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Superfluid Density Measurements of Ba(Co_xFe_{1-x})₂As₂ Films near Optimal Doping JIE YONG, Dept. of physics, The Ohio State University, SANGHAN LEE, Dept. of M.S.E, University of Wisconsin, Madison, J. JIANG, Applied Superconductivity Center, National High Magnetic Field Laboratory, Florida State University, C.W. PARK, J.D. WEISS, E.E. HELLSTORM, D.C. LARBALESTIER, C.B. EOM, T.R. LEMBERGER — We report the first direct, low-frequency measurements of superfluid density, $n_s(T) \propto \lambda^{-2}(T)$, in Ba(Co_xFe_{1-x})₂As₂ thin films, near optimal doping. 100 nm thick films are fabricated by Pulsed Laser Deposition (PLD) in high vacuum and SrTiO₃ is used as template to match Ba layer in ba-122. Temperature dependence of superfluid density is measured by our two-coil mutual inductance apparatus down to 1.3K. The magnetic penetration depth, λ , at $T \approx 0$ is 350 to 430 nm. The T-dependence of λ^{-2} is well characterized by a small s-wave gap, $2\Delta(0)/k_B T_c = 2.2 \pm 0.1$. In detail, λ has power-law behavior at low T: $\lambda(T)/\lambda(0) - 1 = 0.60*(T/T_c)^{2.5 \pm 0.1}$. A tail of superfluid density near T_c is the only possible indication of a bigger gap. The small gap, together with power-law behavior at low-T, suggests strong intraband scattering on the larger-gap Fermi surface plus significant interband scattering between large-gap and small-gap Fermi surfaces.

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