Improving critical currents and irreversibility line in Fe- and Cu-based High Tc Superconductors

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Vortex matter in Fe and Cu-based superconductors share several characteristics such as, strong thermal fluctuations due to the small coherence length and relatively high critical temperature, as well as anisotropy due to their layered structure. These in turn have important consequences in determining how vortices are trapped by different pinning potentials. Angular dependent critical current measurements are extremely useful to determine in which way vortices are trapped and how effective different pinning centers are.

Nano particles have been extremely successful to enhance the critical current and shift upwards the irreversibility line. I will present recent studies of the critical current and irreversibility line of P-$BaFe_2As_2$ with and $BaZrO_3$ nanoparticles that show enhancement in the entire field-temperature-angle phase diagram. Comparisons performed at different temperature and field regimes allowed us to draw important conclusions with respect of the strength and efficiency of nanoparticle vortex pinning and dynamics in cuprates and iron-pnictides, including data at very high fields.

Another common feature among iron and cuprate high temperature superconductors is the layered structure; consisting of intercalated conducting and insulating planes. This intrinsic layering gives rise to the electronic mass anisotropy as well as a periodic planar pinning potential. Depending on the insulating layer size the anisotropy of the compound can vary from close to 1 up to hundreds for Bismuth- or Mercury-based superconductors. The effect on vortices, also known as *intrinsic-pinning,* of these periodic planar potentials should not depend on the specifics of different materials but rather be universal. In this talk I will show measurements of the different angular regimes of the vortex dynamics that confirm the generality of the intrinsic pinning found in YBCO films and coated conductors (with and without numerous types of inclusions) as well as in iron based superconductors.

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