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Thermodynamic Determination of the Upper Critical Field and Anisotropy of $Ba_{0.6}K_{0.4}Fe_2As_2$ Single Crystals[1] WAI -K. KWOK, ULRICH WELP, RUOBING XIE, ALEXEI KOSHELEV, JOHN SCHLUETER, JIONG HUA, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439, USA, HUI-QIAN LUO, ZHAO-SHENG WANG, GANG MU, HAI-HU WEN, Institute of Physics, Chinese Academy of Sciences, Beijing, China — We present anisotropic heat capacity measurements of the upper critical field of $Ba_{0.6}K_{0.4}Fe_2As_2$ single crystals in fields up to 8 Tesla. In zero-magnetic field a clear step in the heat capacity is observed at T_c ∼36K. Using an entropy conserving construction we determined the transition temperatures in applied fields and the upper critical field slopes $dH_{c2||c}/dT$ = -6.5 T/K and $dH_{c2||ab}/dT$ -17.4 T/K, the latter showing record high critical field slope near T_c. The temperature dependence of the specific heat of $Ba_{0.6}K_{0.4}Fe_2As_2$ indicates strong coupling effects. Based on the experimental values of the upper critical field slopes, we determined the Ginzburg parameter, coherence and penetration lengths, anisotropy and thermodynamic critical fields. We also present magnetization measurements and discuss their implications on the nature of critical currents in this material.

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