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Electrical Transport Properties of Nanostructured $YBa_2Cu_3O_{7-\delta}$ Rings and Wires[1] P. MORALES, J.Y.T. WEI, Dept. of Physics, University of Toronto, P.C. KUO, J. SHIUE, M.K. WU, Institute of Physics, Academia Sinica Taiwan — The resistance and current-voltage characteristics of nanostructured high-T_c superconducting $YBa_2Cu_3O_{7-\delta}$ rings and wires were studied as a function of temperature and applied magnetic field. The rings and wires were fabricated by pulsed laser deposition of $YBa_2Cu_3O_{7-\delta}$ on patterned $SrTiO_3$ substrates. The substrates were patterned using two different techniques. The first technique is based on selective epitaxial growth, and the second, using a method based on focused ion beam. Nanostructured superconducting rings were fabricated with a diameter of 1.5μm with the width of the arms of the rings being 150nm. The low field magnetoresistance of the rings exhibit characteristics indicative of quantum interference effects. Nanostructured superconducting wires were fabricated with lengths up to 300μm and widths as small as 200nm. The current-voltage characteristics of the wires exhibit discontinuities under current biasing and s-shaped non-linearities under voltage biasing characteristic of the formation of phase slip lines, the 2D analog of phase-slip centers.

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