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High quality topological insulator thin films grown by molecular beam epitaxy using MoS2 monolayer as buffer layer K. H. CHEN, H. Y. LIN, C. Y. WANG, S. R. YANG, J. KWO, Dept. of Physics, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan, C. K. CHENG, M. HONG, Graduate Institute of Applied Physics and Dept. of Physics, National Taiwan Univ., Taipei 10617, Taiwan, X. Q. ZHANG, Y. H. LEE, Dept. of Material Science and Engineering, Natl Tsing Hua Univ., Hsinchu 30013, Taiwan — Topological insulators (TIs), a new state of quantum matter, display a rich variety of physical phenomena. High quality TI films of Bi2Se3 and Bi2Te3 have been obtained by van der Waals epitaxy on various substrates. To further reduce the high defect density level common in these films, we have extended the investigation to utilize 2D layered materials of hexagonal symmetry as substrates, such as large area CVD-grown MoS2 monolayer. Streaky RHEED patterns were observed during growth. Normal scans of x-ray diffraction indicated that the c-axis of films grown on both Al2O3(0001) and MoS2/Al2O3(0001) were fully strain relaxed with a FWHM varying from 0.01 to 0.03, suggesting a very high degree of crystallinity. Using AFM, we found that size of triangular shaped domains were substantially bigger (˜1.5um) than those without MoS2 (˜0.6um). Furthermore, reduction by ˜16% in carrier concentration and a mobility as high as 5700cm2/Vs were observed in our 50nm film with MoS2. Other thickness dependent transport properties such as WAL are underway, along with ARPES study of the electronic structures.

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