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Enhanced grain connectivity in K-doped ferropnictide Ba-122 bulks and wires with high transport critical current density JEREMY WEISS, CHIARA TARANTINI, JIANYU JIANG, FUMITAKE KAMETANI, ANATOLII POLYANSKII, DAVID LARBALESTIER, ERIC HELLSTROM, National High Magnetic Field Laboratory Applied Superconductivity Center — We present very much improved properties of $(Ba_{0.6}K_{0.4})Fe_2As_2$ (Ba-122) made as round wires in which transport critical current densities J_c (4.2 K, SF) in excess of 0.12 $MAcm^{-2}$, which is approximately 5 times higher than any other ferropnictide wire, have been obtained. Careful low-temperature synthesis was used to eradicate extrinsic current-blocking phases and cracks, which also had the effect of producing fine grain size (<200nm) and a high grain boundary density. Very high magnetic field evaluations showed that the upper critical field H_{c2} was well above 50 T and H_{c2} anisotropy was significantly less than 2. This low anisotropy suggests that high vortex stiffness and perhaps less suppression of the grain boundary (GB) order parameter occur in this compound compared to the planar GBs of Co-doped Ba-122 used for bicrystal experiments, which showed weak link behavior that limits critical current across GBs like in other high-temperature superconductors.

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