**Bottom-up Assembly of Large-Area Nanostructure Arrays**



**Disclosure Number**

* 3401

**Patents Issued**

* [8,361,297](http://www.google.com/patents/US8%2C361%2C297)

**For Licensing Information**

Matthew Smith
Sr. Technology Licensing Officer
Office of Technology Management
mds126@psu.edu
Phone: 814-863-1122
Fax: 814-865-3591

This invention describes a programmed direct assembly method for positioning and integrating different populations of micro/nano structures on a substrate.

**Background**

Photolithography continues to be the dominant technology in the fabrication of electronic devices today. However, the process has drawbacks, including the ability to only process one material at a time and ever-increasing challenges to pattern at smaller scales. The emergence of nanomaterials and nanostructures, such as nanowire, nanoparticles, etc., as a viable technology that can overcome the limitations of photolithography depends on finding processes that can accurately place and position such nanostructures so that electronic devices can be fabricated.

**Invention Description**

This invention describes a programmed direct assembly method for positioning and integrating different populations of micro/nano structures on a substrate. The nanostructures can be synthesized under optimal conditions off of the substrate prior to their assembly on the substrate and then dispersed in delivery medium and accurately placed and positioned on the substrate. Electric-field forces are used to with programmed control for nanostructure placement. A variety of materials may be used during this process allowing for the creation of heterogeneous devices. Furthermore, the nanostructures can be chemically functionalized prior to placement to allow for the creation of devices or arrays of devices that have the ability to selective detect analytes.

**Advantages**

* Allows for heterogeneous manufacturing of a variety of micro/nano structures and materials
* Micro/nano structures can be formed and functionalized prior to the assembly process
* Provides the means to accurately and reliable engineer and manufacture devices based on micro/nano structures
* Prototype nanoscale devices have been manufactured using this process
* Broad set of applications for electrical devices and sensors, including biological and chemical sensors with electrical, as opposed to optical, outputs (e.g. nanocantilever-type arrays).