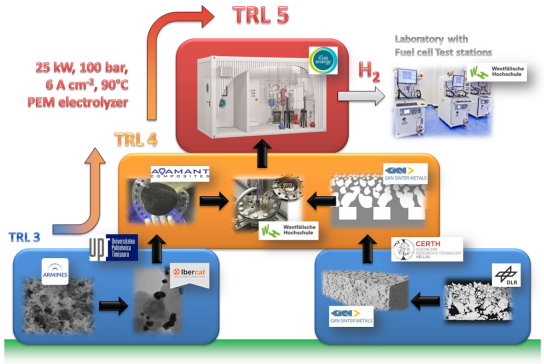
NOVEL MODULAR STACK DESIGN FOR HIGH PRESSURE PEM WATER ELECTROLYZER TECHNOLOGY WITH WIDE OPERATION RANGE AND REDUCED COST (PRETZEL)

Goal of the project

The overall objective of PRETZEL project is to develop an innovative polymer electrolyte membrane electrolyzer (PEMEL) that provides significant improvements in eff¬iciency and operability to satisfy emerging market requirements. Such electrolyzers are urgently needed for the increased demands of the grid balancing services. In this context, PRETZEL is offering breakthrough technologies for becoming game changer in the field of water electrolyzers.

Short description of the project

PRETZEL consortium will develop a 25 kW water electrolysis system based on a patented innovative cell concept, with a production capacity of 4.5 m^3 H_2 / h at rated power at a pressure of 100 bar and water temperature of 90°C.



Concept of PRETZEL project with com-ponent inputs and expected outcome.

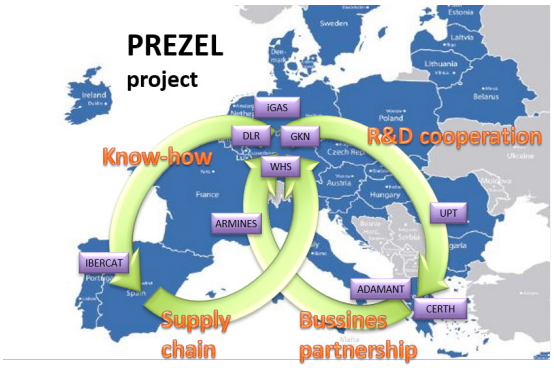
Project implemented by:

Project Coordinator:

German Aerospace Center, Stuttgart, Germany (DLR)

EU Partners:

- Westphalian University of Applied Sciences, Germany (WHS)
- Association for Research and Development of Industrial Methods and Processes, France (ARMINES)
- Politehnica University Timișoara, Romania (UPT)
- Adamant Composites Ltd., Greece
- GKN Sinter Metals Engineering GmbH, Germany (GKN)
- Centre for Research and Technology Hellas, Greece (CERTH)
- Soluciones Catalíticas IBERCAT, Spain
- iGas energy GmbH, Germany



"PRETZEL"-like shape passing over the geographical location of all PRETZEL partners representing the long-term collaboration in know-how, supply chain, business partnership and R&D.

Implementation period

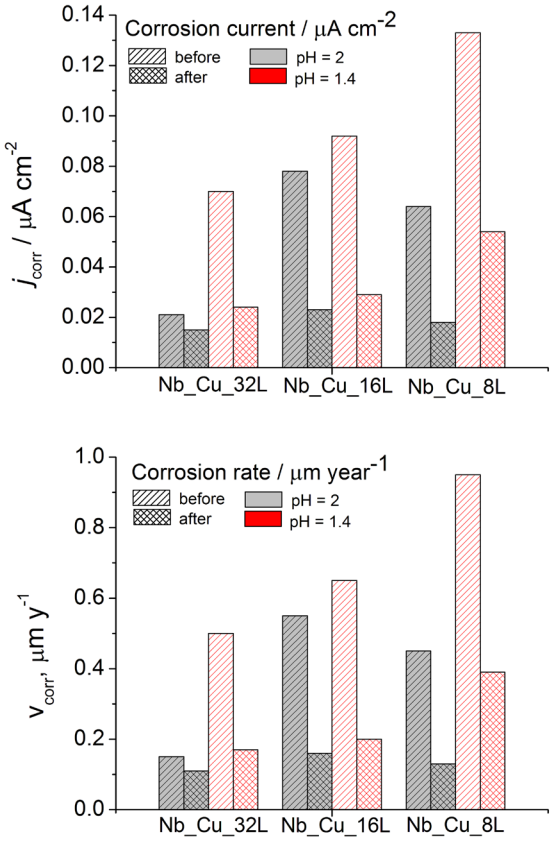
01.01.2018 – 31.12.2020

Main activities

1. Develop and manufacture the components of the PRETZEL for the innovative high pressure PEMEL that operates at increased temperatures.
2. Develop and manufacture the PRETZEL high pressure PEMEL stack based on the novel principle of hydraulic compression.
3. Set-up and undertake continuous procedures to evaluate the development process through all phases against PRETZEL specifications.
4. Integrate the innovative PEMEL stack into a high pressure PEMEL test facility and validate the overall performance and operational criteria.
5. Disseminate and exploit the innovations in PRETZEL in order to prepare the market penetration of the new technology.

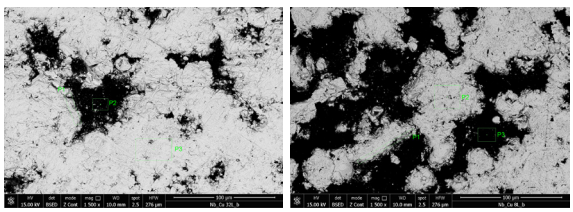
Results

• **Corrosion tests** on vacuum plasma sprayed Nb coatings on copper plates



Comparison of corrosion currents and corrosion rates at pH = 2 and pH = 1.4, before and after stress test at 2 V for 6 h.

• **Physical characterization** of vacuum plasma sprayed Nb coatings on copper plates



FE-SEM images of Nb_Cu_32L and Nb_Cu_8L after corrosion test in 0.05 M H_2SO_4 + 0.1 ppm F- (pH = 1.4)

Applicability and transferability of the results:

• **System:** Development and validation of a 25 kW PEM electrolyzer system with hydrogen output pressure of 100 bars or higher. The high pressure will allow reducing costly and ineffective mechanical compression stages.

• **Cell components:** Reduction of critical raw materials such as Ir by the use of new aerogel supports, which allow reducing more than 70 % of the current precious metal loading compared to the state-of-the-art.

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Research Centre

Research Institute for Renewable Energy (ICER-TM), UPT

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