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Variable range hopping behavior in the magnetic semiconductor SnO_2:Co P.A. STAMPE, R.J. KENNEDY, Department of Physics, Florida A&M University, Tallahassee, FL 32307, YAN XIN, National High Magnetic Field Laboratory, Tallahassee, FL 32310, E. HU, PENG XIONG, S. VON MOLNÁR, MARTECH and Physics Department, Florida State University, Tallahassee, FL 32306 — To explore the origin of ferromagnetism in doped oxide systems we have grown SnO_2: Co thin films on R-plane Al_2O_3 substrates by laser ablation. We present detailed structural (x-ray diffraction and TEM), transport and magnetic measurements on films grown at different temperatures, growth rates and oxygen pressures. TEM studies show no evidence of cobalt clustering in any of the SnO_2:Co films investigated. Variations in growth conditions have been found to affect the physical properties of the material. For example, films with high crystallinity, grown at low growth rates, show transport consistent with Mott variable range hopping, with $\log(\rho) \propto T^{-1/4}$. This is in contrast to the $\log(\rho) \propto T^{-1/2}$ dependence found previously in TiO_2:Co containing metallic cobalt clusters[1]. We will discuss implications of these findings on the ferromagnetism observed in SnO_2:Co.
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[1] R.J. Kennedy, et al, Appl. Phys. Lett. 84 2832 (2004).

Robin Kennedy
Physics Dept, Florida A&M University, Tallahassee, FL 32307

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