Heterogeneous electrocatalysts for the oxygen evolution reaction (OER) are complicated materials with dynamic structures. They exhibit potential-induced phase transitions, potential-dependent electronic properties, variable oxidation and protonation states, and disordered local/surface phases. These properties make understanding the OER, and ultimately designing higher-efficiency catalysts, challenging. Measurements of intrinsic activity show that, by far, the most-active phases for OER under alkaline conditions are Fe-containing mixed-metal oxyhydroxides, but exactly how they function remains controversial. I will discuss our work to understand the key properties of these catalysts, including morphology, composition, and molecular/electronic structure, and how they evolve and are dynamic under active catalytic conditions. These concepts inform design strategies for higher-performance catalyst architectures and for their incorporation into practical electrolyzer devices to make clean hydrogen fuel from inexpensive renewable electricity.

Biography

Dr Boettcher is a Professor in the Department of Chemistry and Biochemistry at the University of Oregon, United States. He has been named a DuPont Young Professor, a Cottrell Scholar, a Sloan Fellow, and a Camille-Dreyfus Teacher-Scholar. In 2019, he was included as an ISI highly cited researcher (top 0.1% over past decade). He founded the Oregon Center for Electrochemistry, and in 2020, an accelerated Masters Industrial Internship Program in Electrochemical Technology.

His research is at the intersection of materials science and electrochemistry, with a focus on fundamental aspects of energy conversion and storage.

Tuesday, 15 Dec 2020 ǁ Time: 10:00 am – 11:00 am ǁ Live streaming via Zoom Meeting: https://ntu-sg.zoom.us/j/99820509712  Meeting ID: 998 2050 9712  Passcode: 151220  Hosted by: Associate Professor Jason Xu Zhichuan