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Programmable Schottky Junctions Based on Ferroelectric Gated MoS_2 Transistors. ZHIYONG XIAO, JINGFENG SONG, STEPHEN DRCHARME, XIA HONG, Univ of Nebraska-Lincoln — We report a programmable Schottky junction based on MoS_2 field effect transistors with a SiO_2 back gate and a ferroelectric copolymer poly(vinylidene-fluoride-trifluorethylene) (PVDF) top gate. We fabricated mechanically exfoliated single layer MoS_2 flakes into two point devices via e-beam lithography, and deposited on the top of the devices ˜20 nm PVDF thin films. The polarization of the PVDF layer is controlled locally by conducting atomic force microscopy. The devices exhibit linear I_D-V_D characteristics when the ferroelectric gate is uniformly polarized in one direction. We then polarized the gate into two domains with opposite polarization directions, and observed that the I_D-V_D characteristics of the MoS_2 channel can be modulated between linear and rectified behaviors depending on the back gate voltage. The nonlinear I_D-V_D relation emerges when half of the channel is in the semiconductor phase while the other half is in the metallic phase, and it can be well described by the thermionic emission model with a Schottky barrier of ˜0.5 eV. The Schottky junction can be erased by re-write the entire channel in the uniform polarization state. Our study facilitates the development of programmable, multifunctional nanoelectronics based on layered 2D TMDs..

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