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## Smooth and conductive DNA-templated Cu<sub>2</sub>O nanowires: growth morphology, spectroscopic and electrical characterization

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### NANOTECHNOLOGY

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### Abstract

DNA strands have been used as templates for the self-assembly of smooth and conductive cuprous oxide (Cu<sub>2</sub>O) nanowires of diameter 12-23 nm and whose length is determined by the template (16 μm for lambda-DNA). A combination of spectroscopic, diffraction and probe microscopy techniques showed that these nanowires comprise single crystallites of Cu<sub>2</sub>O bound to the DNA molecules which fused together over time in a process analogous to Ostwald ripening, but driven by the free energy of interaction with the template as well as the surface tension. Electrical characterization of the nanowires by a non-contact method, scanned conductance microscopy and by contact mode conductive AFM showed the wires are electrically conductive. The conductivity estimated from the AFM cross section and the zero-bias conductance in conductive AFM experiments was 2.2-3.3 S cm<sup>-1</sup>. These Cu<sub>2</sub>O nanowires are amongst the thinnest reported and show evidence of strong quantum confinement in electronic spectra.

### Keywords

**KeyWords Plus:** ELECTROSTATIC FORCE MICROSCOPY; OXIDE THIN-FILMS; CUPROUS-OXIDE; PHOTOVOLTAIC CELLS; RAMAN-SPECTROSCOPY; COPPER-OXIDE; FABRICATION; CUO; NANOSTRUCTURES; OXIDATION

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