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Quasiparticle Band Gap Tunability in Mono- to Few Layer Molybdenum Disulfide

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Quasi two-dimensional molybdenum disulfide (MoS 2) has emerged as an attractive candidate for next generation 2D semiconductor devices due to its substantial and tunable band gap 1,2 . Controlling the band gap of single layer MoS 2 has been the focus of significant research effort as it offers complimentary functionality to metallic or semi-metallic 2D materials. In this work, we investigate the effect of various tuning knobs, such as crystallographic orientation 3 and strain 4 , on the magnitude of the quasiparticle band gap of MoS 2 . We employ low temperature scanning tunneling microscopy and spectroscopy (STM/STS) to obtain quantitative measurements of the local electronic density of states on the atomic scale. Measurements were performed on mono- to few layer MoS 2 films grown by ambient pressure chemical vapor deposition (AP-CVD). Additionally, Greens function based electronic structure calculations were carried out in order to shed light on the mechanisms at play responsible for changes in the band gap.

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