

Hybrid Omni-Thermoelectrics: Atomically Re-Engineered P/N Nanowire Inks for Flexible Generators



Ayash Sahu

Postdoctoral Fellow
Lawrence Berkeley National Laboratory

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Time: Lecture: 4:00-5:00 p.m.

Place: PAA A110

Happy Hour in Benson Hall Lobby

Abstract

Thermoelectric devices possess enormous potential to reshape the global energy landscape by converting waste heat into electricity, yet their commercial implementation has been limited by their high cost to output power ratio. No single “champion” thermoelectric material exists due to a broad range of material-dependent thermal and electrical property optimization challenges. While the advent of nanostructuring provided a general design paradigm for reducing material thermal conductivities, there exists no analogous strategy for homogeneous, precise doping of materials. Here, I will demonstrate a mix of traditional doping mechanisms and innovative nanoscale interface engineering approaches that harness the large chemically accessible surface areas of nanomaterials to yield massive, finely-controlled, and stable changes in thermoelectric properties, switching a prototypical *p*-type thermoelectric material, tellurium, into a robust *n*-type material exhibiting stable properties over months of testing. These remodeled, *n*-type nanowires display power factors comparable to their *p*-type counterparts, and are partnered together to demonstrate the first solution-processed, monomaterial flexible thermoelectric generators. Finally, I will present a myriad of approaches that demonstrate how engineering of nanoscale interfaces can drive novel macroscale behavior.

Bio

Dr. Ayaskanta Sahu is a Materials Post-Doctoral Fellow at the Molecular Foundry, Lawrence Berkeley National Laboratory in Berkeley, California. His research focuses on investigating new classes of nanostructured hybrid materials that have promise for optoelectronic and thermoelectric energy conversion. He has a B.Tech. in Chemical Engineering from Indian Institute of Technology Roorkee (2007) and a Ph.D. in Chemical Engineering from University of Minnesota (2012). He spent a couple of years (2011-2013) at ETH Zurich as a visiting scientist before joining the Materials Science Division at LBNL in 2013.