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Progress and Challenges in R&D of High Current $REBa_2Cu_3O_7$ Coated Conductors

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***Abstract*–There is a worldwide huge effort in the R&D of high current superconducting wires for large scale power applications and magnets which encompasses many materials science and engineering challenges. Coated conductors based on $REBa_2Cu_3O_7$ have reached very competitive performance goals but it is still challenging to reduce the cost/performance ratio down to the desired levels to reach a massive penetration of these materials into the market.**

Much progress has been reached in the control of the nanostructure to generate the vortex pinning landscape necessary to display high currents at high magnetic fields and the manufacturers have demonstrated how to fabricate long and robust HTS Coated Conductors with high performances. Providentially, we are now at one of the most exciting times for these materials, with their expansion into several emerging applications, such as fusion, and the race for large volume production has started.

Particularly, in order to improve performance together with cost reduction, faster growth methods are now being explored, which raise new vortex physics scenarios. It is still very challenging to disclose the origin of the rich vortex pinning nanostructure for vapour-solid, solid-solid and liquid-solid growth methods and how it is modified through fast-growth processes.

In this presentation I will outline the recent progress in enhancing performance through different processing approaches as well as the challenging aspects that limit their widespread use and the role that materials science can play in mitigating these factors. In particular, I will discuss about the fundamental aspects of materials processing (higher growth rate, large areas, I_c for large thicknesses) and what are the ideas which are being considered to influence these issues.

***Keywords (Index Terms)*–$REBa_2Cu_3O_7$ superconducting materials, Coated Conductors, film growth, nanostructure, vortex pinning**

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