

Water Quality Aspects for PEM Electrolysis

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Proton Exchange Membrane Water Electrolyser (PEMWE) lifetime is highly dependent on water quality requirements. The recommendation is to always use Ultra-Pure Water (UPW, $<0,1\mu\text{S}/\text{cm}$), but return of experience shows that failures in the water treatment train, corrosion of system elements, or degradation of stack components can occur, affecting water quality. Small amounts of unwanted ions and molecules can cause irreversible damage to electrolyser stacks, which have very high CAPEX costs. In this study, a first step will be taken towards developing water quality requirements and operational guidelines in case of contaminant intrusion in PEMWE.

Methodology

A small bench-scale PEMWE (~50W) at the ENGIE Laborelec site was used to assess the effect of typically encountered water contaminants on the operation and efficiency of the stack. To this end, a first set (e.g., sodium, iron,...) was tested at three different levels of concentration (low (1 ppm), medium (10 ppm), and high (100 ppm)).

Degradation was assessed by obtaining EIS spectra and polarization curves after performing a use case on the different impurity levels, compared to the UPW baseline. Cations were introduced in sulphate salt form and anions in acid form, and screening effects by counterions were investigated by performing tests with H_2SO_4 . Testing conditions were compliant with JRC standards[1].

Results and Outlook

Detailed results and conclusions will be shared at the ICPWS in Boulder, Colorado.

References

1. European Commission, Joint Research Centre, Tsoitridis, G., Pilenga, A., *EU harmonized protocols for testing of low temperature water electrolysis*, Publications Office, 2021, <https://data.europa.eu/doi/10.2760/58880>