Silver nanowires synthesized from end-of-life solar panels for transparent electrodes and CO_2 reduction to e-fuels

Presented by Sophie Depriester

Topics and stakes

Context of global warming, resource depletion and environmental pollution

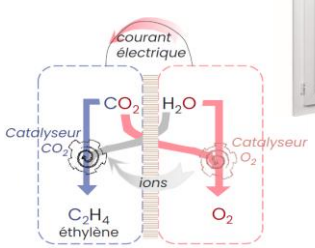
- Contributing to carbon and silver circular economies
- Green chemistry approach
- 2 applications :
  - ⇨ IR-low-emissivity films for reduction of heat loss
  - ⇨ Electroreduction of CO_2 to produce e-fuels

➢ Study of the impact of impurities (Cu, Sn and Pb) on :
- Synthesis of silver nanowires (AgNWs)
- Physical properties of AgNW networks : highest electrical and thermal conductivity at RT + good chemical stability
- Stability under electrical stress or chemical wear, and performance as active material in the devices

Separation and refining

Purification and synthesis

Spray (SALD)

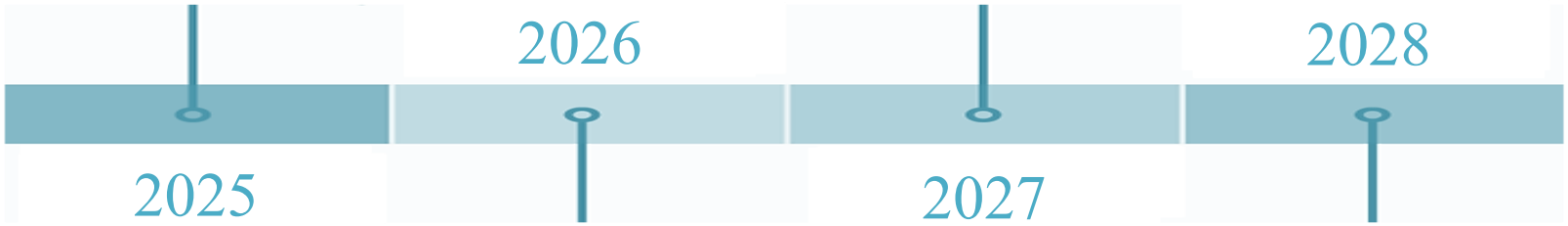


Implementing in applications

Running steps

Tasks / Year	Oct. 2025 - March 2026	April – August 2026	Sept. 2026 – April 2027	May 2027 – January 2028	February – August 2028
1/ AgNW synthesis from recycled sources	Ag dissolution then polyol AgNW structure synthesis, elementary analysis	Combinatorial analysis, physical modelling, study of mechanisms, optimisation by experimental plan			
2/ Networks of AgNW for transparent and low-emissivity films	Fine spray, electrical conductivity, thermal emissivity		Study of film stability, protective layer effects		
3/ Catalysts of AgNW into electrolyser of CO_2 reduction			Thick spray, catalytic flow, selectivity	Stability in catalysis Galvanic displacement	
Writing			Paper writing	Paper writing	Thesis manuscript writing

Divided into the main phases



Actors and governing bodies

- Collaboration between chemists and physicists who have solid expertise in the project :
  - ⇨ Research lab **LMGP** (expert in materials science, synthesis and implementation)
  - ⇨ Fundamental research lab **SyMMES** (expert in nanomaterial design and energy devices)

- Thesis director : **Pascale Chenevier** (SyMMES)
- Thesis co-director : **Daniel Bellet** (LMGP)

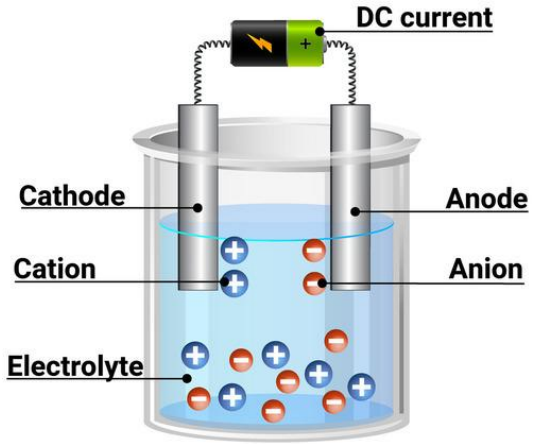
- Supported by a local industrial recycling company : **Rosi Alpes**

- 4 governing/supervising bodies : UGA, Grenoble INP, CNRS and CEA

Some definitions…

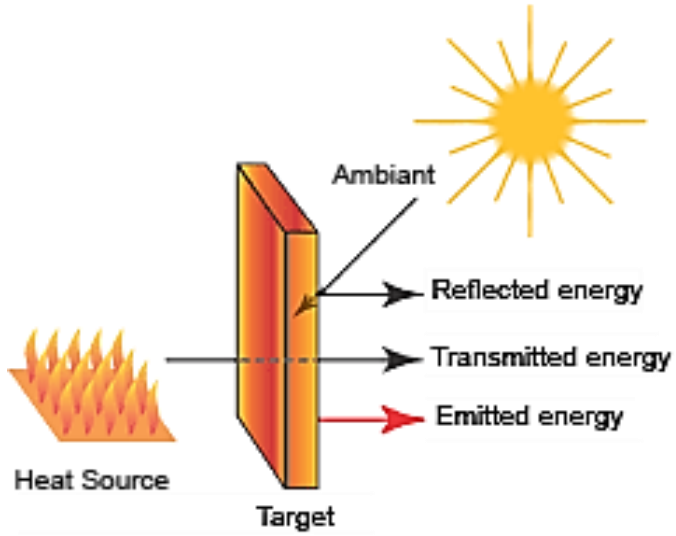
Electrolysis

- Chemical decomposition produced by passing an electric current through a liquid or solution containing ions
- Oxidation-reduction reaction by electron movement where substances gain or lose electrons
- Obtaining C_2H_4 (ethylene) from CO_2 as industrial chemical input



Emissivity

- Effectiveness in emitting energy as thermal radiation (i.e. electromagnetic radiation including both visible radiation (light) and infrared radiation)
- Ratio between 0 (ideal reflecting mirror) and 1 (ideal black body)
- Case of AgNW : very low (< 0,05)



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