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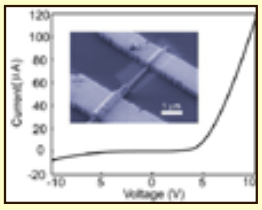
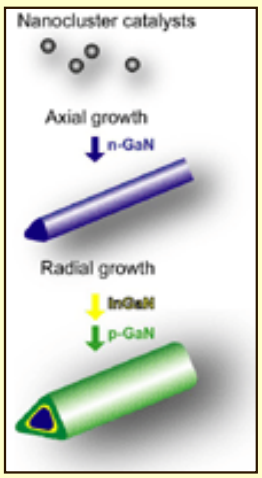
Lighting Up with Nanowires

Charles Lieber

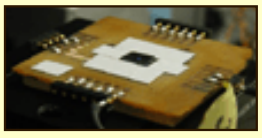
Charles Lieber and his colleagues at Harvard University have recently made a breakthrough in the area of nanowires. They have used metal-organic chemical vapor deposition (MOCVD) to grow radial nanowire heterostructures consisting of an n-type gallium nitride (n-GaN) nanowire core, an indium gallium nitride (InGaN) inner shell grown around the core, and finally a p-type GaN outer shell.



Lieber and colleagues Fang Qian, Yat Li, Silvija Gradeak, Deli Wang, and Carl Barrelet have already demonstrated that these nanowire heterostructures function as efficient blue light-emitting diodes (LEDs), which could make them useful in optical sources for lab-on-a-chip type spectrometers or in optical information storage systems. "The new nanophotonic device works through the injection of electrons and holes from the inner nanowire core and outer shell, respectively, followed by recombination and emission of light within the InGaN layer," Lieber told Reactive Reports.



Semiconductor nanowires are beginning to emerge as rather versatile building blocks for creating photodetectors, LEDs and lasers, says Lieber. Construction of well-defined doped core/shell/shell (CSS) nanowire heterostructures and their assembly at a microscopic scale means they will be well adapted to integration into single chip devices that overcome some limitations in conventional planar processing, Lieber told us. For example, assembly of CSS nanowire heterostructures with different composition InGaN shells would enable facile integration of multicolor LED sources on a single chip.



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The researchers point out that their approach to this kind of nanowire is general and could be applied to other materials for tuning the emission wavelength from ultraviolet to infrared.

Nano Letts, 2004; 10.1021/nl0487774

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