Niobium doping effects on the ferromagnetism and microstructure of anatase Co: TiO$_2$ films$^1$ SHIXIONG ZHANG, SATISH OGALE, SANKAR DHAR, DARSHAN KUNDALIYA, WEGDAN RAMADAN, JOSHUA HIGGINS, RICHARD GREENE, THIRUMALAI VENKATESAN, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD 20742-4111., LIANFENG FU, NIGEL BROWNING, Lawrence Berkeley National Laboratory, NCEM, 1 Cyclotron Road, MS 72-150, Berkeley, CA 94720 — Niobium doping is shown to have a significant effect on the ferromagnetism and microstructure of dilutely cobalt-doped anatase TiO$_2$ films. Epitaxial films of anatase TiO$_2$ with 3% Co, with and without 1% niobium doping were grown by pulsed-laser deposition at 875 °C at different oxygen pressures. For growth at 10$^{-5}$Torr Niobium doping suppresses ferromagnetism, while it enhances the same in films grown at 10$^{-4}$Torr. The results of High-resolution Z-contrast Scanning Transmission Electron Microscopy and Electron Energy Loss Spectroscopy study reveal uniform surface enrichment of cobalt in the form of Ti$_{1-x-y}$Co$_x$Nb$_y$O$_{2-δ}$g phase, without cobalt metal clusters. The transport and Hall effect results will also be presented and discussed.

$^1$Work Supported under DARPA SpinS program

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Date submitted: 29 Nov 2005

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