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Strain engineering Dirac surface states in heteroepitaxial topological crystalline insulator thin films ILIJA ZELJKOVIC, DANIEL WALKUP, BADIH ASSAF, KANE SCIPIONI, Boston College, RAMAN SANKAR, FANGCHENG CHOU, National Taiwan University, Taipei, VIDYA MADHAVAN, University of Illinois Urbana-Champaign — In newly discovered topological crystalline insulators (TCIs), the unique crystalline protection of the surface state (SS) band structure has led to a series of intriguing predictions of strain generated phenomena, such as the momentum-space tunability of the Dirac nodes. In this work, we have designed an experiment to not only generate and measure strain locally, but to also directly measure the resulting effects on the Dirac SS. We grow heteroepitaxial thin films of TCI SnTe in-situ and measure them by using high-resolution scanning tunneling microscopy (STM). Large STM images were analyzed to determine picoscale changes in the atomic positions which reveal regions of both tensile and compressive strain. Simultaneous Fourier-transform STM was then used to determine the effects of strain on the Dirac electrons. We find that strain continuously tunes the momentum space position of the Dirac points, consistent with theoretical predictions. Our experiments demonstrate the fundamental mechanism necessary for using TCIs in strain-based applications.

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