Anti Proximity Effect in Aluminum Nanowires

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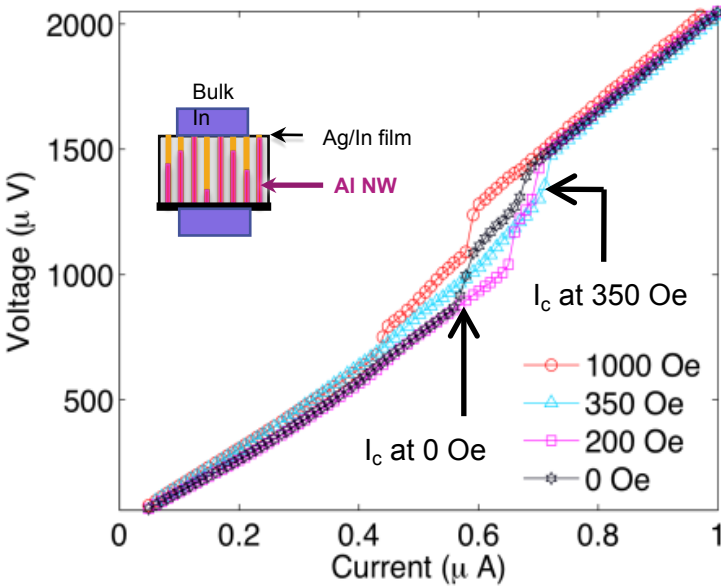
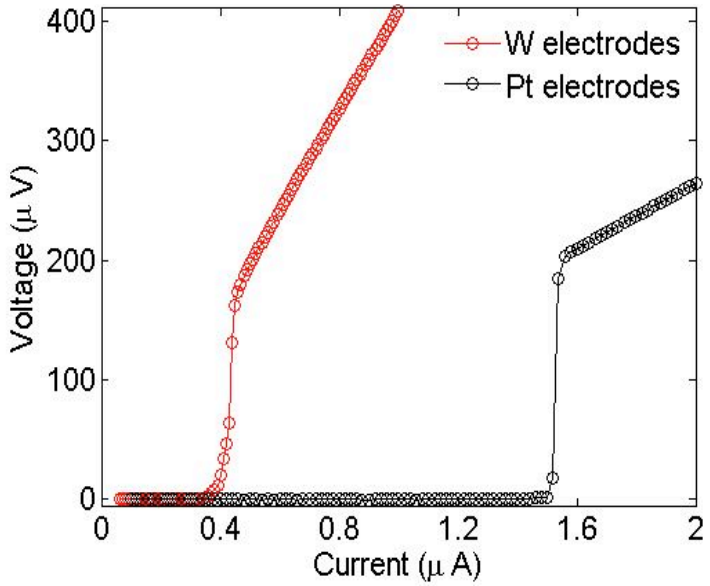
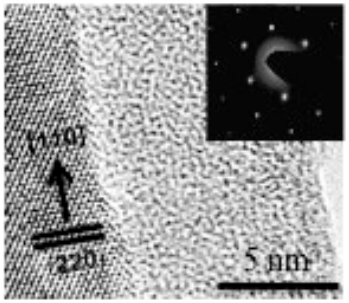




High resolution transmission electron micrograph of a 50 nm wide Al nanowire with a 10 nm thick amorphous oxide layer; electron diffraction pattern inset. The wire is single-crystal an grows along [110].



Two-probe current-voltage measurement of a 80 nm wide Al NW inside a porous membrane, contacted by indium electrodes pressed onto the membrane. The critical current I_c at 350 Oe (with the indium electrodes normal) is *larger* than that at 0 Oe, when the indium electrodes are superconducting.

The counterintuitive anti-proximity effect, wherein superconducting electrodes *suppress* superconductivity in a nanowire, has now been confirmed in single crystal aluminum nanowires (Al NW) fabricated by electrodeposition in an organic electrolyte, confirming that this is a general phenomenon for quasi-1D superconductors.

Four-probe current-voltage measurement of two individual 70 nm wide Al NWs. Normal (Pt) and superconducting (W) electrodes are patterned using a focused ion beam. I_c with normal electrodes (1.5 μA) is larger than that with superconducting electrodes (0.4 μA).