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Topological phase transition in the $(Bi_{1-x}In_x)_2Se_3$ system investigated via STM WENWEN ZHOU, YOSHINORI OKADA, ZHENSONG REN, DANIEL WALKUP, STEPHEN WILSON, VIDYA MADHAVAN, Boston College — Transport and photoemission measurements on $(Bi_{1-x}In_x)_2Se_3$ have shown that the system transforms from a pure (x=0) topological insulator (TI) into a topologically trivial material ($x > 0.07$) through a topological phase transition. Indium (In) substitution for heavier Bismuth is expected to have a large effect on the electronic properties of TIs and is a very sensitive way to tune spin-orbit coupling while maintaining the same lattice structure. In this talk we present scanning tunneling microscopy measurements of the surface state and electronic structure of $(Bi_{1-x}In_x)_2Se_3$ single crystals over a wide range of In concentrations. We identify the local density signature of the In impurities and use these local measurements to determine the actual doping levels. Using spectroscopy and Fourier transform maps we then trace the evolution of the topological insulator into the trivial phase, thereby providing insights into the nanoscale evolution of this process.

Wenwen Zhou
Boston College

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