Photons, plasmons, and polaritons: optical phenomena in complex materials

When light interacts with complex materials, we can excite a variety of modes including plasmon polaritons and optical phonons. In layered materials, these modes can interact with each other to produce hybrid excitations resulting in novel optical phenomena such as negative refraction, extreme light confinement, and preferential thermal emission. In this talk, I will first discuss our work on the growth of topological insulator thin films and heterostructures by molecular beam epitaxy. Topological insulators have two-dimensional surface states that house massless electrons, and the plasmon polaritons in these materials show unusual properties. I will discuss the dispersion of these modes and show record high mode indices and extremely long polariton lifetimes. Using MBE, we can then grow layered structures comprising multiple topological and normal insulators, resulting in hybrid coupled plasmon modes. I will close by discussing our work on semiconductor hyperbolic metamaterials, which are layered materials comprising alternating metallic and dielectric materials. I will show our work demonstrating negative refraction in these materials as well as their ability to house their own complex plasmon polariton modes and show preferential thermal emission.

Thursday, May 6 • 4 PM CDT • Zoom

Registration is required. RSVP link.

Questions? Contact Kristina.lugo@northwestern.edu.