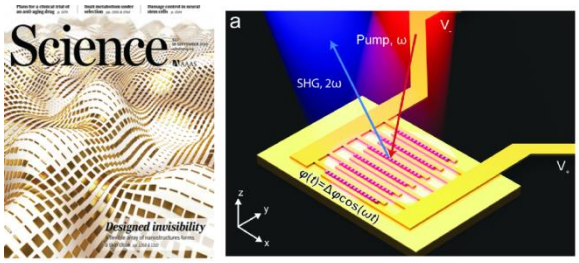
PURDUE UNIVERSITY Discovery Park | Birck Nanotechnology Center

Dynamic, Active, and Nonlinear Metasurfaces

Prof. Xingjie Ni, Pennsylvania State University

3:00pm - 4:00 pm, Thursday, May 23, 2019.

BRK 1001



Metamaterials, or artificially engineered, subwavelength-scale structures, already provided us a revolutionary way to control the behavior of electromagnetic, acoustic, or thermal fields with flexibility that are unattainable with naturally available materials. Their two-dimensional counterparts – metasurfaces extend these capabilities even further. Optical metasurfaces offer fascinating possibilities of controlling light with surface-confined flat components which can manipulate the light properties directly. With the fascinating capabilities of manipulating light with judiciously designed optical nano-elements (meta-atoms), many new physics and unparalleled applications have been demonstrated, such as steering the light to an arbitrary direction, generating optical vortex beams, and enhancing the optical spin-orbit interaction. Here, I would like to introduce our recent exploration on a distinct class of dynamic, active, and nonlinear metasurfaces that enables a number of novel applications. For example, with a spatiotemporal phase modulated metasurface, we truly break Lorentz reciprocity of light propagation; with dynamic phase modulation, we dramatically enhance the second harmonic generation on a dielectric metasurface; and with a new class of integrated metasurfaces, we realize fully controllable on-chip orbital angular momentum lasers.

Dr. Xingjie Ni is the Charles H. Fetter Assistant Professor of Electrical Engineering at the Pennsylvania State University since 2015. He is also a faculty member of the Materials Research Institute (MRI) at Penn State. Prior to that, he was a postdoctoral fellow at University of California, Berkeley. He received his BS degree in Engineering Physics in 2005 and his MS degree in Automation in 2007 from Tsinghua University, Beijing, China. He completed his Ph.D. degree in Electrical and Computer Engineering at Purdue University in 2012. His research interests are in nanophotonic materials and devices, which encompass metamaterials, integrated photonics, photonic sensors, nonlinear optics, photovoltaics, and quantum optics. Dr. Ni is one of the five inaugural Moore Inventor Fellows. He also received NASA Early Career Faculty Award in 2017, Sony Faculty Innovation Award in 2018, and 3M Non-Tenured Faculty Award in 2019.