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In situ growth and electrical measurement of metal nanowires on DNA wire templates[1] JORGE BARREDA, LONGQIAN HU, LIUQI YU, JACOB HUDIS, ZHIBIN WANG, JUNFEI XIA, JINGJIAO GUAN, PENG XIONG, Florida State Univ, GUAN'S GROUP TEAM, XIONG'S GROUP TEAM — We report on the development of a process for controlled stretching and deposition of DNA wires as templates for in situ growth and electrical measurement of metal nanowires (NWs). The complete process is separated into three main steps: 1) stretching of DNA wires with a one-step dewetting of a DNA solution on a PDMS stamp where the DNA wires are suspended across an array of micropillars along a chosen direction [1]; 2) transfer of the DNA wires to a Si/SiO2/SiNx substrate, via micro-contact printing, over and across a trench lithographically defined to have an opening in the SiNx layer and an undercut in the SiO2 layer; and 3) formation and electronic transport characterization of the metal NWs in ultrahigh vacuum at low temperature. The stretching process provides a high degree of control over the spacing and orientation of the DNA wires, as well as the lengths and widths of the metal NWs. For the metal NW growth, the DNA template is placed in a customized cryogenic system for low temperature quench-condensation deposition resulting in a metal NW. The thickness of the NW is increased incrementally and electrical measurement performed in situ at each thickness. Two-terminal and quasi-four terminal I-V measurements reveal that, with increasing thickness, a transition from strongly nonlinear IV to Ohmic behavior accompanies rapid increase of the NW conductance. [1] Guan, Jingjiao, et al. Soft Matter 3.11 (2007): 1369-1371.

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