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Observation of oscillatory relaxation in the Sn-terminated surface of epitaxial rock-salt SnSe {111} topological crystalline insulator[1]

WENCAN JIN, JERRY DADAP, RICHARD OSGOOD, Columbia University, SURESH VISHWANATH, HUAI-HSUN LIEN, ALEXANDER CHANEY, HUILI XING, Cornell University, JIANPENG LIU, University of California, Santa Barbara, LINGYUAN KONG, JUNZHANG MA, TIAN QIAN, HONG DING, Institute of Physics, CAS, JERZY SADOWSKI, Center for Functional Nanomaterials, BNL, ZHONGWEI DAI, KARSTEN POHL, University of New Hampshire, RUI LOU, SHANCAI WANG, Renmin University of China, XINYU LIU, JACEK FURDYNA, University of Notre Dame — Topological crystalline insulators have been recently observed in rock-salt SnSe {111} thin films. Previous studies have suggested that the Se-terminated surface of this thin film with hydrogen passivation is a preferred configuration. In this work, synchrotron-based angle-resolved photoemission spectroscopy, along with density functional theory calculations, are used to demonstrate conclusively that a rock-salt SnSe {111} thin film has a stable Sn-terminated surface. These observations are supported by low energy electron diffraction (LEED) intensity-voltage measurements and dynamical LEED calculations, which further show that the Sn-terminated SnSe {111} thin film has undergone an oscillatory surface structural relaxation. In sharp contrast to the Se-terminated counterpart, the Dirac surface state in the Sn-terminated SnSe {111} thin film yields a high Fermi velocity, 0.50×10^6m/s, which may lead to high-speed electronic device applications.

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