

Concept

Nowadays, scientists and communities are particularly worried about climate change and the transition towards renewable energies is a matter of crucial importance. In this context, European Community is strongly promoting the production of green hydrogen, i.e., the electrolysis of water coupled with renewable electrical sources.

In recent decades, membrane technologies have increasingly become part of scientific interest. Among them, electro-membrane processes are characterised by a unit with two electrodes. Inherently, the processes can easily be used to produce hydrogen, after carefully choosing well-performing electrodes and the best electrodic solution.

Typical electro-membrane processes are: Electrodialysis (ED), Reverse Electrodialysis (RED). For instance, ED a is process able to desalinate a salty feed by the application of an external power supply. It takes advantage of the use of ionic exchange membranes which allow a controlled separation of ions from the salty feed to obtain freshwater and brine as outputs. Conversely, the reverse process (RED) is able to convert the spontaneous ion fluxes.

Scientific approach

The research aims to study, investigate, model and evaluate the performance and cost-effectiveness of the proposed processes.

The scientific method is to first conceptualise the idea and evaluate the operating principle from a theoretical point of view. This is followed by the realisation of an experimental set-up of the technology on a laboratory scale to obtain data.

On the basis of the experimental results, the implementation of a mathematical model, capable of predicting and estimating the behaviour of the equipment, proceeds. Finally, the technical model is combined with an economic model to estimate the main economic parameters of the technology, such as the Levelised Cost of Hydrogen (LCOH).

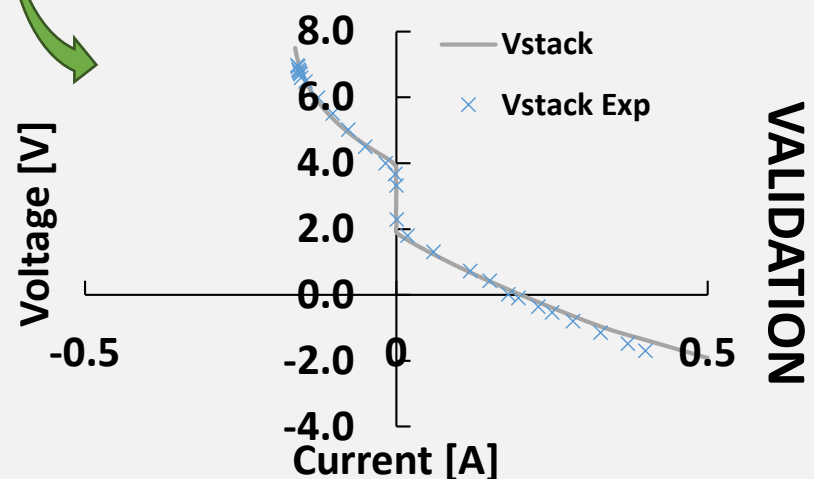
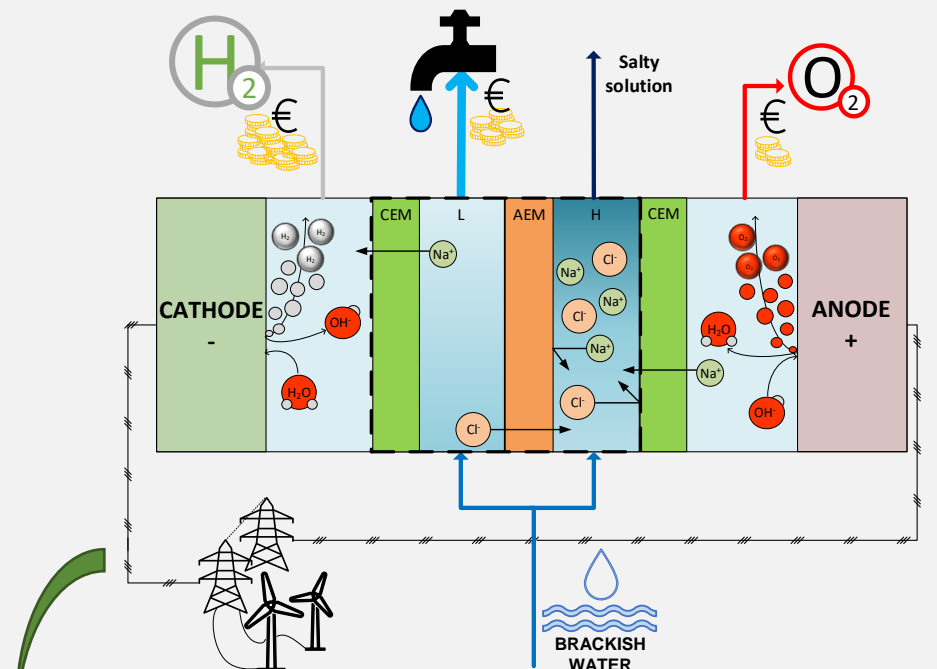
Research objectives

The entire research orbits around one question:

'Is it possible to produce hydrogen with electro-membrane processes and are these cost-effective?'

The significance of these answer may be a breakthrough in the field of electro-membrane application, which still has limitations for its large-scale use.

CONCEPTUALIZATION



VALIDATION

ECONOMIC PROFITABILITY

