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Transient Liquid Assisted growth (TLAG), A Method to Increase Coated Conductors Throughput and Meet Applications Requirements

T. Puig, L. Saltarelli, D. Garcia, K. Gupta, S. Rasi, R. Vlad, A. Kethamkuzhi, E. Pach, J. Banchewski, C. Pop, J. Gutierrez, and X. Obradors

Institute of Materials Science of Barcelona (ICMAB-CSIC), Spain

Email: teresa.puig@icmab.es

Abstract **– $REBa_2Cu_3O_7$ coated conductors (REBCO CCs) are unique advanced materials capable of being integrated in different emerging applications such as fault current limiters, compact fusion, electric aviation or high-field NMR, among others, so much effort is being devoted to meet the different requirements. However, the community is facing a global need to reduce the cost/performance ratio of REBCO CC manufacturing processes, especially when CCs are to enter the market with a large number of devices. Therefore, we are developing a scalable high-throughput growth approach, called "Transient Liquid Assisted Growth (TLAG)" [1,2], which uses multifunctional colloidal inks for chemical solution deposition (CSD) [3] and features ultra-high growth rates of over 1000 nm/s with high critical current densities of 3 MA/cm^2 at 77 K [4]. TLAG is a high non-equilibrium liquid-solid growth process where nucleation and growth are kinetically controlled, so rapid in situ techniques were required to understand the growth mechanism and determine the correlation of the kinetic process parameters with epitaxy and growth rate. In this presentation, I will discuss the current understanding of the TLAG process, relevant process parameters for growth of CC nanocomposites, advances in growth rates and the TLAG vortex pinning capabilities. 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. The liquid-solid TLAG process will be compared with other existing gas-solid and solid-solid growth methods.**

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