Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Manipulation of metallic and semiconducting nanowires with FETEM SHENGYONG XU, MINGLIANG TIAN, Centre for Nanoscale Science & Physics, Penn State University, JINGUO WANG, Centre for Nanoscale Science, MRI, Penn State University, MOSES H. W. CHAN, Centre for Nanoscale Science & Physics, Penn State University — We demonstrate that a field-emission transmission electron microscope (FETEM) can be applied to in situ manipulation of metallic, semiconducting nanowires and nanoparticles. With a highly convergent electron beam, we are able to create various patterns, including holes and gaps of 0.2-0.3 nm in width and complex features (e.g. letters) smaller than 10 nm by 15 nm in size, on a single nanowire. We can also weld individual nanoparticles and nanowires together to form metal-metal (e.g., Au-Au, Au-Sn) and metal-semiconductor (e.g., Au-Si) junctions or contacts. This in situ manipulation technique has an applicable length scale ranging from a few angstroms to over 100 nm therefore it may bridge the gap between the limitations of STM/AFM and electron beam lithographic techniques. The method may also open up an alternative approach for in situ patterning, modification and connection of nano-materials in nanoscale devices and circuits.

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Date submitted: 23 Nov 2004 Electronic form version 1.4