Joshua Goldberger
Assistant Professor, Department of Chemistry and Biochemistry
Ohio State University

June 2, 2015
Tech L361, 4:00pm

“Atomic-Scale Derivatives of Solid-State Materials”

Abstract  Similar to how carbon can be sculpted into low-dimensional allotropes such as fullerenes, nanotubes, and graphene, one of the major themes of our research program is that the framework connectivity of atoms for any crystalline solid can be ligand-terminated along specific axes to produce stable, crystalline van der Waals materials comprised of single or few atom thick fragments. These new atomic-scale materials can have completely different and transformative physical properties compared to the original material. Here, we will describe our recent success in the creation of hydrogen and organic-terminated group IV (Si, Ge, Sn) 2D graphane analogues. We will discuss how the optical, electronic, and thermal properties of these materials can be systematically controlled by substituting either the surface ligand or via alloying the framework with other elements. Additionally, since every atom in these materials is a “surface atom”, we will show how the optical, electronic, and thermal properties of these materials can be manipulated by altering the identity of the surface bound ligands. These atomic-scale materials represent an intriguing and unexplored regime in materials design in which both surface functionalization and solid-state chemistry can be uniquely exploited to design properties and phenomena.

Biography: Josh Goldberger received his B.S. in chemistry from The Ohio State University in 2001. He then received his Ph.D. in chemistry from the University of California at Berkeley under Professor Peidong Yang in 2006, as an NSF graduate fellow. He completed his postdoctoral research with Professor Sam Stupp at Northwestern University as part of the Chemistry and Materials Science Departments as well as the Institute for BioNanotechnology in Medicine, as an NIH-NRSA postdoctoral fellow (2007-2010). Goldberger has received awards including a MRS Graduate Student Finalist Award in 2003, an IUPAC Prize for Young Chemists in 2007, and a Camille Dreyfus Teacher-Scholar Award in 2015. He joined The Ohio State University Chemistry and Biochemistry Department in August of 2010.

Co-Sponsored by Materials Research Science and Engineering Center (MRSEC)