Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Electrical transport study of Bi_2Se_3 and $Bi_{1-x}Sb_x$ crystals PENG WEI, XINFEI LIU, DEQI WANG, JING SHI, Department of Physics and Astronomy, University of California at Riverside, RANDY DUMAS, KAI LIU, Department of Physics, University of California, Davis — Bi_2Se_3 and $Bi_{1-x}Sb_x$ are predicted and recently confirmed by ARPES experiments to be 3D topological insulators. We have successfully grown Bi_2Se_3 and $Bi_{1-x}Sb_x$ single crystals using a two-step melting method. Both X-ray diffraction (XRD) and electron back-scatter diffraction (EBSD) show excellent structural quality of the crystals on the micro- and macro-scales. The undoped Bi_2Se_3 is metallic, but $Bi_{1-x}Sb_x$ is insulating for x=0.09 and 0.10. We have also fabricated devices with a wide range of thicknesses and measured the electrical transport properties. The longitudinal resistance R_{xx} and Hall resistance R_{xy} measurements are conducted from 1.5K to room temperature in a magnetic field up to 8 Tesla. The sample thickness dependence of the 2D carrier density indicates that there is a large surface carrier density contributing to the transport properties. The devices are then exposed to several dilute gases (e.g. H2, Cl2, etc.), and the effect of the chemical treatment is studied by comparing to the transport properties measured before the gas exposure. We will discuss the correlation between the surface carrier density and the chemical treatment.

Peng Wei
Department of Physics and Astronomy, University of California at Riverside

Date submitted: 20 Nov 2009 Electronic form version 1.4