Test for superconductivity in individual end-bonded MWNTs

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U. Mich.-Flint — Takesue et al. [1] recently reported 12K superconductivity in
templated arrays of \(\sim 10^4\) “end-bonded” multi-walled carbon nanotubes (MWNTs).
They attributed the occurrence of superconductivity to intershell (interlayer) effects
within each MWNT. We have tested this by preparing and measuring \emph{individual}
end-bonded MWNTs, which were grown by arc-discharge without catalyst. High
resolution TEM showed they had typical outer (inner) diameters of 10 - 15 nm (1-2
nm), with no visible defects, values verified by AFM and electrical measurements.
We also verified by TEM that, as grown, the nanotube ends were closed. We then
used a novel nanolithographic approach to facilitate end-bonding (\emph{i.e.} contacting
all layers), which was subsequently verified in \(I-V\) tests. Four-probe resistivity
was measured for several such individual end-bonded MWNTs, to 1.4 K, including
the use of current densities smaller than those used in Ref. 1. No evidence for
superconductivity was found.