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Single Domain Bi_2Se_3 Films Grown on InP(111)A by Molecular-Beam Epitaxy X. GUO, Z.J. XU, Phys. Dept.,The University of Hong Kong, H.C. LIU, Phys. Dept., Hong Kong University of Science and Technology, B. ZHAO, X.Q. DAI, College of Physics and Information Engineering,Henan Normal University, H.T. HE, J.N. WANG, Phys. Dept., Hong Kong University of Science and Technology, H.J. LIU, W.K. HO, M.H. XIE, Phys. Dept.,The University of Hong Kong — We report the growth of single domain Bi_2Se_3(111) thin films by MBE on InP(111) substrate. On singular and vicinal substrate surfaces, we observe the 2D growth mode, as implied by the streaky RHEED patterns and the RHEED intensity oscillations. In the 2D step-flow growth mode, the epitaxial Bi_2Se_3 film is found to be diminished of twin and rotation domains, as inferable from both the unidirectional mounds seen by STM and by the three-fold LEED patterns. Such films show relatively low background doping ($\sim 1 \times 10^{18}$ cm^{-3}) and high low-temperature electron mobility (3500 cm^{2}V^{-1}s^{-1}). Magnetoresistance measurements unveil SdH oscillations at different sample tilting angles. Ab initio total energy calculations suggest the existence of strong chemical interaction between atoms at the hetero-interface. Therefore, the growth does not proceed by the vdW epitaxy process. The additional chemical interaction between P and Bi atoms at steps would facilitate step-flow mode of growth, making the steps to offer an effective guide to the lattice of epitaxial Bi_2Se_3.

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