

INVITED

Superconducting Properties of $\text{BaFe}_{1.8}\text{Co}_{0.2}\text{As}_2$

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We synthesized, the iron-pnictide superconductors $\text{BaFe}_{1.8}\text{Co}_{0.2}\text{As}_2$ single crystals which are optimally doped with a critical temperature, T_c , of 23.6 K, by using the self flux method. In this superconductor, we study the gap structure, magnetic fluctuation, and vortex phase transition. The full range of the temperature dependence penetration depth was explained by using a multi-gap structure, especially, two s-wave gap symmetry. We estimate the magnitude of the two gap as $\Delta_1(0) = 1.37 \pm 0.2$ meV for the small gap and $\Delta_2(0) = 3.84 \pm 0.2$ meV for the large gap. The in-plane penetration depth was estimated to be 169 nm, and the superfluid density deviated from the Uemura relation. We also found that the reversible magnetic fluctuation follows a three-dimensional scaling form in the critical fluctuation region. Vortex glass to vortex liquid transition was also observed. Details will be discussed.

Keywords : Superconductor/ferromagnet hybrid structure, Proximity effect, Odd-triplet superconductivity