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Ambipolar conduction in MoS₂/WSe₂ hetero-bilayers HEMA CHANDRA PRAKASH MOVVA, SANGWOO KANG, AMRITESH RAI, SANJAY BANERJEE, Microelectronics Research Center, The University of Texas at Austin — Recent interest in layered semiconductors, and the ability to assemble them into artificial heterostructures with atomically sharp interfaces has opened up new avenues for the design of future electronic devices. In this work, we fabricated vertical heterostructures of exfoliated monolayer MoS₂ and monolayer WSe₂ using a facile flake pick-up-and-place technique, and studied their optical and electrical properties. Photoluminescence measurements showed evidence of indirect excitons at ~ 1.55 eV, indicating a clean interface between the two layers. We observed back-gate tunable, layer-selective ambipolar conduction in field effect transistors (FETs) made using these hetero-bilayers, with e-transport occurring through the MoS₂, and h-transport through WSe₂. The addition of a top-gate using a thin hBN dielectric further enabled selective operation of the hetero-bilayer FET as an n-FET/p-FET depending on the back-gate bias.

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