Abstract Submitted
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Charge transport physics of individual PbSe Nanowire field effect transistors[1] SOONG JU OH, DAVID KIM, CHERIE KAGAN, University of Pennsylvania — We report the charge transport properties of individual PbSe nanowire (NW) field-effect transistors (FETs) fabricated from single crystalline, PbSe NWs 10 nm in diameter synthesized by wet-chemical methods. PbSe is a particularly interesting semiconductor to study in one-dimension as the diameter of the NWs is smaller than the electron, hole and exciton Bohr radii, allowing study of strongly quantum confined NWs. We investigate the temperature dependent charge transport properties of ambipolar and reversibly, surface, p-doped PbSe NW FETs. We demonstrate that PbSe NW FETs behave as Schottky Barrier (SB) FETs, in which the off current is limited by the SB height and decreases as temperature decreases, while the on current is achieved by gate thinning and increases as temperature decreases. We calculate the SB heights for electron and hole injection in ambipolar and hole injection in p-type PbSe NW FETs. The hole mobility in surface-doped, p-type FETs is temperature dependent, rising monotonically from 200 cm2/Vs at room temperature to 2000 cm2/Vs at 4.5K, without signatures of impurity scattering which commonly limits carrier mobilities at low temperatures in substitutionally doped NWs.

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