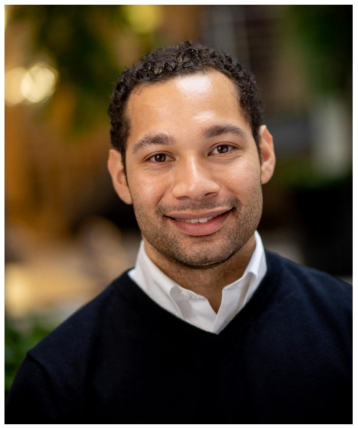
INORGANIC CHEMISTRY SEMINAR

"Atomic-scale Insights into Electrocatalyst Structure and Function"



Anthony Shoji Hall, Ph.D.

Johns Hopkins University

FRIDAY

November 10, 2023 @ 4:00

219 BRL

The development of efficient renewable energy conversion and storage devices to curb climate change is one of the most important challenges of the 21st century. This can be addressed by using renewable electricity to manufacture chemical fuels and synthetic precursors, or by generating electricity with carbon-neutral fuel cell devices. However, electrocatalytic processes are hampered by low efficiencies and poor reaction selectivity because of a lack of rational methods available to create controllable catalyst materials with the preferred electrochemical activities. In this seminar Prof. Hall will discuss the use of intermetallic materials, which are alloys that display high electrocatalytic activities because their well-defined compositions and long-range atomic scale ordering enable predictable geometric and electronic interactions, in contrast to the more widely studied solid-solution type alloys. However, intermetallic materials are difficult to synthesize in nanomaterial form because conventional synthesis methods offer poor control over the composition, phase, and morphology. I will discuss our efforts on the synthesis, stability, and catalytic activity of intermetallics prepared by electrochemical methods at room temperature and atmospheric pressure. Our strategies include the use of electrochemically induced phase transformations which enables us to convert a base metal rich alloy to an intermetallic richer in nobler metal by removal of the base metal, and the direct production of OIC materials by electrochemical deposition. We will also discuss how we leverage the atomically precise configuration of atoms within intermetallics to reveal detailed insights into how a material's structure regulates its electrochemical properties. Developing new methods for preparing intermetallic materials under ambient conditions is essential for designing catalysts for the next generation of renewable energy conversion devices.

UNIVERSITY OF DELAWARE
ARTS & SCIENCES