

## MAX PLANCK LECTURE ON NON-EQUILIBRIUM QUANTUM PHENOMENA

## Strongly correlated excitonic insulator in Coulomb-coupled bilayers

Excitonic insulators (EIs) arise from the formation of bound electron-hole pairs (excitons) in semiconductors and provide a solid-state platform for quantum many-boson physics. Strong exciton-exciton repulsion is expected to stabilize condensed superfluid and crystalline phases by suppressing both density and phase fluctuations. Although spectroscopic signatures of EIs have been reported, conclusive evidence for strongly correlated EI states has remained elusive.

In this talk, I will discuss the realization of strongly correlated Els in Coulomb-coupled bilayers of 2D semiconductors. In particular, I will present direct thermodynamic evidence of the El ground state and discuss the exciton phase diagram that reveals both the Mott transition and interactionenhanced quasi-condensation. If time permits, I will also discuss the realization of a strongly correlated El in a moiré lattice, effectively realizing the Bose-Hubbard model in a solid-state platform.

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Hosts: Andrea Cavalleri, Angel Rubio



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https://www.mpsd.mpg.de/neqp-lecture#mak