Pioneering Green Hydrogen Production from Seawater

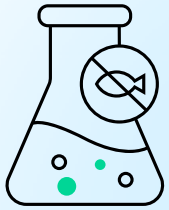
GLOBAL CONTEXT

Hydrogen is rapidly becoming a foundation of the global green energy transition, offering a clean fuel to decarbonize sectors like heavy industry, aviation, and shipping. **Green hydrogen**—produced using renewable electricity—is gaining traction worldwide. However, freshwater resources needed for traditional **electrolysis** are increasingly scarce. This makes seawater—covering over 96% of the Earth's water—a highly attractive and abundant alternative for hydrogen production.

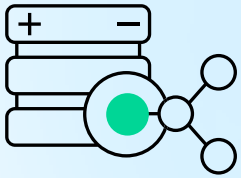
Producing hydrogen directly from seawater avoids the need for costly and energy-intensive desalination, but it brings technical challenges such as corrosion, biofouling, and interference from salts and impurities. New technologies are emerging to address these issues, including specialized catalysts, impurity-tolerant membranes, and **Bipolar Membrane Water Electrolysers (BPMWE)** that can operate efficiently with seawater. When powered by renewable energy, seawater **electrolysis** presents a scalable and sustainable pathway for clean hydrogen production, particularly in coastal and freshwater-stressed regions.

FACTS

Direct seawater electrolysis avoids high energy and costs of traditional desalination processes.



Traditional hydrogen production methods from Seawater can have harmful effects on marine ecosystems.



New technologies like Bipolar Membrane Water Electrolysers (BPMWE) and advanced catalysts are being developed to make seawater electrolysis viable and efficient.

Project Overview

ABOUT

HySEas is a three-year EU-funded project that brings together partners from 6 countries to develop a new, sustainable method to produce green hydrogen directly from seawater. Unlike traditional approaches that can damage equipment and harm marine ecosystems, HySEas uses an advanced Bipolar Membrane (BPM) to carefully control how ions move during electrolysis. This makes the process cleaner, safer, and more efficient.

HySEas aims to overcome the efficiency and material challenges of seawater electrolysis, offering a durable and cost-effective solution for green hydrogen production. The project objectives align with EU goals for climate neutrality and green transition.

RESOURCES

Hydrogen Production via Direct Seawater Electrolysis, JRC Publications ▶

Green hydrogen from seawater electrolysis: Recent developments and future perspectives, Sciencedirect ▶

Hydrogen Infrastructure Report, Hydrogen Europe ▶

PARTNERS

CERTH Centre for Research & Technology Hellas

HyLab

Manchester Metropolitan University

National Institute of Chemistry

NTNU Norwegian University of Science and Technology

National Technical University of Athens

REVOLVE

SINTEF

GENERAL INFO

4M Budget

8 Partners

6 Countries

36 months Duration

Co-funded by the European Union

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UK Research and Innovation

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