

Challenges and Advances in Thick Film REBCO Tapes

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Abstract – Rare Earth Barium Copper Oxide (REBCO) coated conductors (CC) have shown promise for several potential applications over a wide range of temperatures (77K-4.2K), especially at high magnetic fields. However, its high price/performance metric (expressed as \$/kA-m) is a major challenge towards its commercialization. The maximum current carrying capability of REBCO can be improved by growing thicker REBCO films of 4+ μm with high critical current density (J_c). Unfortunately, degradation of critical current density (J_c) in REBCO with increasing film thickness had been widely reported in the literature. The present work attempts to provide a brief overview of the major challenge of thickness effect on the J_c of the tapes made by different processing techniques, and also highlights some proposed reasons for this phenomenon. Also, some major advances in improving 77K self-field J_c of thick REBCO films reported by different research groups in the literature have been summarized. Furthermore, some remarkable improvements in in-field properties of 4+ μm thick heavily Zr-doped REBCO films, such as engineering current density (J_e) of over 5kA/mm² at 4.2K, 14T, have also been discussed briefly.

Keywords (Index Terms) – Coated conductors, thick REBCO films, 2G-HTS, superconducting tapes, thickness dependence, critical current density, engineering current density, flux pinning.

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