MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **868** Type: **Poster Presentation**

Tue-Mo-Po2.10-08 [80]: Improved performance at low temperatures of CSD-grown YxGd1-xBa2Cu3O7-BaHfO3 nanocomposite films

Tuesday 24 September 2019 08:45 (2 hours)

High-temperature superconductors are becoming engineering materials, e.g. as commercially available long-length tapes (coated conductors, CCs). Among them, REBa2Cu3O7-x (REBCO, RE rare earth) compounds have emerged as excellent candidates due to their high-field current carrying capacity. Their properties enhance even further when REBCO nanocomposites are formed, i.e., nanoscale non-superconducting secondary phases are introduced into the superconducting matrix, which pin the vortices. Through this, the performances improve in a wide range of applied magnetic fields and temperatures.
Chemical solution deposition (CSD) has been demonstrated to be a scalable, versatile and cost-effective technique for the preparation of REBCO films with embedded secondary phases, starting from a complex metalorganic precursor solution. In such films, the nanoparticles form spontaneously during the film growth and tend to orient randomly in the REBCO matrix. This creates a high density of defects generating nanostrain within the REBCO matrix, which ultimately leads to a strong enhancement of the isotropic pinning contribution.
In this work, we present the superconducting properties of 220 nm single-RE-Ba2Cu3O7-x (RE = Yb, Er, Ho, Y, Dy, Gd, Sm, and Nd) films on different substrates to develop a deeper understanding of their processing windows and properties at different temperatures. Also, we include a complete study about (Y/Gd)BCO + 12 mol% BaHfO3 nanocomposite films. These films were obtained in a high-quality after a complex growth-parameter optimization for different Y/Gd ratios. Transport measurements of the optimized films were carried out at different temperatures. The results show that the best properties are obtained for different Y/Gd ratios depending on the temperature: at 77 K, where the proximity to the superconducting transition is crucial, GdBCO+12mol% BaHfO3 has the largest critical current density Jc while at 30 K the Y0.5Gd0.5BCO+12 mol% BaHfO3 films exhibit the highest values at self-field. This behavior was understood by studying the microstructure of these samples by advanced TEM measurements. The distribution of Y and Gd in the mixed phases enrichens the pinning landscape making these films more effective at lower temperatures.

Authors: Dr ERBE, Manuela (Karlsruhe Institute of Technology (KIT)); Dr HAENISCH, Jens (Karlsruhe Institute for Technology); Prof. HOLZAPFEL, Bernhard (KIT Karlsruhe); Dr THERSLEFF, Thomas (Stockholm University, Department of Materials and Environmental Chemistry); Dr RIJCKAERT, Hannes Rijckaert (Ghent University, SCRiPTS, Dept. of Chemistry); CAYADO, Pablo (Karlsruhe Institute of Technology (KIT))

Presenter: CAYADO, Pablo (Karlsruhe Institute of Technology (KIT))

Session Classification: Tue-Mo-Po2.10 - REBCO Wires & Cables II