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Fabrication of Ohmic Contacts to Atomically Thin Transition Metal Dichalcogenides by Work Function Engineering KATERYNA PISTUNOVA, LUIS JAUREGUI, ANDREW JOE, ESHAAN PATHERIA, PHILIP KIM, Harvard University — Semiconducting transition metal dichalcogenides (TMDCs) are 2-dimensional semiconductors that can exhibit unique quantum transport phenomena, such as spin-valley coupling and valley Hall effect. However, most metal contacts to TMDCs form a large Shottky barrier due to Fermi level pinning and large work function mismatch, making it challenging to study the intrinsic transport properties at low temperatures. Here, work function engineering by controlling the thickness of metal film and surface morphology, we demonstrate to achieve highly transparent electric contacts to atomically thin TMDCs. We use x-ray photoelectron spectroscopy (XPS) to determine the work function of thin metal films that match the conduction/valence band edge of TMDCs to reduce the work function mismatch. We also utilize a top-gated device geometry with metal contacts underneath the TMDC flake together with metal work function tuning based on XPS to achieve Ohmic contacts to single and bilayer TMDCs. Gate dependent quantum oscillations in conductance were observed in TMDC materials and we will discuss photo response of magneto transport in the quantum limit.

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