

Abstract Submitted  
for the MAR09 Meeting of  
The American Physical Society

**Determination of the phase diagram of the electron doped superconductor  $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$** <sup>1</sup> JIUN-HAW CHU, JAMES ANALYTIS, CHRIS KUCHARCZYK, IAN FISHER, Geballe Laboratory for Advanced Materials and Department of Applied Physics, Stanford University — Systematic measurements of the resistivity, heat capacity, susceptibility and Hall coefficient are presented for single crystal samples of the electron-doped superconductor  $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$ . These data delineate an  $x-T$  phase diagram in which the single magnetic/structural phase transition that is observed for undoped  $\text{BaFe}_2\text{As}_2$  at 134 K appears to split into two distinct phase transitions, both of which are rapidly suppressed with increasing Co concentration. Superconductivity emerges for Co concentrations above  $x \sim 0.025$ , and appears to coexist with the broken symmetry state up to  $x \sim 0.06$ . The optimal  $T_c$  appears to coincide with the Co concentration at which the magnetic/structural phase transitions are totally suppressed. Superconductivity is observed for a further range of Co concentrations, before being completely suppressed for  $x \sim 0.18$  and above. The form of this  $x-T$  phase diagram is suggestive of an association between superconductivity and a quantum critical point arising from suppression of the magnetic and/or structural phase transitions.

<sup>1</sup>This work is supported by the DOE, Office of Basic Energy Sciences, under contract no. DE-AC02-76SF00515

Jiun-Haw Chu  
Geballe Laboratory for Advanced Materials and  
Department of Applied Physics, Stanford University

Date submitted: 11 Dec 2008

Electronic form version 1.4