EXSOTHYC

EXSOLUTION-BASED NANOPARTICLES FOR LOWEST COST GREEN HYDROGEN VIA ELECTROLYSIS

Project ID	101137604
PRR 2024	Pillar 1 – Renewable hydrogen production
Call topic	HORIZON-JTI-CLEANH2-2023-01-01: Innovative electrolysis cells for hydrogen production
Project total costs	EUR 2 495 480.00
Clean H_2 JU max. contribution	EUR 2 495 480.00
Project period	1.1.2024–31.12.2026
Coordinator	Stargate Hydrogen Solutions OÜ, Estonia
Beneficiaries	Agfa-Gevaert NV, Fraunhofer Gesellschaft zur Förderung der angewandten Forschung EV, Technische Universiteit Eindhoven, The University Court of the University of St Andrews

https://cordis.europa.eu/project/id/101137604

PROJECT AND GENERAL OBJECTIVES

The main objective of the Exsothyc project is to develop and validate a next-generation alkaline electrolyser short-stack prototype with a novel cell design containing disruptive subcomponents and breakthrough materials to fulfil the future needs of GW-sized storage of renewable energy.

NON-QUANTITATIVE OBJECTIVES

The project aims to contribute to scientific advances across and within various disciplines, such as material science, membrane science and engineering, and electrochemistry.

Exsothyc aims to enhance EU industrial leadership for hydrogen systems and components by creating new materials, catalysts and production methods that can be applied to other areas of renewable energy and clean technology, thus contributing to standards, the wider adoption of green hydrogen thanks to the lower price, and the growth of the renewable energy sector.

The project also aims to help achieve the Green Deal goals, sustainable energy production, energy security, no CO_2 emissions, cleaner air, a lower environmental impact due to not using platinum group metals and the creation of more green jobs.

PROGRESS AND MAIN ACHIEVEMENTS

The Exsothyc project will optimise electrolyser operation, moving towards lower voltages and higher efficiencies. Within the project, a breakthrough concept for catalyst materials and for cell and stack components for alkaline electrolysers will be developed. A class of ceramic materials that form highly active metallic nanoparticles on the surface when exposed to a reducing atmosphere (a process called 'exsolution') plays a central role in the project.

FUTURE STEPS AND PLANS

- Select recombination catalysts (and their supply) for alkaline water electrolysis.
- Define the catalyst-coated diaphragms (CCD) approach for Zirfon material with optimal binder/catalyst choice, thus determining a benchmark for CCDs.
- Provide risk analysis and a safety-planning strategy.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?
SRIA (2021–2027)	H_2 concentration in O_2 at 5 % of nominal operating point of 0.5 A/cm²	%	0.4	
	Capital cost	€/(kg/day)	-	
	Capital cost	€/kW	The value will be provided by M24	
	Use of critical raw materials (as defined in the SRIA) as catalysts	mg/W	< 0.3 for alkaline cells and 0.0 for novel materials	
	Interface resistance across cell components, expressed as decrease in cell potential between the CCD and the CCS cells	V	Cell potential decrease by ≥ 0.3 V compared with the CCS cells	
	Electricity consumption @ nominal capacity	kWh/kg	48	
	Current density operation (i.e. 1.0)	A/cm²	1	
Project's own objectives	Long-term, stable and efficient materials for high-current-density operation (1.0 A/cm²), expressed as average electricity consumption during nominal operation during 500 hours of testing	kWh/kg	48	

Clean Hydrogen Partnership
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