

Fundamental Insights into the Oxygen Evolution Reaction from Epitaxial Oxide Thin Films



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Dr. Kelsey A. Stoerzinger joined Oregon State University in the Fall of 2018. She holds a joint appointment at Pacific Northwest National Laboratory, where she was a Linus Pauling Distinguished Postdoctoral Fellow. Prof. Stoerzinger completed her doctoral studies in Materials Science and Engineering in 2016 from the Massachusetts Institute of Technology, supported by a National Science Foundation Graduate Research Fellowship. She received an M.Phil. in Physics from the University of Cambridge as a Churchill Scholar and a B.S. from Northwestern University. Prof. Stoerzinger is the recipient of NSF CAREER and DOE Early Career Awards, in addition to recognition for her contributions as a teacher and advisor.

The intermittent nature of renewable energy sources requires a clean, scalable means of converting and storing energy. One Earth-abundant storage option is water electrolysis: storing energy in the bonds of O_2 and H_2 , and later extracting electricity by the electrochemical reaction of gasses in a fuel cell. The efficiency of this process is primarily limited by the sluggish kinetics of the oxygen evolution reaction (OER) at the anode, resulting in extensive use of precious metal electrocatalysts in current devices. We have worked to build mechanistic understanding of the OER on benchmark catalysts rutile IrO_2 and RuO_2 , and have investigated competition with the chlorine evolution reaction (CER) in saline feeds, where breaking scaling relations between oxidative processes can broaden the range of acceptable water sources for electrolysis. We have also investigated earth-abundant oxide materials as alternatives, especially nickel-based perovskites, focusing on fundamental understanding of the electrode/electrolyte interface and its relation to catalyst electronic structure.

I will present studies of model oxide electrodes grown by pulsed laser deposition (PLD) and molecular beam epitaxy (MBE) that display a known crystallographic orientation, strain, surface area, and path for charge transport. Such measurements can establish the intrinsic activity of oxide catalysts in a way that cannot be realized with polydisperse nanoparticle systems, and we use these findings to rationally design composition and structure to maximize activity.

**Sunday, May 7th, 2023, 14:30, Lecture Hall 6, 2nd Floor
Wolfson Department of Chemical Engineering Building**