

***In-situ* GISAXS-Revealed Interplay Among Dealloying, Ostwald Ripening and Coalescence of Pt_xNi_{100-x} Bimetallic Alloy Under PEMFC Simulated Operational Conditions**

Marco Bogar^{1,2}, Yurii Yakovlev³, Daniel John Seale Sandbeck⁴, Serhiy Cherevko⁴, Iva Matolínová³, Heinz Amenitsch², and Ivan Khalakhan³

¹CERIC-ERIC c/o Elettra Synchrotron, 34149 Trieste, Ital

²Graz University of Technology, Institute for Inorganic Chemistry, 8010 Graz, Austria

³Charles University, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, 18000 Prague 8, Czech Republic

⁴Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Forschungszentrum Jülich GmbH, Egerlandstr. 3, 91058 Erlangen, Germany

⁵Friedrich-Alexander-Universität Erlangen-Nürnberg, Department of Chemical and Biological Engineering, 91058 Erlangen, Germany

Platinum-based bimetallic alloys demonstrated to be a promising and cheaper alternative to bare Pt as catalysts for the cathode electrode of Proton Exchange Membranes Fuel Cells (PEMFCs). Among them, PtNi was found to have a very good mass activity and a competitive catalytic activity^{1,2}. The main drawback in applying Pt-based bimetallic alloys relies in their reduced stability, which is still under investigation. Being able to clearly describe Pt-based bimetallic alloy at a fundamental level is essential to shed light on the entire chain of interconnected degradation mechanisms taking place in catalyst model systems, which would help in interpreting catalyst degradation in real complex fuel cells. Here (Figure 1), we have combined *in situ* Inductively Coupled Plasma Mass Spectroscopy, *in situ* Grazing-Incidence Small-Angle X-ray Scattering, and *ex situ* Scanning Electron Microscopy, we have studied the morphological evolution of Pt_xNi_{100-x} model catalysts with different Ni contents (ranging from 0 to 75%) undergoing potentiodynamic cycling to two different upper potentials (1.0 and 1.3 V), selected to mime different operational conditions of a PEMFC. Data analysis allowed to develop a methodology for distinguishing among Ni dissolution, particle coalescence, and Ostwald ripening and their effects on both particle size distribution and interparticle distance. Finally, time-dependent interplay maps were realized to highlight the timeframe in which the aforementioned phenomena are prevailing or coexisting.

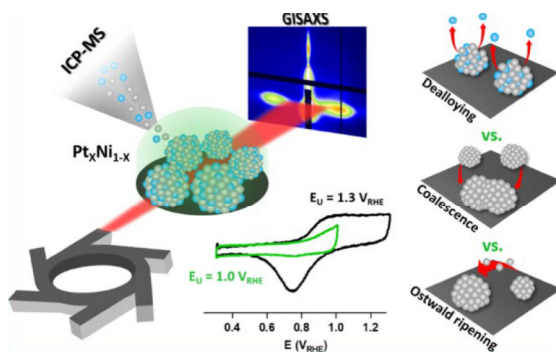


Figure 1. Graphical Abstract³

References

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