UCI Samueli School of Engineering

Department of Materials Science and Engineering UCI

# UNIVERSITY OF CALIFORNIA, IRVINE

## DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

## IS PROUD TO HOST A SEMINAR BY

## *"ELECTRICAL TRANSITIONS IN HIGH ENTROPY OXIDES"*

# ALEXANDER D. DUPUY


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## Thursday, May 28, 2026

## 2:00 PM - 3:20 PM

## McDonnell Douglas Engineering Auditorium

**Abstract:** High entropy oxides (HEOs) are ceramic materials consisting of five or more oxide components which form a single-phase solid-solution structure after processing. Despite their recent discovery, HEOs already show promise in a variety of applications, particularly in electronics and battery components. HEOs possess a wide composition space and unique capacity for phase transformations, making them an ideal platform for tuning material behavior. Here, I will discuss two projects related to engineering HEO behavior. The first project involves studying the evolution in dielectric properties in a $BaTiO_3$ based HEO. By incrementally increasing the compositional complexity of $BaTiO_3$, I will show that the electrical properties in this $BaTiO_3$ based HEO do not arise from out of nowhere. Instead, the properties are a result of a complex interaction between the various ions and defects in the HEO. The second project involves studying electrical transitions in rocksalt HEOs. We observe a reversible transition between ionic and electronic conduction in doped rocksalt HEO, which can be induced and controlled through processing. The origin of this transition will be discussed.

**Bio:** Alexander Dupuy is an Assistant Professor in the Department of Materials Science and Engineering at the University of Connecticut. He received his B.S in Mechanical Engineering from the University of California Riverside (UCR) in 2009. His undergraduate research involved investigating gradient induced inhomogeneity found in the Spark Plasma Sintering (SPS) process. In 2011 he went on to receive his M.S in Mechanical Engineering from UCR where he studied pressure induced densification mechanisms in nanomaterials processed using SPS. In 2016 he received his Ph.D. in Mechanical Engineering from UCR. His doctoral work focused on the processing and measurement of optical and ferroelectric ceramics. After graduation, he became a postdoctoral scholar at UC Irvine, where he studied entropy stabilized oxides. Much of Professor Dupuy's research has involved processing of functional and structural materials with novel or customized phase and microstructural conditions, particularly involving nanostructuring and metastable states. He is interested in the intersection between processing, microstructure, and phase transformations, and their influence on a wide range of material behaviors.