Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Magnetic coupling near the metal-insulator transition in RNiO3
J.-S. ZHOU, J.B. GOODENOUGH, Texas Materials Institute, University of Texas at Austin, B. DABROWSKI, Department of Physics, Northern Illinois University —
In the temperature versus geometric tolerance factor t phase diagram of the $RNiO_3$ perovskite family, the Néel temperature T_N increases with t, *i.e.* the (180° - ϕ) Ni-O-Ni bond angle, until it is intercepted by an insulator-metal transition occurring at T_{IM} that decreases with increasing t. Recent XAS data reveal that as T_N approaches T_{IM} in the insulator phase, large and small $NiO_{6/2}$ octahedra emerge locally although neutron and x-ray diffraction are fit well by an orthorhombic rather than monoclinic space group. The bonding has been shown to be vibronic where T_N approaches T_{IM}. In order to probe how the interatomic exchange interactions evolves where the bonding is vibronic with $T_N < T_{IM}$, we have carried out a systematic measurement of the pressure dependence of T_N. This dependence was determined by tracking under pressure an anomaly of the resistivity ρ(T) that occurs at T_N. The coefficient $d\ln T_N/dP$ of $GdNiO_3$ falls into the range of values for magnetic insulators well-described by superexchange theory. However, this coefficient increases dramatically as t increases, reaching a maximum at lower pressure in $SmNiO_3$ before falling to zero; in $Nd_{0.5}Sm_{0.5}NiO_3$ it is zero in the pressure interval where $T_N < T_{IM}$. A schematic magnetic phase diagram of T_N versus the Ni-O-Ni electron transfer integral is presented.

J.-S. Zhou
Texas Materials Institute, University of Texas at Austin

Date submitted: 03 Dec 2004 Electronic form version 1.4