



e-conversion



Seminarankündigung

Dienstag, 4. Mai 2021

13:00 Uhr

ONLINE via ZOOM

“Atomically thin semiconductors for photonics and spintronics”

The physical properties of atomic monolayers often change dramatically from those of their parent bulk materials. Prime examples are monolayers of graphite (graphene) and MoS₂, as their ultimate thinness makes them extremely promising for applications in electronics and photonics. They also give access to new degrees of freedom of the electronic system such as the valley index or interactions between quasi-particles such as excitons (Coulomb bound electron-hole pairs) exploring new quantum states.

Combining MoS₂ monolayers to form multilayers allows accessing new functionalities and new electronic excitations. We show how the stacking order (twist angle) controls the interlayer coupling of valence states in MoS₂ homobilayer samples, both in exfoliated samples and samples grown by chemical vapor deposition (CVD) [1]. We can optically address electron-hole pairs that reside in the same layer (intralayer excitons) or in different layers (interlayer excitons) and show their strong coupling as they are tuned into resonance. We combine the strong light-matter interaction of excitons in monolayers with high tunability of interlayer excitons in external electric fields in our experiments based on the quantum confined Stark effect [2]. We show how interlayer excitons can mediate tunable second harmonic generation for non-linear optics in van der Waals structures [3].

[1] I. Paradisanox, S.Shree et al, Nature Communications 11, 2391 (2020)

[2] N. Leisgang, S.Shree et al, Nature Nano. 15, 901 (2020)

[3] S. Shree et al, arXiv 2104.01225

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