Mercoledì **9 luglio 2025** alle ore **11:30** presso l'**aula L1**

il **Prof. Nejc Hodnik**

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

terrà il seminario dal titolo:

Towards Understanding Electrocatalysts with Advanced Characterization Methods

I will present advanced electrochemical characterization methods that provide deep insights into the behavior of electrocatalysts,[1] such as PEM-FC platinum alloy nanoparticles supported on high-surface-area carbon. Identical Location Transmission Electron Microscopy (IL-TEM) enables precise comparisons of micrographs before and after electrochemical biasing, revealing nanostructural changes. Our Modified Floating Electrode (MFE) facilitates high-mass-transport electrocatalyst measurements and serves as an IL-TEM grid. These methods are integrated into the Nano Lab platform,[2] a multifunctional system supporting both synthesis and comprehensive materials analysis. Additionally, I will show how we incorporated a cutting-edge 4D-STEM detector into our IL-TEM studies, further enhancing characterization capabilities[3,4]

To ensure industrial relevance, Gas Diffusion Electrode (GDE) experiments provide reproducible and high-throughput data at elevated current densities. The Electrochemical Flow Cell–Inductively Coupled Plasma Mass Spectrometry (EFC-ICP-MS) technique quantifies metal dissolution at ppb levels, enabling detailed, element-specific corrosion analysis.[5]

I will also highlight how these methods generate critical feedback for the development of advanced electrocatalyst materials.6 Specifically, our work on a novel PEM-FC electrocatalyst—now patented and utilized by the ReCatalyst startup for production,[7,8] demonstrates how advanced electrochemical characterization drives innovation in sustainable energy technologies.

References

1. Smiljanić, M. *et al.* Chapter 2 - Advanced electrochemical methods for characterization of proton exchange membrane electrocatalysts. doi:https://doi.org/10.1016/B978-0-323-89784-6.00002-4.
2. Bele, M. *et al. ACS Appl Nano Mater* **6**, 10421–10430 (2023).
3. Kamšek, A. R. *et al. ACS Nano* (2025) doi:10.1021/acsnano.4c12528.
4. Hrnjić, A. *et al ACS Catal* **14**, 2473–2486 (2024).
5. Moriau, L. *et al. Electrochim Acta* **487**, 144200 (2024).
6. Moriau, L. J. *et al*. *iScience* **24**, (2021).
7. Gatalo, M. *et al. Angewandte Chemie - International Edition* **58**, (2019).
8. Gatalo, M. *et al. ACS Appl Energy Mater* **5**, 8862–8877 (2022).

Prof. Stefano Agnoli

Il Direttore del Dipartimento
Stefano Mammi