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Coupled Array of Superconducting Nanowires ANDREI URSACHE, JAMES GOLDBACH, THOMAS RUSSELL, MARK TUOMINEN, University of Massachusetts, Amherst — We present experiments that investigate the collective behavior of arrays of superconducting lead nanowires with diameters smaller than the coherence length. The ultrathin (∼15nm) nanowires are grown by pulse electrodeposition into porous self-assembled P(S-b-MMA) diblock copolymer templates. The closely packed (∼24 nm spacing) 1-D superconducting nanowires stand vertically upon a thin normal (Au or Pt) film in a brush-like geometry. Thereby, they are coupled to each other by Andreev reflection at the S-N (Pb-Au) point contact interfaces. Magnetization measurements reveal that the ZFC/FC magnetic response of the coupled array system can be irreversible or reversible, depending on the orientation, perpendicular or parallel, of the applied magnetic field with respect to the coupling plane. As found by electric transport measurements, the coupled array system undergoes an in plane superconducting resistive transition at a temperature smaller than the Tc of an individual nanowire. Current-voltage characteristics throughout the transition region are also discussed. This work was supported by NSF grant DMI-0103024 and DMR-0213695.

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