Highly Homogeneous YBCO/LSMO Nanowires for Photo-response Experiments

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Abstract - By using nanolithography and a soft etching procedure, we have realized $YBa_2 Cu_3 O_{7-x}$ / $La_{0.7} Sr_{0.3} MnO_3$ (YBCO/LSMO) nanowires, with cross sections down to 100x50 nm^2 that ensures covering areas up to 10x30 μm^2 . The LSMO layer acts as a capping for YBCO, minimizing the degradation of its superconducting properties taking place during the patterning; moreover, as a ferromagnetic manganite, it's expected to accelerate the relaxation dynamics of quasiparticles in YBCO, making such a system potentially attractive for applications in the superconducting ultrafast optoelectronics. The reproducibility of the values of the critical current densities measured in different devices with the same geometry makes our nanowires ideal candidates for photo-response experiments. First measurements have shown a satisfactory photoresponse from YBCO/LSMO devices.

Keywords - Nanowire, photo-response, yttrium cuprate, YBCO, lanthanum manganite, LSMO, quasiparticle, relaxation dynamics, optoelectronics.