Seminar announcement

Tuesday, April 16, 2024
5 pm
ZNN, Seminar room EG 0.001
Exclusively in person

"0-D, 1-D and 2-D heterostructure engineering in 2-D materials and the quasiparticles one can protect"

We explore how atomically sharp hetero structures such as 2-D stacks, 1-D boundaries within a 2-D material, and 0- D vacancies and substitutes in 2-D materials create new protected quantum states using photo low temperature Scanning Tunneling Microscopy, near field optical microscopy, and low temperature time resolved optical spectroscopy. We show how 2-D MoSe2 and 2-D WS2 carry a zoo of intrinsic point defects that modify substantially electronic properties, such as individual S vacancies that create two level systems within the band gap with extremely high spin orbit coupling. These S defects can be artificially induced, and mediate single photon emission via optical stimulation as well as electric stimulation. We show how a variety of Sulfur vacancy substitutes such as a C radical, Co or Si, can induce paramagnetic two level systems that can in principle act as next generation color centers. We show how 1-D defects induced, e.g. by mirror twin boundaries, can host a Tomonaga Luttinger Liquid in MoS2 and WS2. We show that the dispersion of Spin and Charge are different in this 1-D correlated electron system and how critical graphene is substrate for the formation of a Tomonaga Luttinger Liquid. Last I will discuss our exploration of strong quasiparticle coupling between excitons in WSe2 and a plasmon polariton to form a plexciton. We combine plasmonic nano tranch cavities in Au that are resonant with the bright exciton in 2-D WSe2 to create a plexciton. Using Near Field Optical Microscopy we are mapping out the local field distribution of these plexcitons.

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