PARTNERS OF REDHY

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Clean Hydrogen Partnership

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Facts and figures

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7 partners in
5 European countries.

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REDHy

Redox-Mediated economic, critical raw material free, low capex and highly efficient green hydrogen production technology.

Visit our website!

Objectives

Objective 1: Develop highly efficient and durable materials free of critical raw and fluorine free materials for the REDHy technology, especially the membranes, ionomers, electrodes, redox mediators, and heterogenous oxygen and hydrogen evolution catalysts to allow the development of a large area short stack (5 cells) with an active surface area of >100cm2 per cell and a nominal power of >1.5 kW with adequate manufacturing quality guided by Europe's circular-economy action plan for a cleaner and more competitive Europe.

Objective 2: Validate the stack's efficiency and robustness to address dynamic situations frequently occurring when the electrical grid is fed by a large proportion of renewable energy sources or if the system is directly interfaced with RES.

Objective 3: Eliminate the use of and the need for critical raw materials and fluorinated membranes and ionomers at stack level.

Objective 4: Demonstrate optimization strategies for the porous electrodes to enhance their mass transport characteristics and enhance energy efficiency.

Objective 5: Demonstrate a reduced energy consumption of at least 48 kWh*kg-1 H_2 by implementing highly reversible, stable redox mediators with enhanced kinetics.

Objective 6: Demonstrate a drastic reduction in interface resistances across all cell components leading to energy efficiencies >82%.

Objective 7: Demonstrate the decoupling of oxygen and hydrogen production and enabling the REDHy system to operate at minimum 5% of partial load operation (nominal load 1.5 A/cm2) without exceeding 0.4 % of H_2concentration in O_2.

Objective 8: Demonstrate that the REDHy technology is capable to perform efficient and direct seawater electrolysis.

Objective 9: Integrate the short stack in a prototype full system.

Objective 10: Demonstrate the operation of the REDHy electrolyzer at 1.5 A/cm2 with electricity consumption of 48 kWh*kg-1 over at least 1200 hours of operation with a degradation of 0.1 % /1000 hours.

Work packages:
WP1 Project Management, WP2 Redox-Mediators, WP3 Bipolar Membrane, WP4 Electrode design and optimization, WP5 Single cell REDHy prototype development and validation, WP6 REDHy system, WP7 Life Cycle and Techno economical Assessment, WP8 Dissemination and Exploitation

Conclusion: Free from critical raw materials

Cell design without the need for a membrane electrode assembly reducing the interface-resistant values across the cell components,

Lower energy consumption at nominal capacity due to enhanced kinetics and lower interface resistance

Capable of operating safely and efficiently with intermittent renewable energy sources while simultaneously decoupling hydrogen and oxygen evolution, eliminating the risk of exceeding 0.4% of hydrogen concentration in O_2

Capable of long-term operation under current densities up to 1.5 A*cm-2 due to the high cyclability of the redox mediators and no electrochemical degradation of catalysts and electrodes