



SECOND INTERNATIONAL NANOTECHNOLOGY CONFERENCE ON COMMUNICATIONS AND COOPERATION

Abstract

ASSEMBLING MATERIALS FROM NANOSCALE BUILDING BLOCKS

By Richard W. Siegel, *Rensselaer Nanotechnology Center and Materials Science and Engineering Department Rensselaer Polytechnic Institute*

The past decade has seen an explosive growth worldwide in the physical, chemical, and biological synthesis and study of a wide range of nanoscale building blocks with unique properties. Great strides are now being made worldwide in our ability to assemble these nanoscale building blocks to create advanced materials and devices with novel properties and functionalities. The novel properties of nanostructures are derived from their confined sizes and their very large surface-to-volume ratios. The former give rise to unique size-dependent properties in the nanoscale (1-100 nm) regime, while the latter gives rise to the ability of nanoscale additions to conventional material matrices to dramatically change the host material's properties. A perspective of this important research area will be presented based upon specific examples from our work in the Center for Directed Assembly of Nanostructures supported by the Nanoscale Science and Engineering Initiative of the National Science Foundation. Examples will be given of directed assembly of nanoparticles, nanotubes, and hybrid structures containing these and biomolecules, to make new materials and devices that possess enhanced mechanical, electrical, optical, and bioactive properties, and multifunctional combinations thereof. The opportunities and challenges facing the worldwide research community in moving forward in this area will be considered.