Solid State Institute
המכון למצב מוצק

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SPECIAL SEMINAR

סמינר מיוחד

Surface Phonon Polaritons for Low Loss Infrared to THZ Nanophotonics

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Abstract

Progress in plasmonic research has demonstrated its capability for enhancing many technologies including photodetectors, photovoltaics, and molecular spectroscopy. However, in order to maximize functionality, alternative materials to plasmonic metals that exhibit high optical losses must be explored.

In our studies we have demonstrated that plasmonic like effects can be achieved through phonon mediated collective charge oscillations, called surface phonon polaritons (SPhPs) in polar dielectric materials such as SiC and InP. Recently we showed that localized SPhP nanopillar resonators support extreme sub-diffraction ($\lambda_{res}/200$) compression of the free space wavelength, with very low optical losses, resulting in quality factors up to an order of magnitude higher than the best plasmonic devices. Furthermore, the sharp plasmonic-like resonances can be actively tuned and/or turned off through optical pumping of electron/holes carriers.

The use of polar dielectrics to achieve plasmonic like effects is only in the beginning stages of exploration. In particular SPhP in polar anisotropic 2D crystals such as hBN can be exploited as *natural hyperbolic materials* (NHM). We have exploited the NHM response of hBN within periodic arrays of conical nanoresonators to demonstrate 'hyperbolic polaritons', deeply sub-diffractional guided waves that propagate through the volume rather than on the surface of a hyperbolic material. We have identified that the polaritons are manifested as a four series of resonances in two distinct spectral bands that have mutually exclusive dependencies upon incident light polarization, modal order, and aspect ratio. These findings can be extended to produce hyperbolic materials exploiting surface phonon polaritons in layered III-V semiconductors and other 2D materials to extend the optical range and physics.

ההרצאה תתקיים ביום שלישי, ה- 24.4.18, בשעה 09:30
באודיטוריום המכון למצב מוצק, קומת כניסה

The lecture will take place on Tuesday, 24.4.18 at 09:30
at the Solid State Institute auditorium, entrance floor

Host: Professor Efrat Lifshitz