Metal oxide nanoparticles for nanostructuring YBCO layers.

Alba Garzón-Manjón[1,2], Eduardo Solano[1,2], Pablo Cayado[2], María de la Mata[2], Roger Guzmán[2], Jordi Arbiol[2], Teresa Puig[2], Xavier Obradors[2], Ramón Yáñez[1], Susagna Ricart[2], Josep Ros[1]

[1] *Dept. Química, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Barcelona, Spain*

[2] *Institut de Ciència de Materials de Barcelona (CSIC), Cerdanyola del Vallès, Barcelona, Spain*

Polyol (thermal, microwave) and solvothermal methodologies are used to synthesize different metal oxides nanoparticles such as magnetite (Fe_3O_4), cerium oxide (CeO_2) and zirconium oxide ZrO_2. By modifying the precursors, and following the same synthetic route, it is possible to control the size and shape of the nanocrystals obtained. The general route is carried out in triethylene glycol (TREG) media, due to its high boiling point and, which acts also as a capping ligand of the nanoparticles, stabilizing them in polar solvents.

Nanoparticles have been characterized by several common physical laboratory techniques: High Resolution Transmission Electron Microscopy (HR TEM), InfraRed spectroscopy (IR), X-Ray Powder Diffraction (XRPD), magnetometry via Superconducting Quantum Interference Device (SQUID)… With these techniques, the final size, shape, composition, crystal structure and magnetic behaviour have been studied, showing the high quality crystals generated. In addition, we demonstrate the high efficiency of all three one-pot methodologies that have been optimized to synthesize different families of nanoparticles.

The stable colloidal solutions obtained in ethanol have been used to generate ex-situ hybrid $YBa_2Cu_3O_{7-\delta}$ (YBCO) superconducting layers because the critical current can be increased when the nanoparticles are embedded.