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Field-Effect Transistors Based on Few-Layered Ambipolar $MoSe_2$ and α-$MoTe_2$[1] DANIEL RHODES, Florida State University, NIHAR PRADHAN, NHMFL, SIMIN FENG, Pennsylvania State University, BYOUNG-HEE MOON, YAN XIN, NHMFL, SHARHRIAR MEMARAN, MUHANDIS SIDDIQ, LAKSHMI BHASKARAN, FSU, STEPHEN HILL, NHMFL, HUMBERTO TERRONES, Rensselaer Polytechnic Institute, MAURICIO TERRONES, PSU, AJAYAN PULICKEL, Rice University, LUIS BALICAS, NHMFL — We report a room temperature study on the electrical responses of field-effect transistors (FETs) based on few-layered $MoSe_2$ and $MoTe_2$, grown by chemical vapor transport, mechanically exfoliated onto SiO_2. $MoSe_2$ FETs electrically contacted with Ti display ambipolar behavior with current on/off ratios up to 10^6 for both hole and electron channels. For both channels the Hall effect indicates Hall mobilities $\mu_H \simeq 250$ cm^2/(Vs), which are comparable to the corresponding field-effect mobilities, $\mu_{FE} \sim 175$ cm^2/(Vs), evaluated through two-terminal field-effect configuration. $MoTe_2$ field-effect transistors are observed to be hole-doped, displaying on/off ratios of $\sim 10^6$ and subthreshold swings of $\sim$140 mV per decade. Our results suggest that $MoSe_2$ is a good candidate for single atomic layer p$-$n junctions and for low-power, complementary logic applications, with $MoTe_2$ having similar properties. However, in $MoTe_2$ we observe a field-effect mobility of only $\mu_{FE} \sim 20$ cm^2/(Vs) in a bilayer device and ~ 27 cm^2/(Vs) in seven layers.

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