

(NANO SCIENCE AND TECHNOLOGY)

Mark-100

Properties of individual Nanoparticles:

Magic numbers, Theoretical modeling of nanoparticles, Geometric structure, Electronic structures, relativity, fluctuations, magic clusters, Bulk to nanostriction

Semiconducting Nanoparticles:

Optical properties, photofragmentation, Coulombic explosion.

Carbon nanostructures

Carbon molecules: Nature of the carbon Bond, New carbon structures

Small Carbon Clusters, Discovery of C_{60} , Structure of C_{60} and its crystal, Alkali doped C_{60} , Larger and Smaller Fullerenes, Other Bucky balls,

Carbon Nanotubes

Fabrication, Structure, Electrical properties, Vibrational properties, Mechanical properties

Applications of carbon nanotubes: Field emission and shielding, computers, Fuel cells, Chemical Sensors, Catalysis, Mechanical Reinforcement.

Bulk Nanostructured materials:

Solid Disordered Nanostructures: Methods of synthesis, Failure mechanism of Conventional Grain-Sized Materials, Mechanical properties, Nanostructured Multilayers, Electrical properties, Other properties, Metal Nanocluster Composite Glasses, Porous Silicon

Nanostructured Crystals: Natural Nanocrystals, Computational Prediction of Cluster Lattices, Arrays of nanoparticles in Zeolites, Crystals of Metal Nanoparticles, Nanoparticle Lattices in Colloidal suspensions, Photonic Crystals

Nanostructured Ferromagnetism: Basics of ferromagnetism, Effect of bulk Nanostructuring of magnetic properties, Dynamics of nanomagnets, Nanopore Containment of magnetic properties, Nanocarbon ferromagnets, Giant and colossal Magneto resistance, Ferro fluids

Optical and vibrational spectroscopy:

Infrared frequency range: Spectroscopy of semiconductors; Excitons, Infrared surface spectroscopy, Raman spectroscopy, Brillouin spectroscopy,

Luminescence: Photoluminescence, Surface states, thermo luminescence nanostructures in Zeolite Cages.

Quantum wells, Wires and Dots : Preparation of quantum nanostructures, size and Dimensionally effects: Size effects, Conduction electron and dimensionality, Fermi gas and density of states, potential

wells, partial confinement Properties dependent on Density of states, Excitons, Single electron tunneling, Applications: infrared detectors, Quantum Dot Lasers, Superconductivity.

References:

Introduction to Nanotechnology: Charles P. Poole, Jr., Frank J. Owens