MAR15-2014-008804

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Doping and Hall effect in $SrTiO_3$

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Electron-doped $SrTiO_3$ has generated renewed interest because of reports of coexisting magnetism and superconductivity, and of superconducting transitions at extremely low carrier densities. In this talk, we will present new insights into doping and its electronic structure obtained using very high quality $SrTiO_3$ films grown by molecular beam epitaxy. We discuss the arrangements and imaging of individual La dopant atoms and clusters using quantitative scanning transmission electron microscopy. We present studies of the temperature dependence of the Hall coefficient, Hall mobility, and of Shubnikov-de Haas oscillations. We will particularly discuss the significance of the regime in which the resistance follows a T^2 temperature-dependence over a wide range of temperatures and doping.

This work was performed in collaboration with Evgeny Mikheev, Adam Kajdos, Jinwoo Hwang, Jack Zhang, and Jim Allen.