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Effects of annealing and doping concentration on the critical current density and superconducting properties of $Ba(Fe_{1-x}Co_x)_2As_2$ and $Ba_{0.5}Sr_{0.5}(Fe_{1-y}Co_y)_2As_2$[1] A.O. IJADUOLA, University of North Georgia, C. CANTONI, K. GOFRYK, J. MITCHELL, A. SAFA-SEFAT, Correlated Electron Materials Group, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6061 USA — We report on the study we have made in order to better understand the intrinsic nature of superconductivity and pinning mechanisms in $Ba(Fe_{1-x}Co_x)_2As_2$ with various cobalt concentration and in $Ba_{0.5}Sr_{0.5}(Fe_{1-y}Co_y)_2$. The critical current density J_c(as functions of temperature, and applied magnetic field) for different x values of 0.04, 0.08, and 0.15 (underdoped, optimally doped and overdoped respectively) is determined magnetically. From the $J_c(H)$ analysis, we see that J_c slowly decays with respect to H in all the samples. We also found that J_c in the annealed compared to the as-grown sample is enhanced in the underdoped and the optimally doped $Ba(Fe_{1-x}Co_x)_2As_2$ while there is no difference in the overdoped $Ba(Fe_{1-x}Co_x)_2As_2$ and the $Ba_{0.5}Sr_{0.5}(Fe_{1-y}Co_y)_2$. Analysis of the J_c(T) data shows a weak pinning feature rather than correlated pinning. The pinning force F_p as a function of the irreversible field H_{irr} is also analyzed to gain further insights into the pinning mechanism.

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