

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Induced Phase Separation in $\text{GdBaCo}_{2-x}\text{Fe}_x\text{O}_{5.5-\delta}$ by Fe Doping¹

YAN-KUN TANG, C.C. ALMASAN, Department of Physics, Kent State University, Kent, Ohio 44242, USA — A detailed magnetic study has been carried out for the Fe doped $\text{GdBaCo}_{2-x}\text{Fe}_x\text{O}_{5.5-\delta}$ ($x = 0, 0.02, 0.05, 0.10, \text{ and } 0.20$) cobaltites. Fe doping enhances the high temperature T ferromagnetism present in the Fe-free samples and it induces a second ferromagnetic order, which develops at a lower T. Also, the spin-state transition temperature shifts to higher T with increasing the Fe content. Phase separation in two magnetic phases, namely, Fe-rich and Fe-free regions, provides a phenomenological interpretation of these magnetic behaviors. The Fe-rich regions are responsible for the second ferromagnetic order present at lower T. The shift of the low temperature M(T) peak related to this second ferromagnetic order is due to the decrease in the oxygen content in the Fe-rich regions with increasing Fe doping and the presence of the antiferromagnetic Fe-Co superexchange interaction in these regions. The high temperature M(T) peak (corresponding to the Fe-free regions) and the spin-state transition temperature shift to higher temperatures with Fe doping because of the slight compression of the Fe-free regions with Fe doping.

¹This research was supported by the National Science Foundation under Grant No. DMR-0705959.

Yan-kun Tang
Department of Physics, Kent State University, Kent, Ohio 44242, USA

Date submitted: 29 Nov 2007

Electronic form version 1.4