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Vanadium impurity state in the doped Sb_2Te_3 quantum anomalous Hall system[1] PENGCHENG CHEN, YU LIU, YAU CHUEN YAM, YANG HE, Harvard University, CHRISTOPHER ECKBERG, JOSHUA SAMUEL, JOHNPIERRE PAGLIONE, University of Maryland, MOHAMMAD HAMIDIAN, Harvard Univeristy, University of California, Davis, JENNIFER HOFFMAN, Harvard University, HOFFMANLAB TEAM, JOHNPIERRE PAGLIONE TEAM — The quantum anomalous Hall (QAH) effect has recently been reported in the ferromagnetic topological insulator V-doped $(Sb,Bi)_2Te_3$. However, the microscopic origin of the insulating ferromagnetic ground state is unclear. We employed scanning tunnelling microscopy and spectroscopy on $(Sb_{1-x}V_x)_2Te_3$, and identified two types of V substitutions, in the first and second Sb layers beneath the surface. We found that, second-layer V substitutions induce a peak within the bulk gap, which may form an impurity band at high impurity concentration. However, first-layer V substitutions suppress the impurity state and locally induce a gap in the surface state. Our results clarified the contribution of the V impurity state to the electronic structure of this QAH system.

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