

Meet PEPPER

PEPPER is a research and innovation project accelerating the transition to sustainable green hydrogen production, funded by the Clean Hydrogen Partnership under the Horizon Europe Programme.

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PEPPER Consortium

8 partners | 6 countries

Coordinator

DLR (Germany)

Partners

AVL (Austria)

CEA (France)

CNRS (France)

DTU (Denmark)

EIFER (Germany)

ELCOGEN (Estonia)

GRANT GARANT (Czechia)

CNRS Affiliated Entities

Institut des matériaux
de Nantes Jean Rouxel (France)

Université de Montpellier (France)

Université de Technologie
Belfort-Montbéliard (France)



Find Out More About PEPPER

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and its members.



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pepper

**Performant
and Efficient
Planar
Proton-conducting
Electrolysis
Reactor**

Spicing Up Hydrogen Innovation

The Hydrogen Challenge

Green hydrogen is essential for a climate-neutral future. It powers heavy industries like steel, chemicals, and transport without releasing emissions — a powerful tool in the fight against climate change. Yet current technologies can't keep up with the growing demand. They struggle with high energy use, dependence on critical raw materials, and are difficult to scale up, leaving a gap in the path to sustainable hydrogen production.

Our Mission

PEPPER aims to develop the next generation of high efficiency hydrogen electrolyzers based on planar proton conducting ceramic electrolysis cells (PCCEs).

Advance PCCEL technology operating at 400–600 °C, improving efficiency and sustainability by using industrial waste heat in the form of steam.

Develop two scalable cell designs — cermet-supported and metal-supported.

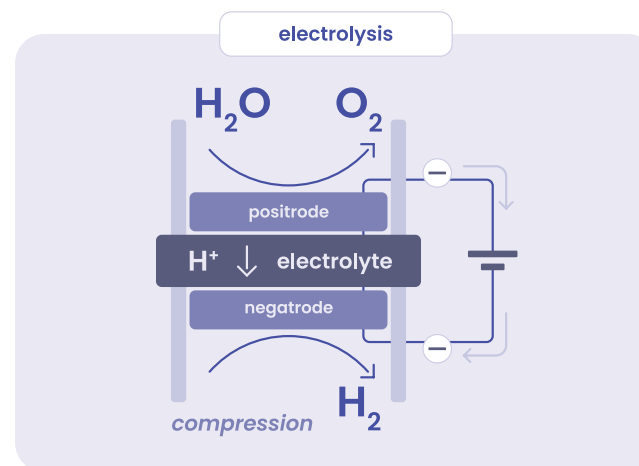
Integrate cells into compact short stacks for validation and testing.

Set PCCEL technology on the path to real world industrial deployment.

PEPPER Technology

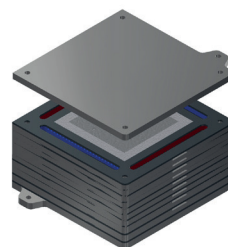
PCCEL is an innovative hydrogen technology operating at ~600 °C, turning steam into green hydrogen. How it works:

- 1 H_2O in the form of steam enters the oxygen electrode (positrode).
- 2 Electrolysis splits H_2O into oxygen gas and protons, with protons (H^+) moving through the ceramic electrolyte.
- 3 At the negatrotrode, protons combine with electrons to form pure hydrogen, which can be electrochemically compressed, reducing energy use for storage and transport.



PCCEL at work

PEPPER's planar cell design allows compact and easily scalable stacks. Combined with metal-supported cells, it cuts the use of critical raw materials by up to 90% and enables cost-effective manufacturing.



PEPPER Stack

PEPPER Performance Goals



At least 20 %

less electricity consumption compared to low temperature electrolysis



Up to 90 %

reduction in critical raw materials through metal supported design



At least 90 %

Faraday efficiency



Enhanced Tolerance

to acidic contaminants like Si and Cr species



Scalable

~ 100 cm² cell size suitable for industrial application

Shaping the Future

PEPPER's long-term impact on industry, energy, and the environment:

Helps industrial decarbonization

Contributes to EU hydrogen production sovereignty

Increases efficiency and sustainability by recycling industrial waste heat

Supports EU Green Deal goals