Electronically Tunable Conducting Oxide Plasmonics, Metasurfaces, and Nanostructured Fiber Optics

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Controlling the flow of light is fundamental to optical applications. With the recent advances in nanofabrication capabilities and new theoretical concepts, ground breaking platforms for the nanoscale manipulation of light have been demonstrated in recent years. These include metal-based plasmonic and metasurface structures, which offer unique optical features such as sub-wavelength field confinement, unusual optical constants and advanced wavefront shaping.

In this talk, the speaker will present his group's recent development on the use of tunable semiconducting materials, transparent conducting oxides, to demonstrate an efficient nanoscale plasmonic modulator (PlasMOStor) that operates via solid-state MOS field-effect dynamics [1], and an electrically tunable metasurface that can tune the optical phase and amplitude for on-chip beam steering devices [2]. A phase shift of π and ~ 30% change in the reflectance are achieved by applying 2.5 V gate bias, a basic requirement for electrically tunable beam-steering phased array metasurfaces. The speaker will also discuss the study of "nanostructured"-optical fibers that provide a promising unique platform with controllable optical dispersion and long interaction lengths for the investigation of various sciences, such as photochemistry, biosensing, and nonlinear optics [3, 4].

References:

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