

## OUR INSTITUTIONAL PARTNERS



## SOME OF OUR INDUSTRIAL PARTNERS



## CONTACTS

(first name.name@)

### IMT Mines Albi (@mines-albi.fr)

- RAPSODEE: Doan PhamMinh, Maria Gonzalez\_Martinez
- ICA: Olivier deAlmeida

### IMT Mines Alès (@mines-ales.fr)

- C2MA: Belkacem Otazaghine, Aurélie Taguet
- CREER: Luc Malhautier, Frédéric Heymes (EUREQUA), Guillaume Junqua (ERT)

### IMT Atlantique (@imt-atlantique.fr)

- GEPEA: Pascaline Pré

### IMT Nord Europe (@imt-nord-europe.fr)

- CERI EE: Rémi Gautier, Daniel Bougeard
- CERI MP: Salim CHAKI

### MINES Saint-Etienne (@mines-stetienne.fr)

- SPIN: Mathilde Rieu, Riadh Lakhmi
- Fayol: Valérie Laforest
- SMS: Cédric Bosch

### Mines Paris - PSL (@minesparis.psl.eu)

- PERSEE: Christian Beauger
- MAT: Yazid Madi
- CEEP: Chakib Bouallou, Salem Hoceini
- Géosciences: Faouzi Hadj\_Hassen
- OIE: Mathilde Marchand-Lasserre
- CSI: Madeleine Akrich
- ISIGE: Jasha Oosterbaan, Daniel Florentin
- CMA: Gilles Guerassimoff
- CERNA: François Lévêque
- CRC: Franck Guarnieri
- CAS: Florent Di\_Meglio

### ENSTA Paris (@ensta-paristech.fr)

- UCP: Laurent Catoire, Johnny Deschamps

### INP Clermont Auvergne (clermont-auvergne-inp.fr)

- I. Pascal: Jean-François Cornet

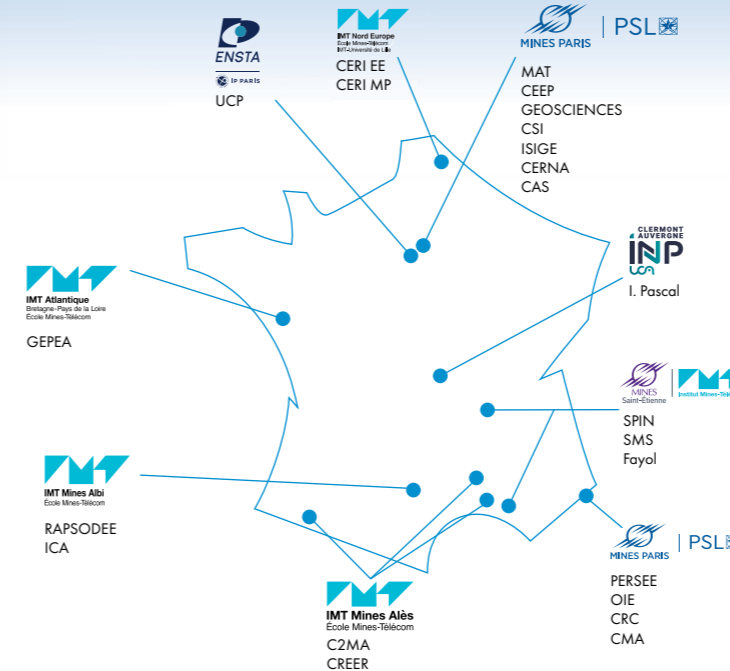
**Coordinator : Christian Beauger**  
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## OUR NETWORK FOR THE H<sub>2</sub> ENERGY SECTOR

RESEARCH & DEVELOPMENT | EDUCATION

Carnot M.I.N.E.S research centres involved in H<sub>2</sub> MINES



carnot-mines.eu

## H<sub>2</sub> MINES TAKES PART IN

### Networks

- Hydrogen Europe Research
- EERA
- France Hydrogène
- GDR (Solar Fuels, molec. and proc. thermod.)
- FRH2 (CNRS)
- Géodénergies
- SFGP
- SFT
- SEE
- Mission H<sub>2</sub> Pays de Loire
- Climate KIC

### Clusters

- CAPENERGIES
- DERBI
- NEXTMOVE
- AXELERA
- EMC2
- ASTECH
- TENERRDIS

### Ongoing projects (ANR, EU, PIA, etc.)

- PEPR-H2 décarbonné: DURASYSPEC, MATHYLDE, FLEXISOC
- ANR: PARACHUTE, Trhy, MCMET
- ANR-BMBF: IDEAS
- Projet EU: ECOHYDRO, HYWAY, FrHyGe
- PIA3: Symbio Hydrogen Academy
- Industrial chair: MESSIAH
- Direct collaborations: Symbio, Monolith, Renault, Vallourec, etc.

### Technological Platforms

- Fuel Cell & Electrolysis
- H<sub>2</sub> storage, purification
- Gas sensors
- Burners, flash pyrolyzers, gasifiers, HP reactors, methanation...
- Materials synthesis and characterization
- Shaping processes
- Fluids thermophysical properties
- Rock geomechanical characterization
- Power to gas

### Education Programs

- Conferences, courses and student projects in the framework of the different education programs of the partner schools
- PSL H<sub>2</sub> Certificate (EXED)
- Symbio Hydrogen Academy

PRODUCTION

STORAGE | DISTRIBUTION

END USES

TRANSVERSE



• Biomass gasification  
• Biogas reforming  
**RAPSODEE**

• Compression and distribution: simulation  
**RAPSODEE**

• Cryogenic multiscale mechanical behavior and gas permeability (materials characterization and modeling)  
**ICA**

• Fisher-Tropsch synthesis  
• Methanation  
**RAPSODEE**



• PEMFC membrane materials: functionalization of clays  
**C2MA**

• Biological methanation  
**CREER | EUREQUA**

• Risk analysis  
• Eco-industrial synergy  
**CREER | EUREQUA | ERT**



• Purification (PSA, membrane, absorption)  
**GEPEA**

• Porous materials  
• Solid storage tank  
**GEPEA**

• Power to gas: methanation, CO<sub>2</sub> capture  
**GEPEA**



• Modeling & Optimization: porous media, adsorption, storage, topology optimization  
**CERI EE**

• Pipelines & tanks: conception, NDC/SHM, digital twins  
**CERI MP**



• Gas sensors: CO, H<sub>2</sub>, safety/process control  
**SPIN**

• Electrode material: modeling /simulation (image analysis)  
**SPIN**

• Pipeline integrity and durability  
**SMS**

• Environmental analysis: qualitative assessment and absolute sustainability evaluation  
• Decision aid support for territorial planning  
**FAYOL**



• Electrolysis (LT PEMWE, AEM)  
• Plasma methane pyrolysis  
• Electrochemical purification (LT)  
• Photocatalysis  
**PERSEE**

• Electrochemical compression  
• Porous materials  
**PERSEE**

• PEMFC: MEA materials (catalysts and composite membranes), system studies (mobility, Heat and water management,modeling...)  
• CO<sub>2</sub> reduction  
• Renewable Energy coupling  
• Multi-energy systems  
**PERSEE**

• Future energy systems and markets  
**PERSEE**

• Prospective & optimization of energy systems  
**CMA**

• Life cycle assessment  
**OIE**

• Socio-technical controversies  
**CSI**

• Phase diagrams / measurement of thermophysical properties  
• Selection of solvents  
**CEEP**

• The economics of H<sub>2</sub> (cost benefit analysis, public policy assessment, innovation and competition)  
**CERNA**

• Electrolysis (SOEC, PEMWE, MCEC)  
• System analysis  
**CEEP**

• Power to gas  
• CO<sub>2</sub> recycling  
• Biogas  
**CEEP**

• Process economics  
**CEEP**

• HP composite tanks: tests/calculations  
• Pipeline protection: cold spray coating  
• Hydrogen Embrittlement: Material Characterization and Modeling  
**MAT**

• Territorial planning and public policies in energy transition  
**ISIGE**

• Safety and reliability assessment, public perception of safety  
**CRC**

• Salt caverns: integrity/reactivity  
**GÉOSCIENCES**

• PEMFC: membrane hydration modeling, online estimation, feedback control, optimization  
**CAS**

• Underground storage environmental impact  
**GÉOSCIENCES**



• Biomass flash pyrolysis  
**UCP**

• Doped MOFs (C, metal, metal+C)  
• Liquid carriers (LOHC)  
• Hydrides  
**UCP**

• Combustion  
• Reactivity/Risk  
**UCP**

• Tech-eco evaluation of the distribution chain  
**UCP**



• Solar photoreactive processes  
**I. PASCAL**