



Hang Ren, Ph.D.

Assistant Professor,
Department of Chemistry and Biochemistry,
Miami University, Oxford, OH

Nanoscale electrochemical mapping of the electrode/electrolyte interface

ABSTRACT: Potential of zero charge (PZC) is fundamentally important in electrochemistry and affects the activity of many energy storage and conversion processes. PZC at solid electrodes can be determined on single crystal electrodes using the differential capacitance and laser-induced potential transient. However, the distribution of PZC on a polycrystalline electrode, often treated as patches of single crystals of different orientations, has been less studied. Herein, we used the approach of scanning electrochemical cell microscopy (SECCM) to measure the local PZC on polycrystalline solid electrodes. The principle is based on the potential-dependent charging current on the working electrode defined by a nanodroplet in SECCM. Co-localized maps of PZC, electrocatalytic activities, and crystal orientations on Pt and Au show that the PZC and electrocatalytic activity of the hydrogen evolution reaction (HER) is correlated with the local crystal orientation on a polycrystalline electrode. Our results demonstrate such a technique as a general method to map the PZC of solid material at the nanoscale.

BIO:

Hang Ren is an Assistant Professor of chemistry at the Miami University, Ohio. His current research interests include revealing the heterogeneity and stochasticity of electrochemical systems at the nanoscale.

Dr. Ren received a BS in Chemistry in 2011 from Sun Yat-Sen University. He obtained his Ph.D. in Analytical Chemistry from the University of Michigan in 2016 under Mark E. Meyerhoff. His Ph.D. work is focused on using electrochemistry to in situ deliver nitric oxide for biomedical applications. From 2016 to 2018, He worked with Henry S. White as a postdoc associate at the University of Utah, where he measures physical processes during electrode processes using nanoelectrochemistry, including the nucleation of bubbles. He joined Miami University in 2018, and he has been awarded DARPA Young Faculty Award, and ACS PRF Doctoral New Investigator Award.