Abstract Submitted
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Tuning the Fermi Level in the Topological Insulator Bi_2Se_3 by Gate Voltage[1] JOSEPH CHECKELSKY, QIUCEN ZHANG, DONGXIA QU, YEW SAN HOR, R.J. CAVA, N.P. ONG, Princeton University — We have fabricated field-effect devices using cleaved, few-monolayer Bi_2Se_3 for electrical transport measurements. By varying the applied gate potential V_G, we can shift the chemical potential μ through the bulk electronic bands. In as-grown crystals μ is pinned to the bulk conduction band due to carriers donated by Se vacancies. In these crystals the density of electrons can be varied continuously with V_G and mobilities 2000 cm^2 / Vs realized. In crystals chemically doped with Ca to suppress the density from the remnant bulk electron pocket, we can tune μ below the conduction band edge. From the behavior of the resistance and Hall resistivity vs. V_G, we show that we can access states inside the energy gap. A finite conductance is observed for all V_G consistent with conducting surface states or impurity bands in the bulk band gap. Transport measurements are performed down to $T = 0.3$ K and up to magnetic field $H = 14$ T. We measure the Hall resistivity to extract the carrier density n_{Hall} and observe suppression of conductance σ_{xx} in large H.

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