

Department of Physics & Astronomy

General Colloquium

Thursday, January 25th, 2024

PHYS 112 at 3:30 pm

Refreshments will be served at 3:00pm in PHYS 242

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Advancing Nanophotonics: From Materials to Machine-Learning Assisted Designs

The recent advent of tailorable photonic materials such as plasmonic ceramics including transition metal nitrides (TMNs), MXenes and transparent conducting oxides (TCOs) is currently driving the development of compact, chip-compatible devices for information technology, communication, sustainable energy and emerging quantum photonic applications. In addition to great tailorability of their optical properties, strong plasmonic behavior, optical nonlinearities, these materials offer pathways to uncovering new physics and optical phenomena ranging from transdimensional photonics to epsilon-near-zero behavior and photonic time crystals. In this lecture, we explore novel applications of TMNs (titanium nitride, zirconium nitride) and TCOs for flat optics, all-optical switching, high-harmonic-based XUV generation as well as for demonstrating new physical effects in near-zero-index materials and atomically thin, transdimensional plasmonic films related to strong light confinement and metal-to-insulator transition. Our work paves the way to novel phenomena and device design with ultrafast tunable and tailorable optical materials.

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