



Contribution ID: 514

Type: **Invited Oral Presentation**

[Invited] The Processing of Bulk, Melt Processed (RE)BCO Superconductors with World Record Fields

Monday, June 29, 2015 4:00 PM (30 minutes)

(RE)-Ba-Cu-O [(RE)BCO, where RE = rare earth element such as Y, Nd, Sm, Eu, Gd, etc.] high temperature superconductors (HTS) have significant potential for high field engineering applications at 77 K when fabricated in the form of large single grains by the so-called top seeded melt growth process (TSMG). A novel Y_2Ba_4CuMOy (Y-2411, where M = U, Zr, Hf, Nb, Ta, W and Mo) phase that is effective at pinning magnetic flux quanta in bulk (RE)BCO HTS on the nm scale has been developed at Cambridge with a number of desirable properties, including crystallographic compatibility with the superconducting (RE)Ba₂Cu₃O₇ (RE-123) phase, chemical stability at the melt processing temperature and an ability to resist coarsening during the melt process. This novel phase, which is more effective at pinning flux than the RE₂BaCuO₅ (RE-211) phase produced as a by-product of the melt growth process, has been used to develop a practical processing method for the fabrication in air of large, single grain RE-Ba-Cu-O superconductors. The process also includes a new type of generic seed crystal (Mg-doped NdBCO) that can promote effectively the epitaxial nucleation of any (RE)-Ba-Cu-O system and secondly by suppressing the formation of (RE)/Ba solid solution in a controlled manner within large (RE)BCO grains processed in air. This process has enabled fabrication of single grain samples of GdBCO that exhibit a record trapped field of 17.6 T at 26 K. The recent development of multi-seeding and recycling techniques for the fabrication of larger sample of conformal geometry has improved further the prospects of these technologically important materials for practical applications.

Primary author: CARDWELL, David (University of Cambridge)

Co-authors: Dr DURRELL, John (University of Cambridge); Mr DENNIS, Tony (University of Cambridge); Dr SHI, Yun-Hua (University of Cambridge)

Presenter: CARDWELL, David (University of Cambridge)

Session Classification: M1OrD - Superconductor Materials I: Bulk and New Materials

Track Classification: ICMC-06 - HTS and MgB₂ Bulk