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Metal Contact Formation and Substrate Ferroelectric Poling: Effective Means of Determining MoS_2 Transport Properties LUDWIG BARTELS, JOSEPH MARTINEZ, ARIANA NGUYEN, MICHAEL GOMEZ, EDWIN PRECIADO, VELVETH KLEE, MICHAEL VALENTIN, I-HSI LU, DAVID BARROSO, University of California Riverside, THOMAS SCOTT, PETER DOWBEN, University of Nebraska- Lincoln — Monolayer transition metal dichalcogenides (TMDs) are of rising interest due to their direct band gap at the single-layer limit and pronounced spin splitting in the valence band. Metal contact formation to such materials is a persistent issue yet it holds tremendous opportunity for improving TMD transport properties: simply through their composition, metal contacts can increase the very low carrier numbers in single-layer films leading to significant shifts of the Fermi energy. X-ray photoelectron spectroscopy (XPS) measurements of the charge transfer during metal contact formation reveal the TMD valence band edge to approach the Fermi level underneath the contact, so that TMD devices resemble *pnp*-junctions. We employ a combination of scanning photocurrent microscopy (SPCM) and surface acoustic spectroscopy on ferroelectric substrates to ascertain our findings. SPCM measurements allow us to probe the impact of electrical contacts on the photoconductivity of the materials. In contrast, surface acoustic spectroscopy allows access to the transport properties of the material even in the absence of contacts. The combination of these technique sheds new light on the band alignment in TMD materials between contacts and on ways to manipulate it.

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