Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Specific heat studies of the gap structure in iron-arsenide superconductor $\mathbf{Ba(Fe_{1-x}Co_x)_2As_2}$ K. GOFRYK, LANL, A.S. SEFAT, M.A. MCGUIRE, B.C. SALES, D. MANDRUS, ORNL, E.D. BAUER, J.D. THOMPSON, F. RONNING, LANL — Despite a large theoretical and experimental effort the nature of the superconductivity in FeAs-based materials and the symmetry of the gap remain unknown. Moreover, the experimental results on reported so far are often contradictory, ranging from nodal to fully gapped isotropic superconductivity. We report the doping, field and temperature dependence (down to 0.4 K and in magnetic fields up to 9 T) of the specific heat of $Ba(Fe_{1-x}Co_x)_2As_2$ at under (x=0.038), optimal (x=0.07) and overdoped (x=0.078 and 0.096) regimes. By subtracting the lattice C_p, the temperature and field dependence of the electronic specific heat has been studied. The temperature and field dependencies of the superconducting part of C_p exhibit similar behavior for all doping concentrations. The temperature variation of the electronic C_p as well as its field dependence cannot be described by a single isotropic s-wave gap, pointing to complex gap structure in the system. The lack of doping dependence indicates that the gap structure does not change significantly as a function of doping. We also observe a significant residual linear term in the specific heat in the system which suggests that inhomogeneity may be an important factor in Co-doped $BaFe_2As_2$.

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Date submitted: 24 Nov 2009 Electronic form version 1.4