Investigation of Cobalt Oxide-Based Spinels and Hydrous Oxides Under OER Conditions Using Correlative Microscopy

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The development of efficient and durable electrocatalysts for the oxygen evolution reaction (OER) is crucial for advancing renewable energy technologies. Cobalt oxide-based spinels and hydrous oxides are promising candidates due to their high catalytic activity and stability. However, a comprehensive understanding of their surface properties and behaviors under OER conditions remains challenging. In this study, we employ a correlative microscopy approach combining Scanning Electrochemical Cell Microscopy (SECCM), Atom Probe Tomography (APT), electron backscatter diffraction (EBSD) and Electrochemical Atomic Force Microscopy (EC-AFM) to investigate the structural and chemical dynamics of these materials during OER[1,2].

Our integrated approach aims at gaining significant insights into the active sites' formation, the role of specific surface facets, effect of dopants, and the mechanisms of catalyst degradation. We demonstrate that the combination of these techniques can provide a holistic understanding of the OER processes at a nanoscale level, guiding the design of more efficient and robust cobalt oxide-based electrocatalysts for advancing the field of energy conversion and storage.

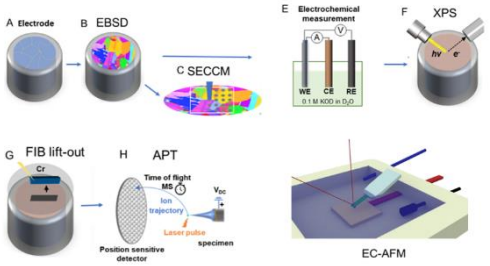

Figure 1: Pictorial Representation of the Correlative Microscopy Approach

[1] C. Luan et al., Angew. Chem. 2023, **62**, https://doi.org/10.1002/anie.202305982.
[2] C. Luan et al., ACS Cat., 2023, **13(2),** 1400–1411, https://doi.org/10.1021/acscatal.2c03903