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Critical Current Density of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ Low-Angle Grain Boundaries¹

H.J. KIM, University of Tennessee, J.R. THOMPSON, University of Tennessee and Oak Ridge National Lab, D.T. VEREBELYI, C. CANTONI, J.D. BUDAI, D.K. CHRISTEN, Oak Ridge National Lab — High-angle grain boundaries (GB) in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ (YBCO) reduce the superconducting critical current density J_c exponentially with misorientation angle θ . In present day, highly textured coated conductors, the GB θ is only a few degrees and the structural details of YBCO films become significant. Here we study the low angle regime (where the distance between dislocation cores in the GB becomes greater than the coherence length ξ) using magnetometry measurements of the persistent current J . We investigate dual grain boundary rings deposited on SrTiO_3 and containing 0° , 2° , 3° , 5° and 7° tilt boundaries. Studies in self-field and in applied magnetic field H show that for $\theta \leq \sim 3^\circ$, the GB's are basically transparent, while for $\theta = 5^\circ$ and 7° , $J(H)$ becomes hysteretic and exhibits a large peak in decreasing field.

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