Abstract Submitted
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High-Performance Topological Insulator Bi_2Se_3 Nanowire Field Effect Transistors[1] HAO ZHU, GMU, CURT RICHTER, NIST, ERHAI ZHAO, HUI YUAN, HAITAO LI, DIMITRIS IOANNOU, QILIANG LI, GMU, GEORGE MASON UNIVERSITY TEAM, NIST TEAM — Single crystal topological insulator Bi_2Se_3 nanowires were synthesized by Vapor-Liquid-Solid (VLS) mechanism. Bi_2Se_3 NW field-effect transistors were fabricated by using self-alignment method with HfO_2 as the gate dielectric. Bi_2Se_3 NWFETs were measured in vacuum at different temperatures. Excellent MOSFET characteristics were achieved: smooth and well-saturated output characteristics, large On/Off ratio (10^7), zero Off-state current and good subthreshold slope in transfer characteristics. We have observed linear behavior of the saturation current extracted from the I_{ds}-V_{ds} curves as a function of the overthreshold voltage (V_g-V_{th}), which indicated the main role of the metallic surface conduction at Bi_2Se_3 nanowire channel. Both effective mobility and field-effect mobility have been extracted. Very good effective mobility (> 5000 $cm^2V^{-1}s^{-1}$ at 77 K) was obtained under a low gate voltage. From off-state current we calculated the band gap of bulk about 0.33 eV, which is in a good agreement with reported value of 0.35 eV.

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