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Topological surface states of Sb thin films adsorbed with impurities¹ CHIH-KAI YANG, CHI-HSUAN LEE, National Chengchi University, Taipei, Taiwan, ROC — An antimony film is known to exhibit topological surface states depending on the thickness of the film. If the thickness of the film is reduced to as low as four bilayers, for example, Dirac cones disappear as a result of quantum tunneling. We use density functional calculation to investigate the electronic structure of the four-bilayer Sb film and find that adsorptions of non-magnetic impurity atoms of hydrogen, copper, or zinc on the film actually facilitate the formation of Dirac cones that preserve time-reversal symmetry. But magnetic atoms such as iron and manganese do just the opposite. The results suggest the counterintuitive concept of achieving topological conduction by doping nonmagnetic foreign atoms on thin films of topological insulators.

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