Long-Range Superconducting Proximity Effect in Template-Fabricated Single-Crystal Nanowires (LT26)

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We study a superconducting proximity effect observed in single-crystal nanowires of Zn, Sn, and Pb of length up to 60 μm. These nanowires are electrochemically deposited into the pores of anodic aluminum oxide membranes and polycarbonate membranes. Using an *in situ* self-contacting method, single nanowires are electrically contacted on both ends to a pair of macroscopic film electrodes of Au, Sn, or Pb pre-fabricated on both surfaces of the membranes. Superconductivity in the nanowires is strongly suppressed when Au electrodes are used. When electrodes having higher superconducting transition temperatures are used, the nanowires become superconducting at the transition temperatures of the electrodes. Microscopy analyses of the structure and the chemical composition of the nanowires will be presented. Measurements of sample resistance and $I - V$ characteristics at various temperatures and magnetic fields will also be presented. Furthermore, the effects of the length, the diameter, and the residual resistance ratio of the nanowires on the proximity induced superconductivity will be analyzed and discussed.