“Understanding and Tailoring Microstructures of Halide Perovskite Semiconductors for Efficient, Stable Solar Cells”

Yuanyuan Zhou, PhD
Assistant Research Professor, School of Engineering
Brown University

Thursday, January 16
2:30 – 3:30 PM
Brauer Hall, Room 12

Abstract
Halide perovskites (HPs) are a new family of inorganic-based semiconductors, which have been revolutionizing the field of functional electronics. In particular, perovskite-based solar cell (PSC) has rapidly emerged as a disruptive photovoltaic technology, drawing significant interests from both academia and industry. In fact, such rapid PSC development has been led by the advances in the understanding and engineering of microstructures of HP thin films. In my talk, first, I will present a fundamental understanding on the HP microstructural evolution pertaining to the nucleation and grain growth phenomena. Based on this, a soft chemical method that entails an unusual gas-solid interaction will be demonstrated for processing HP thin films with uniform microstructures in a scalable manner. Then, I will discuss the key role of grain boundaries on the physical properties and chemical stability of HPs. Rational strategies including a new materials-science concept of ‘grain-boundary functionalization’ will be shown for tailoring HP grain-boundary microstructures for enhanced device performance and stability. Finally, I will present a brief perspective on the future HP research.

Biography
Dr. Yuanyuan Zhou joined Brown University as Assistant Research Professor right after receiving Ph.D. in Engineering (with the Outstanding Thesis Award) from the same institute in 2016. He earned B.S. and M.S. in Materials Science & Engineering from Xi’an Jiaotong University (China) and also M.S. in Chemistry from Korea Research Institute of Chemical Technology. Zhou’s research focuses on synthesis and characterization of high-performance, low-cost, multifunctional semiconductors. He has authored or co-authored 78 papers (Google Scholar: ~4,000 citations; h-index: 34), many of which are on top-tier journals such as Nature Communications, JACS, Advanced Materials, and Energy & Environmental Science. He has also served as Principal Investigator (PI) or co-PI in several federal grants such as NSF and ONR, which support his recent research on halide perovskite semiconductor from a materials-science perspective.

Faculty, students, and the general public are invited.