Non-Conventional Inductive Behavior of $YBa_2Cu_3O_7$ Coated Conductors: a New Physical Re-Understanding

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Coated conductors appeared as a breaking idea for long length biaxially textured wires. New processing technologies were developed since to transport high currents through the grain boundary network of the conductor. The percolative nature of this current was identified by magnetopics and consequently, a re-understanding of macroscopic inductive characterization methodologies, now applied to coated conductors, became a real need. The physical mechanisms governing the carrying current capability and possible ways to improve the current transfer are under intense investigation. In this contribution, we analyze the inductive response of coated conductors by means of dc-magnetometry and ac-susceptibility and we emphasize the non-conventional behavior associated to the granular nature of the material. The peculiar features of the hysteresis loops and ac-susceptibility response associated to the presence of grain boundaries, manifest the richness of these two inductive methodologies for the analysis of $YBa_2Cu_3O_7$ coated conductors. A number of IBAD and RABiTs coated conductors from different laboratories have been analyzed and the inter-grain and grain critical current densities have been determined in the framework of the critical state model. The analysis presented enable to tackle issues like thickness dependence of the critical current density, sort out the importance of grain vortex pinning phenomena in this type of materials and deeply analyze grain boundary network dissipation of RABiTs and IBAD coated conductors.

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