Seminarankündigung

Dienstag, 14. Mai 2019
10:30 Uhr

WSI, Seminarraum S 101

“Advances in epitaxial growth of optically active semiconductor nanostructures an 2D materials”

Semiconductor quantum dots (QDs) are fascinating systems for potential applications in quantum information processing and communication, since they can emit single photons and polarization entangled photons pairs on demand. However, tuning techniques for correcting asymmetries and inhomogeneities in real QDs are needed. Recently, two dimensional (2D) materials such as transition metal dichalcogenides (TMDs) and III-VI monochalcogenides (MC) have been emerging as platforms for flexible and transparent electronics and optoelectronics. The common feature is the presence of strong chemical bonds within the 2D blocks and a weak van der Waals (vdW) bonding between the blocks. This system can be obtained by vdW epitaxy by relaxing the requirement for lattice matching between the substrate and the epilayer and, differently to the exfoliation technique, ensures superior interface quality and scalability, both vital for device processing and implementation with SOI technology.

In this talk, I will first present growth methods for the realisation of near-optimal single photon sources and closely spaced QDs, so called QD molecules. By the simultaneous application of large strain and electric fields, control over the electronic and optical properties of single and double QDs is achieved together with high degree of entanglement.

In the second part, vdW epitaxy of large-area MC GaTe thin films on Si(111) with fine control of the thickness will be demonstrated. PL emission from the ex-situ annealed as-grown GaTe shows the successful transition from the hexagonal to the monoclinic phase. Finally, the analogy between phase change materials (PCM) along the Sb_2Te_3-GeTe pseudo binary line, active material for non-volatile solid-state memories, down to the ultrathin regime and TMDs will be introduced. The deviation of the weakly coupled PCM from purely 2D allows for strain engineering in such systems.

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