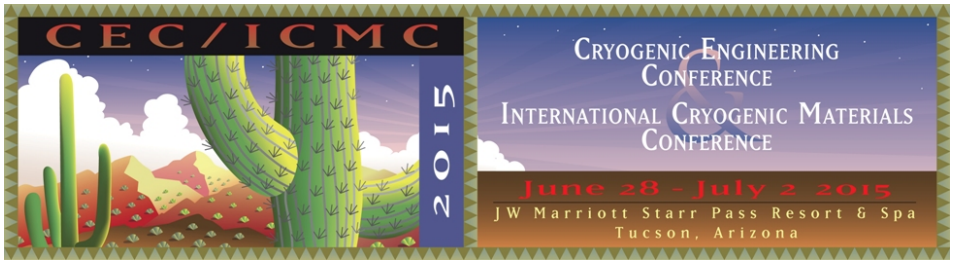

Contribution ID: **514** Type: **Invited Oral Presentation**

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

Monday, 29 June 2015 16:00 (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 Y2Ba4CuMOy (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