Imaging of Nanomaterials and Devices

Lincoln J. Lauhon

Department of Materials Science and Engineering, Northwestern University.
lauhon@northwestern.edu https://lauhon.mccormick.northwestern.edu/

Abstract

The Lauhon group focuses on structural and functional imaging of nanomaterials with a deep interest in how interfaces influence the electronic and optical properties of materials in devices. Our imaging methods, centered on structure-property relationships, inform improvements in the synthesis and processing of electronic materials and the design and optimization of novel devices by our many collaborators. We will first show examples of the unique insights atom probe tomography can provide into doping and nanostructure evolution at non-planar growth interfaces in oxides and III-V semiconductors, supporting more efficient energy utilization in transportation and computing. We will then describe efforts to develop new approaches to increasing the functionality and efficiency of electronic and optical devices based on two-dimensional (2D) and other printable semiconducting materials. Scanning photocurrent microscopy (SPCM) and Kelvin probe force microscopy (KPFM) are deployed in *operando* investigations of printed oxide and 2D devices as well as hybrid mixed-dimensional heterostructure devices incorporating organic electronic materials. In particular, we will highlight approaches to exploit the ferroelectric polarization of both organic and inorganic 2D materials at interfaces to integrate memory into logic devices.

Short Biography

Lincoln Lauhon is a Professor of Materials Science and Engineering at Northwestern University. He received his Ph.D. in Physics from Cornell University in 2000 and completed postdoctoral training in the Department of Chemistry and Chemical Biology at Harvard University in 2003. At Northwestern University, the Lauhon group investigates novel properties that emerge in low-dimensional materials and heterostructures to enable the design and realization of new classes of devices and associated computing modalities. The group has pioneered approaches to correlated imaging of nanoscale structure and properties including atom probe tomography and operando scanning probe imaging. Prof. Lauhon is the recipient of the NSF CAREER Award, an Alfred P. Sloan Research Fellowship, the Camille Dreyfus Teacher-Scholar Award, and an NAS Kavli fellowship.