Evaluation of electrocatalytic activity of OER electrocatalysts using scanning electrochemical cell microscopy (SECCM)

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Structural activity correlations are essential to understanding catalyst materials that would allow a rational design of new performant electrocatalyst materials. Catalyst materials often possess an intrinsic structural complexity, for example, by having different crystal orientations. Scanning electrochemical cell microscopy (SECCM) allows local measurements to be performed at the nanoscale, thus evaluating their local electrocatalytic activity that can be correlated with different structural features when correlated with additional characterization techniques. Due to its configuration, in which a nanopipette having a hanging meniscus is approached to the catalyst surface and upon contact, an electrochemical cell is formed that is used to probe the local electrocatalytic activity, the size of the formed cell strongly depends on the surface characteristics. Electrowetting often occurs when using alkaline electrolytes and testing electrocatalysts in the oxygen evolution reaction regime, leading to measured areas of hundreds of nanometers that prevent measurements with high lateral resolution from being performed.

In the present talk, I will highlight important aspects to be considered when testing oxygen evolution catalysts using SECCM, focusing in particular on the impact of the atmosphere used during the SECCM measurement on the recorded electrocatalytic activity. Correlation of the electrocatalytic activity of a Ni_2/Ni_3 ingot sample with the catalyst composition will be done considering the atmosphere composition, nanopipette size, and electrolyte concentration.

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