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Anisotropic physical properties of single phase, single-crystalline $CaKFe_4As_4$[1]

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An overview of the synthesis and anisotropic thermodynamic and transport properties of single-crystalline, single-phase $CaKFe_4As_4$ will be presented [1]. The samples were grown out of a high-temperature, quaternary melt. Temperature-dependent measurements of x-ray diffraction, anisotropic electrical resistivity, elastoresistivity, thermoelectric power, Hall effect, magnetization, specific heat, and ^{57}Fe Mössbauer spectroscopy measurements, combined with field-dependent measurements of electrical resistivity and field and pressure-dependent measurements of magnetization indicate that $CaKFe_4As_4$ is an ordered, stoichiometric, Fe-based superconductor with a superconducting critical temperature, $T_c = 35.0 \pm 0.2$ K. Other than superconductivity, there is no indication of any other phase transition for 1.8K $\leq T \leq$ 300 K. All of these thermodynamic and transport data reveal striking similarities to those found for optimally or slightly overdoped $(Ba_{1x}K_x)Fe_2As_2$, suggesting that stoichiometric $CaKFe_4As_4$ is intrinsically close to what is referred to as optimally-doped on a generalized phase diagram for Fe-based superconductors. The anisotropic superconducting upper critical field, Hc2(T), of $CaKFe_4As_4$, determined up to $\sim$ 65 T will be discussed in some detail. A comparison with $CaFe_2As_2$ and KFe_2As_2 will be presented.

1. W. R. Meier, T. Kong, U. S. Kaluarachchi, V. Taufour, N. H. Jo, G. Drachuck, A. E. Böhmer, S. M. Saunders, A. Sapkota, A. Kreyssig, M. A. Tanatar, R. Prozorov, A. I. Goldman, Fedor F. Balakirev, Alex Gurevich, S. L. Bud'ko, and P. C. Canfield, Phys. Rev. B 94, 064501 (2016).

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