Chemical solution approaches to self-assembled and nanocomposite superconducting and ferromagnetic films

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Chemical solution deposition (CSD) has emerged in the last years as a very competitive technique to obtain epitaxial films, multilayers, nanocomposite films and interfacial templates of high quality with controlled nanostructures. In particular, the all CSD approach has been shown to be one of the most promising ways for-cost-effective production of second generation superconducting wires with high performances.
The development of nanostructured superconductors with enhanced vortex pinning properties requires the preparation of either nanocomposite epitaxial films or epitaxial films grown on interfacial nanotemplates.

In this presentation we will show different approaches to the preparation of oxide interfacial nanotemplates grown by CSD, either through strain induced self assembling or through the use of nanoporous track-etched polymer templates. Several types of functional oxides have been grown, for instance, CeO_2, $BaZrO_3$ or (La,Sr)MnO_3. These oxides have also been used as epitaxial buffer layers for multilayered structures where atomic scale interfacial quality is required.
The Trifluoracetate route (TFA) is the most suitable route to achieve epitaxial $YBa_2Cu_3O_7$ (YBCO) layers with high critical currents and so these precursors have been used to achieve nanocomposites based on interfacial nanotemplates or on randomly distributed nanodots.
Emphasis will be made on understanding the relationship between the different processing parameters, the nanostructure and the physical properties (magnetic and superconducting).