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Magnetic field induced suppression of the forward bias current in Bi_2Se_3/Si Schottky barrier diodes[1] HAOMING JIN, ARTHUR HEBARD, University of Florida — Schottky diodes formed by van der Waals bonding between freshly cleaved flakes of the topological insulator Bi_2Se_3 and doped silicon substrates show electrical characteristics in good agreement with thermionic emission theory. The motivation is to use magnetic fields to modulate the conductance of the topologically protected conducting surface state. This surface state in close proximity to the semiconductor surface may play an important role in determining the nature of the Schottky barrier. Current-voltage (I-V) and capacitance-voltage (C-V) characteristics were obtained for temperatures in the range 50-300 K and magnetic fields, both perpendicular and parallel to the interface, as high as 7 T. The I-V curve shows more than 6 decades linearity on semi-logarithmic plots, allowing extraction of parameters such as ideality (η), zero-voltage Schottky barrier height (SBH), and series resistance (R_s). In forward bias we observe a field-induced decrease in current which becomes increasingly more pronounced at higher voltages and lower temperature, and is found to be correlated with changes in R_s rather than other barrier parameters. A comparison of changes in R_s in both field direction will be made with magnetoresistance in Bi_2Se_3 transport measurement.

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