

## **Directed Assembly of Nanoelements for High-rate Nanomanufacturing**

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### ***Presentation***

**Abstract:** The transfer of nano-science accomplishments into technology is severely hindered by a lack of understanding of barriers to nanoscale manufacturing. The NSF Center for High-rate Nanomanufacturing (CHN) is developing tools and processes to conduct fast massive directed assembly of nanoscale elements by controlling the forces required to assemble, detach, and transfer nanoelements at high rates and over large areas. The center has developed templates with nanofeatures to direct the assembly of carbon nanotubes and nanoparticles (down to 10 nm) into nanoscale trenches in a short time (in seconds) and over a large area (measured in inches). The center has demonstrated that nanotemplates can be used to pattern conducting polymers and that the patterned polymer can be transferred onto a second polymer substrate. The center has many applications where the technology has been demonstrated. For example, the nonvolatile nanotube memory device switches, the actuating elements (SWNTs) are assembled down to a size that will enable a one SWNT per switch on a wafer level. A new biosensor chip (0.1 mm x 0.1 mm) attached to a catheter could detect multiple biomarkers simultaneously and can be in vitro and in vivo (as part of an intravenous catheter). The center has developed the fundamental science and engineering platform necessary to manufacture a wide array of applications ranging from electronics, energy, and materials to biotechnology.