

# Nanotechnology Handbook

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Nanoscience is an interdisciplinary field that have encompassed physics, biology, engineering chemistry and computer science, among others, the prefix nano appears with increasing frequency in scientific journals and the news. Thus, as we increase our ability to fabricate computer chips with smaller features and improve our ability to cure disease at the molecular level, nanotechnology is at the doorstep. Scientists and engineers believe that the fabrication of nanomachines, nanoelectronics, and other nanodevices will help to solve numerous problems faced by mankind today related to energy, health, and materials development. In nanoelectronics there are two opposing developments: the lithographic scaling down of semiconductor components tending towards the sub10 nanometer region to supramolecular self assembling macroscopic structure with new properties. Currently the trends are mixed and one can build a variety of structures of all scales. For example one can build large scale supramolecular structures serving as templates for building circuits with nanoscale components. On the nanoelectronics architecture side, there have also been many interesting developments trying to cope with the increasing density and smallness of components and the needs of self assembly and fault tolerance. In the emerging field of nanotechnology, the production of nanostructures having special physical and chemical properties with respect to those of bulk materials is an objective due to their limited size and high density of corner or edge surface sites. Metal nanoparticles have received significant scientific and technological interest because of their use in applications such as catalysis, electronics, optics, optoelectronics, biological and chemical sensing and SERS. Nanotechnology is now creating a growing sense of excitement in the life sciences, especially biomedical devices and biotechnology, as there is an immense opportunity to arrange and rearrange molecular structures. The global market for nanotechnology products is worth an estimated compound annual growth rate (CAGR) of 11.1% from 2010 to 2015. The largest segment of the market, made up of nanomaterials, is expected to increase at a 5 year CAGR of 14.7%

The book contains polymeric nanofibres, synthesis of nanostructure, analysis of electron currents through nanojunctions, water soluble carbon nanotubes, nanoelectronic switching networks, growth of silica nanorods, magnetic nanostructures, nanomachining of microscope tips and carbon nanotubes, nanocrystalline semiconductors and many more.

The present book is a sincere attempt to make the readers aware of the evolutionary trends underlying modern engineering practice which are grounded not only on the tried & true principles & techniques of the past, but also on more recent & current advances. This book will be an invaluable resource to technocrats, researches new entrepreneurs, technical institutions & introduction to this field.

1. Polymeric nanofibres
2. Synthesis of nanostructure
3. Assembly of nanocrystals
4. Electrosynthesis of CeO<sub>2</sub> nanotubes
5. 2D patterned nanocrystal arrays
6. Analysis of electron currents through nanojunctions
7. Multi-walled carbon nanotubes decorated with titanium nanoparticles
8. Synthesis and Self-organisation of Au nanoparticles
9. Water soluble carbon nanotubes
10. Nanospheres for Photoluminescence
11. Nanocables from Poly (dimethyl siloxane)
12. Nanorod arrays and their field emission properties
13. Oxidation of OTS monolayers
14. Three dimensional tungsten nanoscale conductors
15. Tungsten nanogratings by nanojoule energy
16. Macroscopically films by zone casting
17. Uniform arrays of nanoholes and nanopillars
18. Electropolymerization of nano-dimensioned polypyrrole micro ring
19. Resistance switching of an individual nanowire heterostructure
20. Nanoelectronic switching networks
21. Photoluminescence in anodic aluminium oxide membranes
22. Wrapping of carbon nanotubes by DNA
23. Synthesis of poly (3, 4-ethylenedioxy thiophene) nanotubes
24. Functionalization of Lanthanum hydroxide nanowires
25. Switching behaviour in multiferroic nanostructures
26. Growth of super paramagnetic nanospheres
27. Synthesis of magic-sized nanocrystals
28. Rapid synthesis and application of polyhedral gold nanocrystals
29. Nanocrystalline iron-carbon materials
30. Microcantilevers coupled with a nanofibre
31. Calibration of nanomechanical sensors
32. Growth of silica nanorods
33. Lithography of nanoscale patterning and manufacturing
34. Nano-machining of microscope tips and carbon nanotubes
35. Structural and optical properties of nanodots
36. Fabrication of a tripod nanorod array
37. Biodiversity: An archive of opportunity for nanodevices
38. Magnetic nanostructures
39. Nanobiotechnology enables new opportunities Bacteriorhodopsin
40. Bioprocessing of Silk Proteins
41. Spider silk production
42. Metalloprotein based electronic nanodevices
43. Scalable fabrication of ZnO nanorod arrays
44. Mechanism of anodic alumina
45. Thickness and density of nanowire hybrid film
46. Chitosan nanoparticles as a smart drug delivery system
47. Synthesis of composites using capsicum annum extract
48. The stability and electronic structure of single walled ZnO nanotubes
49. SWNT reinforced composites

50. Super paramagnetic core and rhodamine B doped silica shell
51. Synthesis and characterization of nanoordinating solvent
52. Platinum coated prodes
53. Multiscale failure for carbon nanotube systems
54. Dynamical model for restricted diffusion in nano channels
55. Synthesis of quantum dots
56. Measurement of photonic crystal holes
57. Growth control of nanowires
58. Synthesis of CdSe clusters
59. Nanocrystalline semiconductors
60. Nanotechnology in Bioengineering

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