Advances in nanocomposite $YBa_2Cu_3O_7$ superconductor thin films and coated conductors derived from chemical solutions[&]

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Chemical solution deposition (CSD) has become a very competitive cost-effective technique to obtain nanostructured multilayered films and coated conductors with high critical currents, however, further understanding of the different steps leading to epitaxial film and nanostructure development is required.

In this presentation we will review first recent advances in understanding the processing paths of YBCO films and coated conductors grown from TFA or low F precursors with special reference to the Ink Jet Printing approach which allows obtaining well controlled film thickness. In-situ optical imaging and advanced thermal analysis has been thorough used to characterize the drying-pyrolysis process while in-situ electrical resistance measurements have provided details about YBCO epitaxial film growth and oxygenation.

On the other hand, we will report about the correlation between defect structure and vortex pinning efficiency in YBCO nanocomposite films ($BaZrO_3$, Y_2O_3, $BaCeO_3$ and $Ba_2(Ta,Y)O_6$ second phase nanoparticles) obtained from complex metallorganic solutions or preparing colloidal solutions. The correlation between nanoscale strain evaluated from X-ray diffraction line broadening and from HRTEM and STEM investigation will be analyzed. Our work stresses that CSD is a bottom-up approach with a strong potential to create cost-effectively coated conductors with outstanding performances.

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