

Exciton-Polaritons in van-der-Waals (Hetero)-structures

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The engineering of non-linear light-matter states in optical lattices has emerged as a research tool for the exploration of ultrafast phenomena, the simulation of complex Hamiltonians, including those with non-trivial topology.

Excitons in atomically thin crystals have emerged as an ideal active medium for such experiments. Their giant dipole coupling to optical fields makes them very appealing for implementing novel photonic devices and for fundamental investigations in the framework of cavity quantum electrodynamics [1].

In this talk, I will discuss the formation of exciton-polaritons as a result of the strong coupling between TMDC excitons and microcavity photons. I will focus on the implementation of photonic potentials - ranging from 0D hemispherical lenses to 1D SSH chains - and their tunability in an open cavity configuration [2]. I will show results on different TMDC monolayers and heterostructures as exciton hosting material at ambient and cryogenic temperatures.

[1] C. Schneider et al., Nat Commun 9, 2695 (2018).

[2] L. Lackner et al., Nat Commun 12, 4933 (2021).