Title:	Electronic Structure of Thin Film Anatase TiO_2: A Candidate Spintronics Material
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Description:	The anatase form of titanium dioxide (TiO_2) is a wide band-gap oxide semiconductor that is nearly lattice-matched to Si(100). Anatase films can be made ferromagnetic at room temperature by doping with a few percent of cobalt (Co), and are thus of interest as a potential spin injector for silicon-based spintronics. In this system, the interesting physics, that of the magnetic ions with charge carriers and spin-preserving transport across interfaces, occurs over distances on the order of a few nanometers or less. This collaborative project is investigating several different growth techniques and substrates to optimize and understand ferromagnetic anatase. The aim of this project is to ultimately grow Co-doped and un-doped TiO_2 on Si(100) for the realization of a spintronic device. There are inherent problems with TiO_2 heteroepitaxy on Si, but it is possible to do with a buffer layer. We have recently developed such a layer which we believe enables the growth of TiO_2 on Si. This research will primarily focus on correlating the magnetic, electronic, and atomic structure of Co-doped and un-doped heteroepitaxial TiO_2 films. Future experiments will investigate changes in these properties when Co is incorporated into the anatase lattice. Heteroepitaxial TiO_2 films are also of interest for their large dielectric constant, making them good candidates for the next generation of gate oxides in the semiconductor industry, and for their photocatalytic properties and possible role as a support for other catalysts, such as palladium or platinum.