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Effect of annealing on the gap structure of $Ba(Fe_{1-x}Co_x)_2As_2$: low temperature specific heat studies K. GOFRYK, F. RONNING, E.D. BAUER, J.D. THOMPSON, Los Alamos National Laboratory, A.B. VORONTSOV, Montana State University, I. VEKHTER, Louisiana State University, A.S. SEFAT, Oak Ridge National Laboratory, T. IMAI, McMaster University — We report on the effect of annealing on the temperature and field dependencies of the low temperature specific heat of the electron-doped $Ba(Fe_{1-x}Co_x)_2As_2$ for under- (x = 0.045), optimal- (x = 0.08) and over-doped (x = 0.105 and 0.14) regimes. We observed that annealing significantly improves some superconducting characteristics in $Ba(Fe_{1-x}Co_x)_2As_2$. It considerably increases T_c, decreases γ_0 in the superconducting state and suppresses the Schottky-like contribution at very low temperatures. The improved sample quality allows for a better identification of the superconducting gap structure of these materials. We examine the effects of doping and annealing within a self-consistent framework for an extended s-wave pairing scenario. At optimal doping our data indicates the sample is fully gapped, while for both under- and over-doped samples significant low-energy excitations remain, possibly consistent with a nodal structure. The difference of sample quality offers a natural explanation for the variation in low temperature power laws observed by many techniques.

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