Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**Antiferromagnetic metallic state: A transport and thermodynamic study of $Ca_3(Ru_{1-x}Cr_x)_2O_7$*** V. DURAIRAJ, S. CHIKARA, G. CAO, University of Kentucky, Lexington, KY40506, P. SCHLOTTMANN, Florida State University, Tallahassee, FL32306 — Among the variety of exciting physical properties, a signature feature of the bilayered $Ca_3Ru_2O_7$ is the antiferromagnetic metallic (AFM) state that lies between a Neel temperature, $T_N$=56 K and a Mott-like transition (MIT), $T_{MI}$=48 K. The results of our recent thermodynamic and transport study of single crystal $Ca_3(Ru_{1-x}Cr_x)_2O_7$ ($0 \leq x \leq 0.20$) reveal that the temperature regime for the AFM state is significantly broadened with $T_{MI}$and $T_N$ being pushed to lower and higher temperatures, respectively, as Cr doping (x) increases. In addition, the magnetic easy axis for magnetization moves gradually away from ***a***-axis to ***b***-axis as x increases and at x=0.20, the magnetic anisotropy in the basal plane diminishes. This reduced spin polarization along the easy axis is promptly reflected in the less pronounced negative magnetoresistance as x increases. Furthermore, the DC current–voltage characteristics show the S-shaped negative differential resistivity for $x \leq 0.17$. As seen in the pure compound, observed non-ohmic behavior is restricted to the AF nonmetallic region. All results are presented along with comparisons drawn from related systems such as perovskite $CaRu_{1-x}Cr_xO_3$ where highly anisotropic magnetism is induced by Cr substitution. * This work was supported by NSF grants DMR-0240813 and DMR-0552267.

Vinobalan Durairaj
University of Kentucky

Date submitted: 16 Nov 2006 Electronic form version 1.4