Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Spin Orbit Interaction in Inversion-Symmetric Semiconductors: SrTiO3 and group IV CUNEYT SAHIN, Optical Science and Technology Center and Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242, USA, GIOVANNI VIGNALE, Department of Physics, University of Missouri, Columbia, Missouri 65211, MICHAEL E. FLATTÉ, Optical Science and Technology Center and Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242, USA — Low-energy effective spin-orbit Hamiltonians have proved effective at describing the effect of spin-orbit interactions on populations of polarized carriers in direct-gap semiconductors such as gallium arsenide. No similar low-energy Hamiltonians are available for materials with inversion symmetry, such as cubic oxides or group-IV semiconductors. In order to construct such low-energy Hamiltonians we have calculated the electronic band structure of strontium titanate, a perovskite material which has recently been used to make high-density two-dimensional electron gases, using a tight-binding electronic structure with atomic spin-orbit interactions. We have also calculated the band structures of several group-IV semiconductors, including germanium, silicon, and diamond. An expression for the effective spin-orbit interaction in the conduction band of these materials has been derived, and calculated for these materials. The symmetry properties of this effective spin-orbit interaction tensor will also be discussed. This work was supported by an ARO MURI.

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Date submitted: 27 Nov 2010 Electronic form version 1.4