

Novel properties of topological insulator thin films of Bi_2Te_3 and Bi_2Se_3 prepared by molecular beam epitaxy

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We have grown topological insulator thin films of Bi_2Te_3 and Bi_2Se_3 on Si(111) and 6H-SiC(0001) substrates by using state-of-art molecular beam epitaxy (MBE). We studied nontrivial surface states and their thickness-dependence of the films by *in situ* angle resolved photoemission spectroscopy (ARPES) and scanning tunneling microscopy/spectroscopy (STM/STS). By direct imaging standing waves associated with magnetic and nonmagnetic impurities and steps on Bi_2Te_3 and Bi_2Se_3 (111) surfaces, we show that the topological states have a surface nature and are protected by the time reversal symmetry. We demonstrated the high mobility of the Bi_2Se_3 films by direct observation of Landau quantization. We also studied the growth of superconducting and magnetic thin films on Bi_2Te_3 and Bi_2Se_3 . Implication on probing Majorana fermions and topological magneto-electric effect will be discussed.