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**Electrical Transport in $SrTiO_3$ Under Biaxial Strain**[1]

ADAM KAJDOS, UC Santa Barbara - Materials, BHARAT JALAN, University of Minnesota - Chemical Engineering and Materials Science, JAMES ALLEN, UC Santa Barbara - Physics, SUSANNE STEMMER, UC Santa Barbara - Materials — Mobility engineering with strain is widely used for conventional semiconductors, but has only recently been proposed for complex oxides such as $SrTiO_3$. The conduction band structure of $SrTiO_3$ is complicated with multiple degenerate bands derived from the Ti 3d orbitals. Strain is thus expected to have a significant effect by lifting this degeneracy and altering the occupancy and curvature of the bands. Indeed, a 300% increase in the electron mobility with values exceeding 128,000 $cm^2/Vs$ at 1.8 K was demonstrated in MBE-grown $SrTiO_3$ films subjected to *uniaxial* compressive strain [1]. For heterostructure engineering, the effect of *biaxial* strain is relevant. Here, the electron mobilities in $SrTiO_3$ subjected to biaxial strain are investigated through growth of coherent films on lattice-mismatched substrates. Lightly-doped (high-mobility) strained $SrTiO_3$ films below the critical thickness are insulating because of significant surface depletion, which increases with decreasing temperature due to the high dielectric constant of $SrTiO_3$. We show that highly-doped, low-mobility capping layers address this problem, but require a multilayer model to analyze the Hall data in terms of the mobility in the lightly doped layer.
[1] B. Jalan et al., Appl. Phys. Lett. **98**, 132102 (2011)

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