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Scanning tunneling spectroscopic (STS) studies of MBE-grown topological insulators of Bi_2Se_3 epitaxial films on Si(111) N.-C. YEH, M.L. TEAGUE, W.-H. LIN, H. CHU, Dept. of Physics, Caltech, Pasadena, CA 91125, F.X. XIU, L. HE, K.L. WANG, UCLA, Los Angeles, CA 90095 — We report STS studies of MBE-grown Bi_2Se_3 epitaxial films on Si(111) with varying thicknesses. The films were atomically flat on the scale of hundreds of nanometers, with occasional atomic steps of one c-axis lattice constant. In the case of thick Bi_2Se_3 films, the tunneling spectra were consistent with those found in single crystalline Bi_2Se_3, except that the Dirac point ($E_{Dirac} = -50 \sim$ -100 meV) of the MBE-film is generally much closer to the Fermi level ($E = 0$), in contrast to the large downshift of E_{Dirac} (= -400 $\sim$ -200 meV) commonly found in single crystalline bulk grown Bi_2Se_3. The STS spectra of the thinner films deviate from those of the thicker samples, probably the result of strain. Fourier transformed (FT) STS data as a function of energy reveals several quasiparticle scattering interference wave-vectors that are consistent with the topologically protected surface states with chiral spin texture, although the overall FT-STS maps are simpler than those reported on the $Bi_{0.92}Sb_{0.08}$ (111) surface due to simpler electronic band-structures of Bi_2Se_3. The effect of time reversal symmetry breaking on the FT-STS will be investigated by either magnetic doping or application of magnetic fields. This work was supported by a grant from FENA of FCRP and DARPA.

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