University of Crete
Department of Physics

Physics Colloquium

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Engineering light-matter interaction in atomically thin semiconductors

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ABSTRACT

Potential applications in photonics, optoelectronics and quantum technology can be based on our understanding of the light–matter interaction on an atomic monolayer scale. Layered materials such as graphene and transition metal dichalcogenides (TMDs) exhibit unique optical and electronic properties resulting from their reduced dimensionality and crystal symmetry. The way these materials interact with light depends strongly on the number of atomic layers. More than 5000 compounds are predicted to be stable as atomic monolayers. They can be assembled by simple stacking to form heterostructures and combine the unique properties of the constituent layers and also give access to new degrees of freedom.

In this talk, I will focus on layered TMD semiconductors and describe how in linear and nonlinear optical spectroscopy of TMDs we uncover a surprisingly strong and tunable light-matter interaction, based on a detailed understanding of their crystal and electronic structure. I will show recent investigations on exciton states (Coulomb bound electron hole pairs) that extend over several layers and whose transition energies can be widely tuned in external fields. Approaches to confine electronic and photon states for applications in quantum technology will be discussed and future research opportunities in this multidisciplinary field will be outlined.

ZOOM Link: https://zoom.us/j/96424536129?pwd=d3dmZ0JwT050ZnFoN1F0ZGVQSzE4dz09