

Bulk Superconducting Materials –Ready for Applications?

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Abstract — In 2003 Tomita and Murakami set the record for the trapped field in a bulk superconductor of a shade over 17 T. Last year, not without significant effort, this record was raised to 17.6T. This apparently slow progress may suggest that the pace of progress in Bulk Superconductors has been very slow. In fact nothing could be further from the truth. The growth of bulk materials from (RE)BCO has seen innovations which have permitted a wider range of materials to be successfully grown, engineered pinning enhancement to provide improved critical currents, progressively larger samples and significant progress towards batch processing. In the meantime MgB_2 has emerged, in spite of its relatively low critical temperature, as a cheap, easy to make and rare earth free competitor. In this presentation I will discuss the significant advances that have taken place over the last ten or so years in the materials science of (RE)BCO and MgB_2 bulk superconductors. I will address the challenges to practical application, in particular that of charging, and discuss the approaches being taken around the world to solve them. In parallel with rapid materials development a range of innovative applications for Bulk Superconductors have appeared. I will outline some of these applications which are in domains as diverse as non-destructive testing, energy storage and medicine.

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