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The Electronic Specific Heat of $Ba_{1-x}K_xFe_2As_2$ from 2K to 380K[1]
JAMES STOREY, JOHN LORAM, JOHN COOPER, University of Cambridge, ZBIGNIEW BUKOWSKI, JANUSZ KARPINSKI, ETH Zurich — Using a unique differential technique, we have measured the specific heat capacity of polycrystalline $Ba_{1-x}K_xFe_2As_2$ with x = 0, 0.1, 0.2, 0.3, 0.5 0.9 and 1.0, between 2K and 380K and in magnetic fields (H) from 0 – 13T. We determine the electronic specific heat coefficient γ ($\equiv C_{el}/T$) over the entire range of T, H and x and compare it with the magnetic susceptibility of the seven samples. We show that our results are consistent with single crystal studies but give further interesting information. For x < 0.3, γ is progressively reduced at low T by a SDW gap, but is only weakly doping and T-dependent above the structural/magnetic transition. For x = 0.3 the normal state γ_n is constant up to 380K, but as x increases from 0.3 to 1.0, γ_n becomes increasingly T-dependent, increasing by a factor two at low-T and decreasing by a factor 1.5 at 380K for x = 1. We consider possible explanations for this striking T-dependence in terms of a sharp peak in the electronic density of states, a strongly x- and T-dependent effective mass enhancement, or low energy magnetic excitations. The H-dependent measurements allow us to extract the critical fields, superfluid density and coherence length as functions of doping and temperature.

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