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One-Dimensional Heterostructures Based Nanodevices

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Nanotechnology has beenrapidly evolved from passive nanostructures where nanostructures with steadystructures and functions often used as parts of a product to activenanostructures which change their properties during use. Startingaround 2010, it is anticipated that researchers will cultivate expertise withsystems of nanostructures, directing large numbers of intricate components tospecified needs.

One dimensional (1-D) nanostructures suchas nanowires and nanotubes are extremely attractive building blocks for nextgeneration devices because of their high surface to volume ratio and uniquesize dependent properties. In addition, their extremely high aspectratio offers researchers the potentials to build axial or radialheterostructures to integrate multiple functionality from intrinsic propertiesof the material or through interfacial phenomena. Spatialmanipulation and the ability to assemble and position nanostuructures in acontrolled matter so they are registered to define spaces is also a criticalstep toward scalable integration in high density nanodevices. In thispresentation, a generalized template directed electrodeposition with ancillaryassembly, contact will be presented to synthesize axial and radialheterostructures in cost-effective matter and these individual nanostructureswill be applied to spintronics, gas and biological sensors and thermoelectrics.

Keywords: Nanowire, Nanotube, Nanodevice

PT-2

Microfluidic Devices for Cell Analysis

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Microfluidics and BioMEMStechnology has increasingly been used as a tool for studying small volumes oftissue and even individual cells. One of the most important benefits ofmicrofluidic technology is the potential to build devices that analyze and sortmammalian cells. The "sorting problem" typically requires that a fewcells be selected and isolated from a larger population of hundreds, thousandsor even millions of other cells. For example, cancer tumor cells may resideamong a large population of healthy cells, but it would be of great interest toidentify, isolate and study only the cancer cells. In another application, onemay want to determine the number of white blood cells within a sample of blood.We have developed microfluidic devices that enable researchers to select cellsfrom a population by a variety of methods, including antibody staining,dielectrophoretic selection, and physical size selection. These devices haveapplications in cancer research where cancer cells must be identified fromnormal tissue, but where only small samples of tissue are available. In thistalk, we will present some of our microfluidic cell sorting devices, discusstheir physical principles, and their use in biological applications.

Keywords: bio-MEMS, microfluidicdevices, sorting cell, biological application