Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Electronic specific heat of the iron chalcogenide superconductor Fe($\mathbf{Te}_{0.55}\mathbf{Se}_{0.45}$) JIN HU, TIJIANG LIU, BIN QIAN, ZHIQIANG MAO, Department of Physics and Engineering Physics, Tulane University — We report specific heat studies of superconducting $Fe(Te_{0.55}Se_{0.45})$[1]. We have obtained the electronic specific heat by subtracting the phonon contribution evaluated from the normalization of the phonon specific heat of a non-superconducting reference sample $(Fe_{0.9}Cu_{0.1})(Te_{0.55}Se_{0.45})$. Our results show that the superconducting ground state is accompanied by unpaired quasiparticles, as in FeAs superconductors, with $\gamma_0 \sim 2.3$ mJ/mol K^2. The temperature dependence of the electronic specific heat $C_{es}(T)/T$ can be well fitted using either a single s-wave gap model with $2\Delta = 5.2\ k_B T_c$ or a two-gap model with $2\Delta_1/k_B T_c = 5.8$ and $2\Delta_2/k_B T_c = 4.0$; the two-gap model fitting is slightly better than the single gap fitting. Such large gaps, together with a large specific heat jump $\Delta C(T_c)/T_c \sim 57.3$ mJ/mol K^2, suggest a strong-coupling superconducting state. While $C_{es}(T)/T$ exhibits isotropic s-wave gap behavior, the magnetic field-induced change in the electronic specific heat $\Delta\gamma(H)$ exhibits sublinear field dependence, implying the superconducting pairing in iron chalcogenide superconductors also involves a multiple band effect, as seen in pnictide superconductors. [1] M. H. Fang, H. M. Pham, B. Qian, T. J. Liu, E. K. Vehstedt, Y. Liu, L. Spinu, and Z. Q. Mao, Superconductivity close to magnetic instability in $Fe(Se_{1-x}Te_x)_{0.82}$, Phys. Rev. B 78, 224503 (2008).

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Date submitted: 23 Dec 2010 Electronic form version 1.4