High-Throughput Electrochemical Half-Cell Testing of Realistic Catalyst Layers for Proton Exchange Membrane Water Electrolysis

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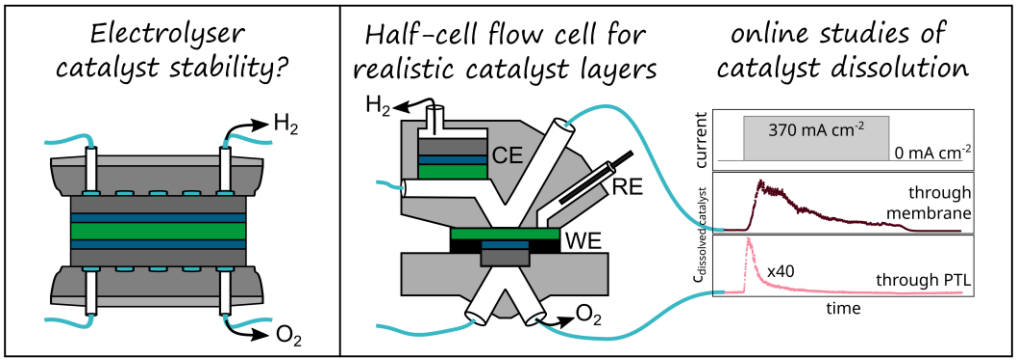
In recent years, gas diffusion electrode (GDE) half-cell setups have attained increasing interest to evaluate the performance of realistic catalyst layers for fuel cells and water electrolyzers. As a bridge between fundamental rotating disc electrode and applied full-cell research, GDE half-cell setups enable the evaluation of the electrochemical activity of realistic catalyst layers at high mass transport conditions making the translation of results to full cells more feasible while keeping the advantages of electrochemical half-cell setups.[1-4]

Here, we present a new method extending the GDE half-cell setups for the use of half-side catalyst-coated membranes. With this, we investigate the oxygen evolution reaction using Ir-containing catalyst layers as used in state-of-the art water electrolyzer anodes. Further, the system is designed as an electrochemical scanning flow cell (SFC) enabling the coupling to downstream analysis techniques such as inductively coupled plasma-mass spectrometry (ICP-MS). This method enables the correlation of the electrocatalyst's activity and its loss during accelerated stress tests with the dissolution of catalyst and other components while operating at elevated current density (Scheme 1). In this contribution, we present insights into the influence of manufacturing and operation parameters of Ir-containing catalyst layers on its activity and stability descriptors.



Scheme 1: Schematic illustration of the setup for online dissolution studies of realistic catalyst layers for water electrolysis.

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References

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