

Semiconductor Nanostructures for Nanoscale Devices

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Semiconductor nanostructures (NSs) including zero-dimensional (0D) (quantum dots), one-dimensional (1D) (nanowires), and two-dimensional (2D) (nanobelts or sheets) have great potential for use as building blocks in the fabrication of electronic-, optoelectronic-, and sensor devices on a nano meter scale. It evolves novel properties intrinsically associated with low dimensionality and size confinement as well as makes it possible to “bottom-up” construction of nano devices using them as building blocks. This talk will focus on the fabrication and engineering of semiconductor nanostructures toward fabrication of nanostructure-based nano devices. Following a brief introduction of the recent research trends on nanostructures, an approach to fabricate various nanostructures from oxide and semiconductor will be presented. Engineering of nanostructures macroscopically (e.g., align of nanowires or develop hierarchical structures) and individually (e.g., doping and creating interfaces in the nanowires) will be presented with their electrochemical-, optical-, magnetic- and electronic properties. Several unique phenomena related to the nanostructures will also be discussed. Some properties from the nanowire-based device structures will be illustrated as an example of the feasibility of these nanostructures as device building blocks. Lastly, the possible application of semiconductor nanostructures in electronic-, optoelectronic-, electromagnetic-, and energy storage devices will be discussed.