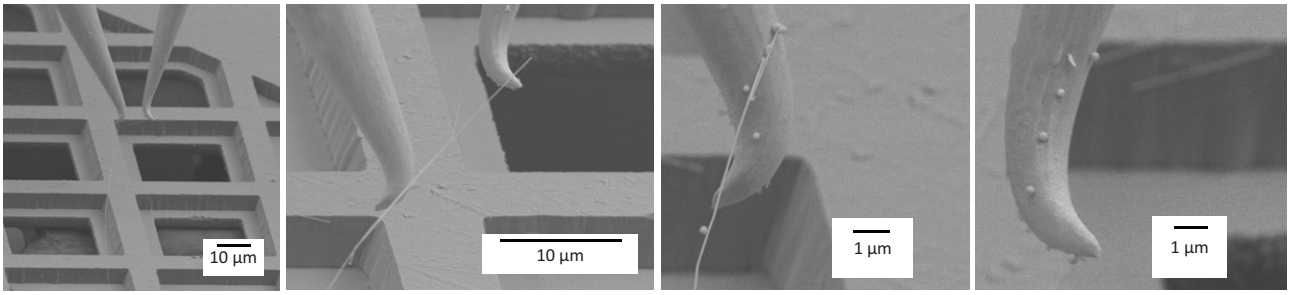

Figure 1. Probes are used to lift nanowire off metal grid and pass current through the wire. Contact resistance between probe and nanowire leads to local melting resulting in solder-like balls.

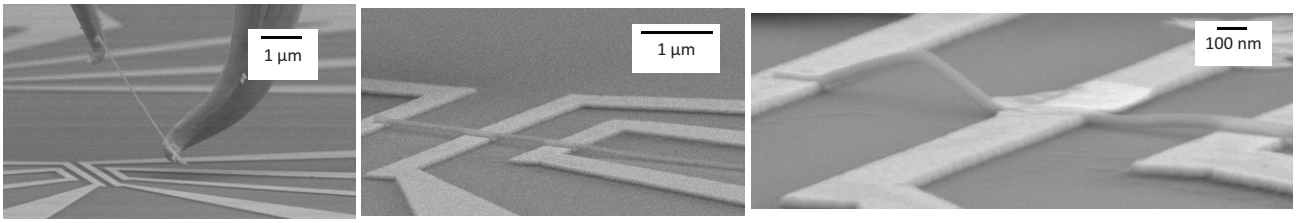

Figure 2. Nanowires are moved to pre-fabricated devices made with electron beam lithography. Images show a nanowire before and after junctions are welded.

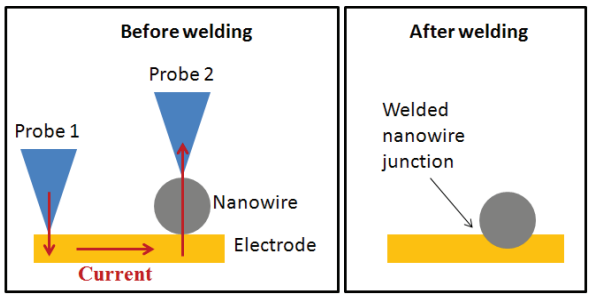

Figure 3. Schematic showing cross-section of nanowire welding process. One probe is placed on the metal electrode, and the other probe is placed on top of the nanowire. A voltage pulse is applied to the probes; the electrode melts locally at the electrode-nanowire junction. The local heating and the force of the probe on the nanowire reduce the contact resistance of the metal-nanowire junction.

Nanoscale Manipulation, Heating, and Welding of Nanowires

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The manipulation and welding of metal and semiconductor nanowires is conducted with tungsten probes in a scanning electron microscope (JEOL 6701F). Probe movement is controlled with an Attocube Systems ANC150 piezo step controller to allow movement in nanometer up to millimeter distances. Nanowires are deposited on a metal grid then picked up with the probes. A voltage bias applied to the probes using an Agilent Technologies B1500A Semiconductor Device Analyzer results in current flowing through the nanowire and probes. Localized melting occurs at the junction between the nanowire and probe due to high contact resistance. The probes can also weld nanowires into device electrodes.

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