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Optoelectronic characterization of single PbS nanowire field effect transistors DONG YU, CHRISTOPHER MILLER, RION GRAHAM, MATTHEW CAULFIELD, Physics Department, UC Davis — Nanostructures composed of narrow bandgap semiconductors have the potential for highly efficient solar energy conversion. Here we investigated the optoelectronic properties of field effect transistors (FETs) incorporating single PbS nanowires grown by vapor-liquid-solid approach. At high bias voltage, the dark current saturates and the gate voltage can tune its magnitude. A zero-bias current occurs when the metal-nanowire contact is illuminated. The polarity and the bias dependence of the photocurrent are consistent with a downward band bending at the contact. The photocurrent spot is elongated into the nanowire if the energy barriers at the contacts are reduced. A physics model based on the charge drift/diffusion and band bending is proposed to account for these behaviors.

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