Title: Growth and Optimization of $TM_xTi_{1-x}O_2$ (TM=Co, Mn, Cr) Films for Silicon-based Spintronic Devices

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Abstract: This application is for a first year proposal on the project of thin film growth of semiconducting transition metal (TM) doped TiO_2 integrated onto silicon for spintronic devices. TM doped TiO_2 is of interest for spin-electronic applications as it has shown promising properties as a dilute magnetic semiconductor. The first part of this project will focus on optimization of the film growth conditions of the anatase phase of TiO_2 by DC/RF magnetron sputter deposition. This will be followed by the incorporation of magnetic TM atoms into the semiconducting TiO_2 lattice to obtain a dilute magnetic semiconductor (DMS). The amount of TM doped into $TM_xTi_{1-x}O_2$ films will be varied from $0<x<0.1$, while structural, transport, and magnetic properties of the films will be studied as a function of TM content. Careful investigation of these properties of thin $TM_xTi_{1-x}O_2$ films will lay a strong foundation for further research for the integration of $TM_xTi_{1-x}O_2$ onto silicon for spintronic devices. We propose an architecture of $Si/SrTiO_3$/DMS (anatase) to overcome problems of silicide formation at the interface and obtain good band-matching and efficient spin-injection.