

## **In-situ ptychography of dynamic processes: recent experiments and computational issues**

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Synchrotron-based X-ray microscopy in terms of spectroscopic imaging has recently been successfully used for exploring processes in electrochemical devices correlating them to the actual operating conditions [1]. Demonstrating the suitability of ptychography for studying such dynamic processes will promote its use for in-situ experiments since it will allow for discriminating differences in the behavior of individual micro-building blocks in this complex functional systems.

The main topic that the talk will address is Soft X-ray Fresnel CDI ptychography for in-situ electrochemistry. The experiments were performed with a novel custom-made three-electrode microcell developed during a series of experiments at Elettra Sincrotrone Trieste [2].

The electrochemical measurements started at the TwinMic beamline of Elettra and were continued at the SXRI beamline of the Australian Synchrotron.

The preliminary results of a ptychography-based examination of dynamic processes during the in-situ electrical biasing of the electrochemical cell will be presented and discussed. Some issues related to the computational aspects will be outlined and potential improvements of the methodology will be suggested.

[1] B. Bozzini et al, *ChemSusChem* 3, 2010, 846; *Chem. Eur. J.*, 18, 2012, 10196; *ChemElectroChem* 1, 2013, 1; *Electrochimica Acta* 114 (2013) 889; 137, 2014, 535-545.

[2] Bozzini B, Gianoncelli A, Bocchetta P, Dal Zilio S, Kourousias G Fabrication of a Sealed Electrochemical Microcell for in Situ Soft X-ray Microspectroscopy and Testing with in Situ Co-Polypyrrole Composite Electrodeposition for Pt-Free Oxygen Electrocatalysis *Analytical Chemistry*, Vol. 86 - 1, pp. 664-670 (2013)

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