Condensed Matter Physics Seminar

Novel Approaches and Material Platforms for Metamaterials and Metasurfaces

Monday

December 12

4:00 P.M.

Rm 184 NSH

Dr. Viktoriia Babicheva

Center for Nano-Optics, Georgia State University

Optical metamaterials are three-dimensional structures with rationally designed building blocks that enable devices with distinct optical responses not attainable with naturally available materials. In turn, optical metasurfaces comprising a class of metamaterials with a reduced dimensionality allow the miniaturization of conventional refractive optics into planar structures. Such a planar photonics technology is expected to facilitate new physics and enhanced functionality for devices that are distinctly different from those observed in their three-dimensional analog. In this talk, I will show that nanostructures made of high-index dielectric materials, such as silicon, transition metal dichalcogenides, or hexagonal boron nitride, support optically induced both electric and magnetic resonances in the visible and near-infrared spectral ranges. I will present our results on antireflective properties of metasurfaces based on high-index nanoparticle arrays and explain how zero backscattering from the highly reflective substrate can be achieved. The recent discovery of high-index materials that offer low loss and tunability in their optical properties as well as complementary metal-oxide-semiconductor (CMOS) compatibility can enable a breakthrough in the field of nanophotonics, optical metamaterials, and their applications.