CatLab Lecture Series hosted by FHI and HZB

Friday, November 24th 2023, 10:30-12:00
BESSY II, Seminar Room at the Entrance, Albert-Einstein-Straße 15, Berlin Adlershof

Serhiy Cherevko

Helmholtz-Institute, Erlangen- Nürnberg
Forschungszentrum Jülich, Erlangen

Applications of ICP-MS in Electrocatalysis Research

Fuel cells and electrolysers require electrocatalysts to minimize losses during energy conversion processes. It is common practice that researchers rely solely on electrochemical methods to test stability in search of novel electrocatalysts. While degradation can be tracked using such methods, they fail when one aims to understand governing degradation mechanisms responsible for the losses in catalyst performance. Complementary physicochemical techniques are required. One such technique is inductively coupled plasma mass spectrometry (ICP-MS) – the main topic of my talk.

ICP-MS is commonly used as a quality control tool, e.g., to confirm if a desired alloy composition is obtained during synthesis. Recently, ICP-MS has been increasingly involved in electrocatalysis research, e.g., checking electrolytes from batch cells on the presence of dissolved species. However, this technique's potential is revealed when ICP-MS is directly connected to an electrochemical cell – online ICP-MS. This tool provides time- and potential-resolved analysis of electrocatalyst corrosion during electrochemical tests.

Since ICP-MS is still a somewhat less known technique in catalysis research, my talk will start with a brief introduction to this analytical chemistry tool. Main operational principles and their importance when coupling ICP-MS to an electrochemical cell will be discussed. Existing approaches to couple electrochemistry to ICP-MS will be briefly overviewed. To demonstrate how scientists can benefit from employing online ICP-MS in their research, representative examples from the author's works will be presented, including the dissolution of Pt in fuel cells and Ir in water electrolysers. The talk will be summarized by listing pressing challenges in online ICP-MS research and possible solutions to be checked in future studies.