

HIGH-PRESSURE PEM WATER ELECTROLYSER PERFORMANCE

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ABSTRACT

One of the means of reducing the cost of electrolytic H₂ is to increase the operating pressure of the electrolyser and thereby remove the need for mechanical downstream compression. A detailed techno-economic assessment [1] has shown that it is possible to achieve economically viable solutions with electrolyser systems operating up to 200 bar, but to realize high-pressure PEM electrolysers, several challenges related to system durability and safety need to be addressed.

IFE has installed a flexible, in-house developed polymer electrolyte membrane electrolysis (PEMEL) system platform for testing of small-scale prototype electrolyser stacks up to 200 bar and 33 kW. This one-of-a-kind test facility is well suited to study performance and lifespan of next-generation stacks and systems, which was recently published [2]. In this work, we present the result from the characterization of a small-scale (2 Nm³/h) prototype stack operating up to 180 bar including the electrochemical impedance spectroscopy (EIS) data that was used to obtain information about the electrode processes. Later, the stack was heavily degraded with failure of some cells and the characterization at the end of life of the stack is also presented, see Figure 1.

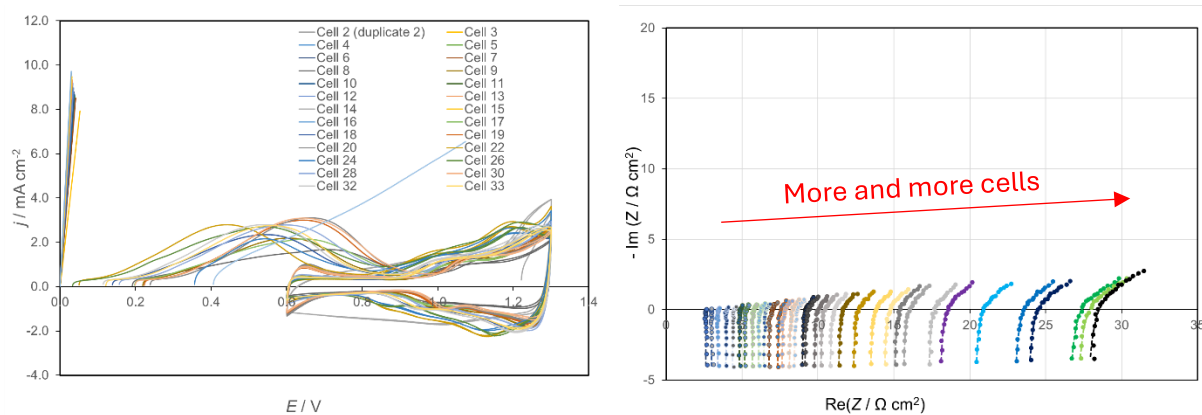


Figure 1 a) cyclic voltammetry and b) EIS of the stack after failure used to analyse the performance and existence of shorted cells in the stack.

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References

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