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Clear Revelation of Topological Surface States in Bi_2Se_3 Thin Films by *in situ* Al Passivation MURONG LANG, LIANG HE, XINXIN YU, JIANSHI TANG, XUFENG KOU, KANG L. WANG, UCLA Electrical Engineering, ALEXEI V. FEDOROV, Lawrence Berkeley National Laboratory — We report that *in situ* aluminum (Al) passivation of Bi_2Se_3 can inhibit the degradation process and clearly reveal the massless, Dirac-like topological surface states. In this work, an 8 quintuple layers Bi_2Se_3 film was passivated with 2 nm Al, immediately after the MBE growth, which prevents native oxide (BiO_x) formation, isolates the film from ambient n-type doping or contaminations in the subsequent fabrication process. Dual evidences from both Shubnikov-de Hass (SdH) oscillations and weak antilocalization (WAL) effect, originated from the π Berry phase of the nontrivial surface states, were clearly revealed in the sample with *in situ* Al passivation. In contrast, we show that the two dimensional carrier density was increased 39.2% for the un-passivated control samples. Also, the SdH oscillations were completely absent and a large deviation from the WAL was observed

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