Ultrafast Transient Liquid Assisted Frowth of $YBa_2Cu_3O_7$: A New Scenario for Enhanced Vortex Pinning

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***Abstract*–High current superconducting wires have been one of the most challenging achievements during all the HTS era which encompasses many materials science and engineering challenges. Coated conductors of $REBa_2Cu3O_7$ (CC-REBCO, RE= Rare Earth) have emerged as the most attractive opportunity to reach unique performances at high and low temperatures, while reducing the cost/performance ratio continues to be a key objective for their marketability. Chemical solution deposition (CSD) is a very competitive cost-effective deposition technique which has been used to obtain nanocomposite films and CCs, however their growth rates is rather small (0.5-1 nm/s) when the BaF_2 route is used. To address this challenge, we are developing a novel growth approach, entitled Transient Liquid Assisted Growth (TLAG) [1], which is able to combine CSD of non-fluorine precursors with ultrahigh growth rates mediated by a non-equilibrium transient liquid (100-1000 nm/s), being compatible with nanocomposite structures including $BaMO_3$ (M=Zr, Hf) nanoparticles [2,3]. High critical current densities have been achieved up of 5 MA/cm2 at 77K are already realized in thin films, and now the process is being transferred to thicker films and metallic substrates. In this presentation, we will discuss on the present understanding of the TLAG process, the correlations of the new microstructure with vortex pinning and the capacity of TLAG to modify the pinning landscape. The use of fast acquisition in-situ XRD imaging (100 ms/frame) under synchrotron radiation, transmission electron microscopy, in-situ resistivity experiments and angular transport measurements have been crucial for this study.**

***Keywords (Index Terms)*—Coated conductor; $YBa_2Cu_3O_7$; Chemical Solution Deposition; Transient Liquid Assisted Growth; critical currents; vortex pinning; nanocomposite**

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