About
the project

The PROMISERS project is developing next-generation materials for hydrogen energy technologies — completely free of PFAS, substances known for their harmful environmental impact.

The project focuses on the core components where electrochemical reactions take place such as ionomers, proton exchange membranes, inks, and membrane electrode assemblies (MEAs), as well as on single-cell and multi-cell assemblies, commonly referred to as fuel cell stacks. These assemblies are central to two key hydrogen technologies: fuel cells, which generate electricity from hydrogen, and electrolysers, which produce hydrogen from water using electricity. By advancing these core technologies, the project aims to support the broader deployment of green hydrogen systems across Europe.

The project aims for scalable, sustainable, and safe by design technologies. Instead of relying on PFAS, it focuses on developing environmentally friendly materials based on hydrocarbons and cellulose. These materials will be used to manufacture key components such as ionomers, membranes, electrode inks, and MEAs — all designed to be completely PFAS-free. The ultimate goal is to drive the transition towards cleaner and more sustainable energy systems by combining safe materials, scalable manufacturing methods, and eco-conscious processes.

What are PFAS?

PFAS (per- and polyfluoroalkyl substances), known as "forever chemicals", are synthetic chemicals used in a wide range of products because of their high heat and chemical resistance.

Due to their resistance to natural breakdown, PFAS can accumulate in the environment and living organisms for a very long time. Their widespread use and exposure have raised severe health and environmental issues.

What are PEMs?

PEMs (proton exchange membranes) are polymer semipermeable membranes used in hydrogen technologies. They act as selective barriers that allow only protons to pass through, while blocking others like electrons and gases. This unique property enables two key processes: generating clean electricity from hydrogen in fuel cells and producing clean hydrogen from water using electricity in electrolysers.

promisers
PFAS-FREE HYDROGEN TECHNOLOGY

PFAS-free solutions for hydrogen fuel cells and electrolysers to ensure clean and safe hydrogen

PROMISERS Project
@promisersproj
info@promisersproject.eu
promisersproject.eu

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Clean Hydrogen Partnership

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Main objectives

01 — Development of Fluorine-Free Proton Exchange Ionomers

Development of fluorine free proton exchange ionomer based on hydrocarbon and nanocellulose for substitution of PFAs substances.

02 — Fluorine-Free Hydrocarbon and Bio-based Membranes

Replacement of current PFAs-based PEM membranes for eco-friendly fluorine free proton exchange membrane for fuel cell and electrolyses.

03 — Catalyst Selection and Ink Preparation

Developing fluorine-free catalyst inks for fuel cells and electrolysers, targeting safer, greener, and more sustainable technologies.

04 — PFAS-Free Cell and Stack Design & Testing

Integrate both fluorine-free based membranes and catalyst in a fuel cell and electrolyses systems without harmful PFAS chemicals to ensure, safe, reliable and sustainable operation.

05 — Safe and Sustainable Components

Design of new materials that will be possible to fabricate in large amounts with low production cost.

06 — Scalable and Affordable Solutions

Study of economic viability of components, processes, scalability and business potential through novel simulation approaches and techno-economic assessments.

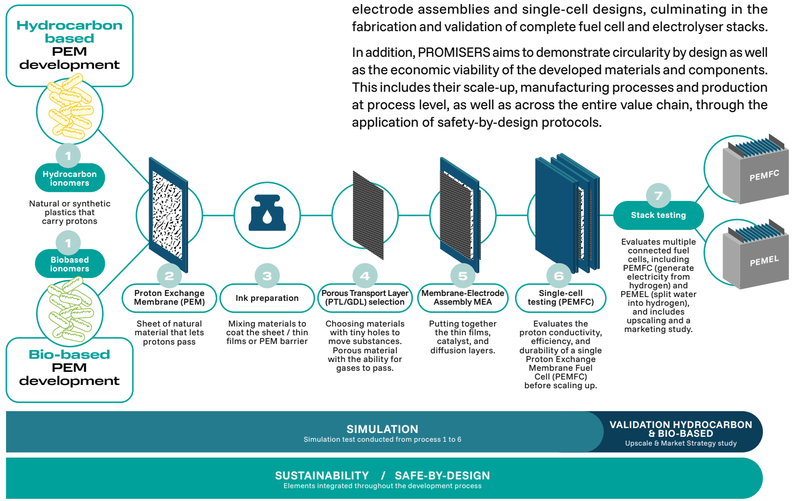
Challenge: “forever chemicals” in hydrogen

PROMISERS focuses on developing fluorine-free solutions (PFAS-FREE) for Proton Exchange Membrane Fuel Cells (PEMFCs) and Proton Exchange Membrane Electrolysers (PEMELs) using hydrocarbon-based and bio-based materials. The project explores two innovative pathways for the development of non-fluorinated components (PFAS-Free) for fuel cells and electrolysers. Hydrocarbon-based polymers and cellulose have been selected for their potential to replace current fluorinated materials.

These new fluorine-free materials will be incorporated into Proton Exchange Membranes (PEM) for fuel cell and electrolyser applications. All newly developed components will be integrated into membrane electrode assemblies and single-cell designs, culminating in the fabrication and validation of complete fuel cell and electrolyser stacks.

In addition, PROMISERS aims to demonstrate circularity by design as well as the economic viability of the developed materials and components. This includes their scale-up, manufacturing processes and production at process level, as well as across the entire value chain, through the application of safety-by-design protocols.

The two technological developments of PROMISERS



The project in numbers

The PROMISERS consortium, composed of RTOs (TNO, Leitat, and Istituto Italiano di Tecnologia) large industries (RINA, Fumatech, De Nora), and SMEs (Cellfion, Hysyech, Syensqo), brings together expertise across the entire value chain. From the synthesis and modification of materials to ink formulation, component printing, and complete cell assembly, the consortium covers every stage.

Each partner contributes its strengths: RTOs provide research and process development, industries bring production and market experience, and SMEs offer agility and innovative solutions. Together, PROMISERS develops safe, scalable, and high-performing energy technologies ready for industrial adoption.

9	6	3M	36	start	end
PARTNERS	COUNTRIES	INVEST	MONTHS	1/01/2025	31/12/2027