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Thesis Defense

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Tuning Surface Phonon Polaritons

by

Hrag Karakachian

Physics Department, American University of Beirut

The growing need for the development of nanophotonic devices has led to challenges in describing and manipulating energy transport in sub- diffraction length scales. Low- loss Surface Phonon Polariton (SPhP) modes supported at the surface of polar materials are promising candidates for realizing this task. These surface waves are evanescent electromagnetic waves localized at the surface of dielectric crystals. They result from the coupling between photons and optical phonons. In the present thesis, we provide a thorough explanation of SPhP modes, and then introduce various methods for tuning the different properties of such a near- field radiation. The effect of free carrier concentration on the temporal coherence of surface polaritons is investigated, showing a practical method for enhancing the temporal coherence of infrared light- emitting nano- sources. Changing the surface symmetry of a dielectric crystal is shown to be a pragmatic technique for tuning the region of existence of SPhP modes. Finally, it is observed that the shape of the nanosized crystal plays a major role in determining the dispersion relation of these surface modes. The results highlighted in the present thesis are obtained from a rigorous analysis of reflectivity measurements using the conventional Kramers- Kronig conversion technique corrected on the basis of Fresnel equations for reflectivity.

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Place: Rm. 217
Time: 1:00 p.m.