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Visualizing virgin magnetic domains of V-doped Sb_2Te_3 thin films[1] WENBO WANG, Department of Physics and Astronomy, Rutgers University, Piscataway, NJ, 08854 USA, CUI-ZU CHANG, JAGADEESH S. MOODERA, Francis Bitter Magnet Lab, Massachusetts Institute of Technology, Cambridge, MA 02139, USA., WEIDA WU, Department of Physics and Astronomy, Rutgers University, Piscataway, NJ, 08854 USA — Quantum anomalous Hall effect (QAHE) was experimentally realized in a ferromagnetic topological insulator Cr-doped $(Bi,Sb)_2Te_3$ thin film for the first time[1]. Recently, a more robust QAHE has been observed in V-doped $(Bi,Sb)_2Te_3$ thin film, which has a much larger coercive field and higher Curie temperature at the same doping level[2]. However, a mysterious self-magnetization phenomenon was observed in the V-doped Sb_2Te_3, where net magnetization spontaneously develops after zero field cooling. In this talk, we utilize cryogenic magnetic force microscopy (MFM) technique to study the domain states of V doped Sb_2Te_3 film under various cooling fields. A zero net magnetization state with equally distributed up and down domains was observed after zero-field cooling. In addition, a small external magnetic field ($\sim$5 Oe) is able to significantly polarize the magnetization of the film. Our MFM results are qualitatively consistent with in-situ magnetoresistance measurements. [1] C.-Z. Chang et al., Science 340, 167 (2013). [2] C.-Z. Chang et al., Nature Materials 14, 473477(2015).

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