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# M2Or1A-03: Key Components Enabling the Strong A-axis Growth Grain Texture and Clean Grain Boundary Nanostructure in High Critical Current Density Bi-2212 Round Wires.

*Tuesday, July 23, 2019 10:00 AM (15 minutes)*


Bi2Sr2CaCu2Ox (Bi-2212) is the only high temperature superconductor (HTS) available in the round wire form preferred by magnet builders. Recent advances in the processing have raised its critical current density (Jc) > 6500 A/mm2 at 4.2 K and 15 T, placing Bi-2212 at the forefront of candidates for future HTS high field magnets. The key microstructure for high Jc is a unique a-axis grown bi-axial texture that develops during the Bi-2212 re-solidification from the melt. Our previous study suggested that the geometrical confinement of narrow filament cavities plays the major role for the texture development.
Now that the routine over-pressure heat treatment (OPHT) explores clear Jc correlations to various resultant filament structures and types of precursor powder, it is important to understand how the grain texture develops in such various circumstances and how it correlates to the wire Jc.
By using Electron Backscatter Diffraction –Orientation Imaging Microscopy (EBSD-OIM) and Scanning Transmission Electron Microscopy (STEM), we studied the key microstructural differences in the Bi-2212 round wires with the Jc that significantly vary by a multiple of 9 from the lowest to highest.
We found that the Bi-2212 RW with the highest Jc developed the very distinct microstructure compared with the other wires with lower Jc. The key difference is the grain length along the filament direction that differentiates the degree of biaxial texture, varying the grain boundary misorientations. STEM revealed Bi-2201 precipitation at the grain boundaries in some of low Jc wires. In the presentation, we will discuss the key components to derive such distinct microstructural differences.
We hope that understanding how these differences account for the Jc values will help us optimize our OPHT parameters towards making Bi-2212 RW the ideal candidate in the next generation of superconducting magnets.



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