Planar nanostructures of ferromagnetic manganites by e-beam lithography

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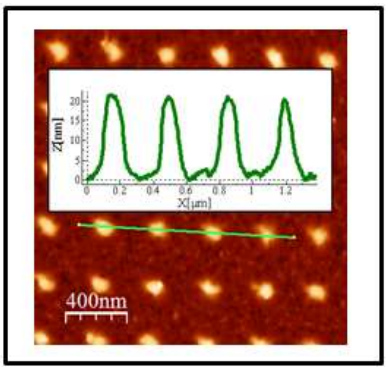
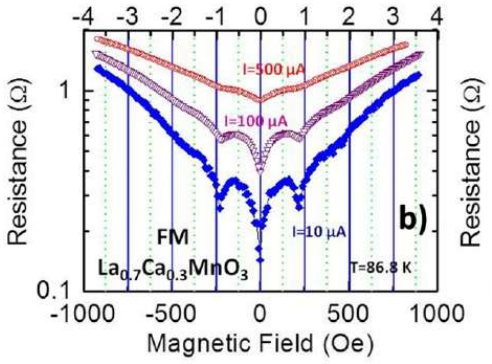
The field of correlated oxides has rapidly expanded in recent years mostly fueled by the emergent electronic states nucleating at epitaxial interfaces combining different oxides. However, most of the work so far has been done on large area thin films or in devices patterned to allow perpendicular CPP transport. Little work, so far, has been devoted to planar nanostructures, where interesting effects may arise when lateral dimensions are reduced to match characteristic length scales. The processing of thin films into planar nanostructures using electron beam lithography may enable new device concepts for advanced applications. In this presentation we show examples of lateral nanostructures of manganites $La_{0.7}Sr_{0.3}MO_4$ (LSMO) and $La_{0.7}Ca_{0.3}MO_3$ (LCMO) thin films. We will describe control of the vortex matter in the high Tc superconductor $YBa_2Cu_3O_7$ (YBCO) by pinning of the vortex lattice by an ordered array of LCMO nanodots. This pinning effect exploits the long range suppression of the superconductivity occurring at the interface between manganites and cuprates. As a second example of oxide nanostructures we present a nanoscale LSMO wire with a 90º angle shape, which promotes the nucleation of domain walls. TMR-like switch of the magnetoresistance will be presented, which results from the large domain wall resistivity due to the large spin polarization of the wire.





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