# Unveiling Electrocatalyst Stability via Advanced Electrochemical Characterization

Nejc Hodnik[1,*]

[1]*National Institute of Chemistry, Hajdrihova 19, 1000 Ljubljana, Slovenia*
**nejc.hodnik@ki.si*

In my presentation, I will unveil our cutting-edge electrochemical characterization methods and showcase their remarkable capabilities.[1] The Identical Location Electron Microscopy (IL-EM) method revolutionizes our ability to observe electrochemically induced processes by meticulously comparing micrographs before and after electrochemical biasing. This approach yields unprecedented insights into dynamic changes at the nanoscale. Our Modified Floating Electrode not only facilitates electrocatalyst measurements under elevated mass transport conditions but also serves as an IL-EM grid simultaneously. The integration of these two methods is further advanced in the Nano Lab, a multifunctional platform that not only supports IL-EM and MFE but also serves as a substrate for synthesis. This holistic approach enhances our understanding of nanomaterials in electrochemical applications. The Gas Diffusion Electrode (GDE) automation experiments represent a leap forward in data collection, ensuring reproducibility and enabling high-throughput analysis under industry-relevant conditions, such as elevated current densities. This contributes significantly to more efficient and reliable electrochemical studies. The Electrochemical Flow Cell-Inductively Coupled Plasma Mass Spectrometry (EFC-ICP-MS) method provides precise quantitative analysis of dissolution processes, offering insights into element-specific corrosion behavior even at extremely low concentrations (ppb) during reactions. Lastly, Electrochemical Mass Spectrometry (EC-MS) combines electrochemistry with mass spectrometry, enabling real-time detection of gaseous reaction products. This approach provides valuable information on reaction pathways, intermediates and degradation. Through the incorporation of these advanced electrochemical characterization methods, our research aims to redefine the boundaries of understanding and optimizing electrochemical processes, ultimately paving the way for groundbreaking innovations in energy conversion and storage technologies.

**References**

[1] Milutin Smiljanić, Armin Hrnjić, Nik Maselj, Matija Gatalo, Primož Jovanovič, Nejc Hodnik, Chapter 2 - Advanced electrochemical methods for characterization of proton exchange membrane electrocatalysts, Editor(s): Massimiliano Lo Faro, Sabrina Campagna Zignani, Polymer Electrolyte-Based Electrochemical Devices, Elsevier, 2024, Pages 49-90