The Role of Liquid in Determining the YBCO Grain Size in ex situ Processed Coated Conductors

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Applied Superconductivity Conference
Jacksonville, FL
October 3–8, 2004

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prepared by
CONDENSED MATTER SCIENCES DIVISION
OAK RIDGE NATIONAL LABORATORY
Managed by
UT-BATTELLE, LLC
under
Contract No. DE-AC05-00OR22725
with the
U.S. DEPARTMENT OF ENERGY
Oak Ridge, Tennessee

March, 04

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EBSD has been used to map the YBCO and substrate grain structure in several CCs. Using a laser, markers were cut that penetrated through the YBCO into the substrate. Using these markers and ion milling to remove the YBCO, the grain structures of the YBCO and the directly underlying substrate were registered and compared. In thin ex situ YBCO films (< 0.5 μm, BaF_2 process) on RABiTS, aside from a slight improvement in c-axis alignment, the YBCO grains directly replicate the substrate grain structure (with grain size of 20-40 μm) as has been previously reported. In thick films however, where liquid assisted growth is believed to play a significant role, deviations were found. In a 2.9 μm thick YBCO film on IBAD-YSZ, a large YBCO grain size of 40-50 μm was observed, much larger than the template grain size (~0.1 μm). A similar effect was found for films on RABiTS templates. In thick (> 2.5 μm) YBCO films on RABiTS, almost no size or shape correlation between the YBCO and substrate grain structures was found, though grain-to-grain alignment of the YBCO remained similar to or superior to that of the substrate. The result is the template plays a lesser role in determining the YBCO grain structure in the presence of liquid, and liquid assisted growth may present a means of improving YBCO texture and raising J_c in CCs.