Transmuting nanostructures for nanocomputing technologies: Directed synthesis, assembly and accessing novel properties of functional nanostructures

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Realizing viable nanodevices for logic as well as data storage applications requires the ability to create nanoscopic device elements with tailored functional properties (e.g., lectronic/optical/magnetic/thermal) and place them at precise locations over macroscopic length-scales. The first condition requires the ability to control the structure, shape, composition and chemistry of functional nanostructures, while the second condition implies that the stability, and hence the unique properties, of the nanoscale building blocks must be preserved during and after assembly. This talk will highlight our recent efforts in developing a new toolbox of strategies to manipulate the structure and chemistry of functional nanomaterials across multiple length scales to realize novel properties attractive for nanodevice wiring, switching, data storage, power generation, and reliability enhancement. The talk will describe completely new approaches to assemble oriented carbon nanotube architectures and nanoparticle/nanorod heterostructures of metal alloys and low-band-gap semiconductors and molecular nanolayers for use as wiring, data storage media, thermal conduits, power generators, chemical isolators and mechanical reinforcers in nanodevice architectures of the future.