°C**

Our “Savoir-faire”

• Specific ceramics and nanopowders (doped or not):

Anionic conductors and **protonic conductors**, insulators, perovskites (zirconia and titanium based materials), aluminosilicates, **piezoelectrics**, silicates... for the fabrication of :

- Electrolytes for fuel cells and electrolyzers,
- Electrodes components (cermets),
- Piezoelectric sensors for high temperatures
- Electrical insulators

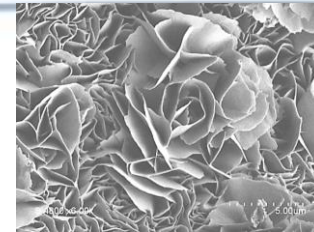
• Electrical conductors :

Synthesis and insertion of **graphene** and **graphene oxide** in ceramic or polymer structures to:

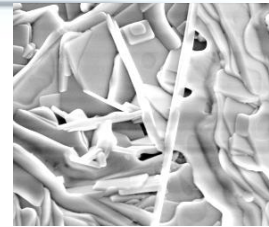
- ✓ Enhance their properties (electrical conductivity, mechanical behaviour, etc.),
- ✓ Improve the electrical characteristics of electrodes used in the energy storage field (batteries and supercapacitors).

Electrochemical deposition (Nickel, Copper, Ruthenium, Iridium: improvement of useful surface

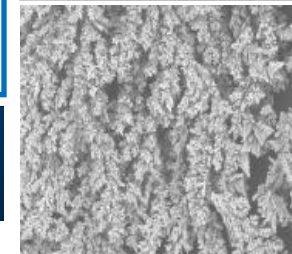
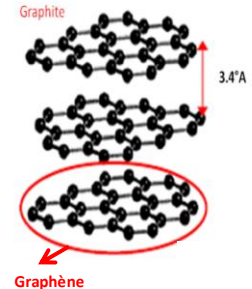
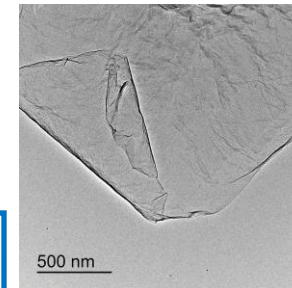
• Ceramic-metal bond (up to 1000°C)



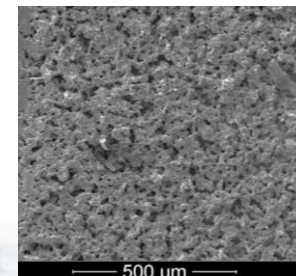
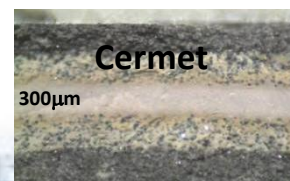
Protonic conductor Al/Si



Titanate de Bismuth



Metallic dendrites



Brazed metallic powder on ceramic surface
Resistant to 1000°C

Our “Savoir-faire”

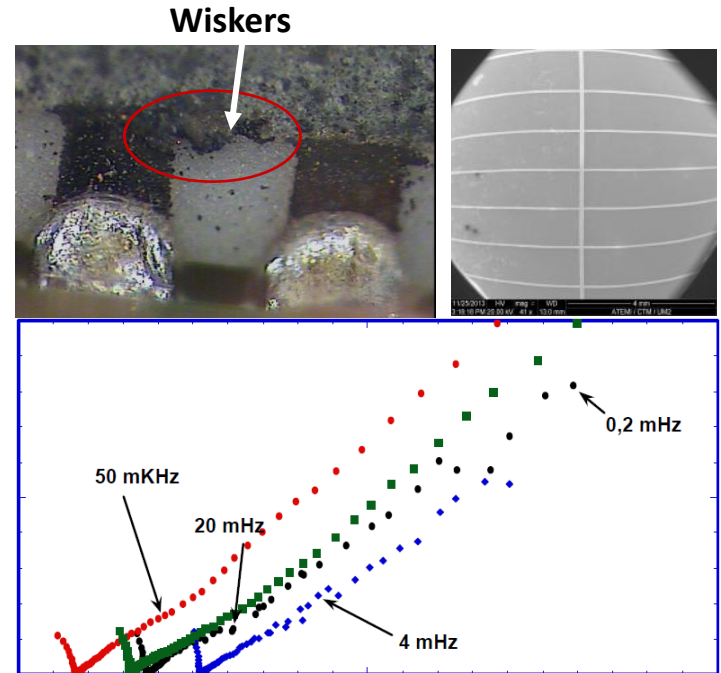
Characterisation and modelling of materials behaviour in real environnement

Room T&P → 800 °C & 100 bar
Critical Environments

- Corrosion of Electronics components (choice of metals and/or alloys)
- Ceramics degradation and/or aging
- Batteries/ fuel cells evolution
- Surfaces and Interphases (Electrodes, solid electrolytes)



Development of **accurate solutions** inherent to the **sought applications** (materials composition, manufacturing processes, etc.).



Electrochemical Impedance Spectroscopy

SEM, EDX, TEM, XRD, Raman Spectroscopy,
IR, NMR, XPS, SIMS

SOLARVI: Our “Own program”



TOP INDUSTRIE
High Pressure Engineering

1. Valorisation of CO₂



Agriculture

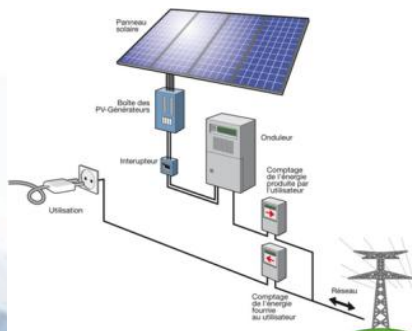


Boilers



Methanisation

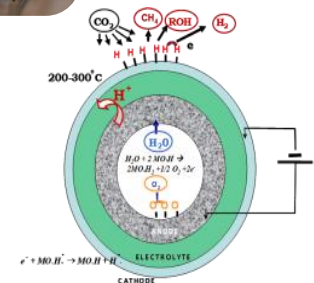
3. Coupling with renewable source



2. Innovative electrolyser for both :



Hydrogen production



Hydrogeno-catalysis of CO₂

Partners

Academic partners



UNIVERSITÉ
DE MONTPELLIER



transferts



CCI LANGUEDOC
ROUSSILLON



Industrials partners



TOP INDUSTRIE
La Technologie Haute Pression





Thank you

Andrea Micheletti

micheletti@electronmaterials.fr