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Residual Stress Around Embedded Particles in Bulk YBa2Cu3Oy Samples

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Abstract : To increase the flux pinning performance of bulk YBa2Cu3O7-δ (YBCO or Y-123) superconductors, it is common to employ secondary phase particles, either Y2BaCuO5 (Y-211) particles created during the growth of the samples or additionally added (nano)particles of various types, embedded in the superconducting Y-123 matrix. As the crystallographic parameters of all the particles indicate a misfit to Y-123, there will be residual strain within the Y-123 matrix around such particles. With a dedicated analysis of electron backscatter diffraction (EBSD) data obtained on various bulk, Y-123 superconductor samples, the strain distribution around such embedded secondary phase particles can be revealed. The results obtained are presented in form of Kernel Average Misorientation (KAM) mappings. Around large Y-211 particles, the strain can be so large that YBCO subgrains are formed. Therefore, it is essential to properly control the particle size as well as their distribution within the bulk sample to obtain the best performance. The impact of the strain distribution on the flux pinning properties is discussed.

Keywords : Bulk superconductors, EBSD, Strain, YBa2Cu3Oy
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