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[Invited] Vortex pinning landscape in low cost chemical solution Nanocomposite YBa₂Cu₃O_{7-x} coated conductors

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Achieving high current superconducting wires for large scale applications and magnets has been one of the most challenging objectives during all the HTS era. Coated conductors of YBa₂Cu₃O₇ (YBCO) have emerged as the most attractive opportunity to achieve unique performances while reducing the cost/performance ratio continues to be a key objective at present. Chemical solution deposition (CSD) is a very competitive cost-effective technique which has been used to obtain nanocomposite films and CCs. In the recent years we have been able to demonstrate the unique potentiality of these CSD techniques to achieve low cost, low anisotropy and high critical current coated conductors. In my presentation, I will report on the present understanding of vortex pinning in CSD nanocomposite YBCO films at different temperatures and magnetic fields, obtained from complex solutions where the nanoparticles are spontaneously segregated during growth and the novel strategy using colloidal solutions of preformed oxide nanoparticles (NPs) stabilized in the YBCO precursor solutions. A thorough investigation correlating the pinning landscape with the defect microstructure has been pursued with detailed angular dependent in-field critical currents and HRTEM/STEM analysis. I will also report on a new approach we are investigating based on low cost nanocomposite CSD crystallization through a transient-liquid assisted growth (TLAG) enabling ultrafast growth rates in the range of 50 nm/s.

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Primary author: Prof. PUIG, Teresa (ICMAB-CSIC)

Co-authors: Mr VALLÈS, Ferran (ICMAB-CSIC); Mr BANCHEWSKI, Juri (ICMAB-CSIC); Mr MUNDET, Bernat (ICMAB-CSIC); Dr GUZMÁN, Roger (ICMAB-CSIC); Dr GÁZQUEZ, Jaume (ICMAB-CSIC); Mr LI, Ziliang (ICMAB-CSIC); Ms CHAMORRO, Natalia (ICMAB-CSIC and UAB); Dr POP, Cornelia (ICMAB-CSIC); Dr COLL, Mariona (ICMAB-CSIC); Ms JAREÑO, Júlia (ICMAB-CSIC); Ms SOLER, Laia (ICMAB-CSIC); Mr VILLAREJO, Bohores (ICMAB-CSIC); Dr PINO, Flavio (ICMAB-CSIC); Prof. ROS, Josep (UAB); Dr RICART, Susagna (ICMAB-CSIC); Dr PALAU, Anna (ICMAB-CSIC); Prof. OBRADORS, Xavier (ICMAB-CSIC)

Presenter: Prof. PUIG, Teresa (ICMAB-CSIC)

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