TECHNOLOGY

Revolutionary Hybrid Core-Shell Nanostructure without Epitaxy

OVERVIEW

Background:

Until now, epitaxy has been the only affordable method of high quality semiconductor crystal growth in nanotechnology and semiconductor fabrication. However, conventional epitaxial growth imposes strict limitations on deposition layer thickness and only allows certain “lattice matched” materials to be combined. Additional issues relating to differences in crystal structure, bonding, and other properties inhibits epitaxial growth of dissimilar hybrid materials such as mono-crystalline semiconductors on metal cores.

Researchers at the University of Maryland have developed a breakthrough fabrication technique using chemical thermodynamics to synthesize, in solution, nanostructures consisting of a broad range of different combination materials, previously impossible to combine, each with a shell of structurally perfect mono-crystal semiconductor material around a metal core. The technique can be applied for growing zero-dimensional nanoparticles , one-dimensional nanowires, and complex planar structures. This will allow for the creation of materials and nanostructures that yield highly integrated multifunctional electronic components. The thicknesses of both cores and shells can be precisely controlled for nanotailoring desired optical properties, leading to additional potential applications for tunable lasers and fluorophores/biomarkers.

Advantages:

-Clean rooms and vacuum pressure are unnecessary for fabrication
-Combinations of previously impossible to combine materials
-Simpler and cheaper to mass produce compared to Epitaxy
-Tunable core/shell thickness and therefore tunable optical properties (ex., quantum dot, SPR)

Applications:

-Microelectronic circuit fabrication
-Biomarkers
-Photovoltaic cells
-Tunable Lasers

CONTACT INFO

UM Ventures
0134 Lee Building
7809 Regents Drive
College Park, MD 20742
Email: umdtechtransfer@umd.edu
Phone: (301) 405-3947 | Fax: (301) 314-9502

Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Available for exclusive or non-exclusive license

CATEGORIES

- Chemical
- Nanotechnology + Nanoparticles + Nanomaterials
- Materials
- Industrial Processing

EXTERNAL RESOURCES

- US Patent 8,685,841

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