

M.Tech (Nano Science & Technology)

~~601101~~ Introduction to Nanoscience & Nanotechnology

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Introductory remarks, Understanding Science of Small, Wave function, Surface effect, Surface energy, Surface reactivity and catalysis, The Quantization of Energy, Particle in Well and box, Fermi energy and energy distribution function, density of state, Molecule and Molecular interactions, From atoms to solid materials, Bonding in Materials, Metallic bonding, Ionic bonding and covalent bonding, Molecular orbital theory, Dipole moment, Dipole-Dipole interaction, Introduction to Nanostructured materials, Low-dimensional structures: Quantum wells, Quantum wires, and Quantum dots, Nano clusters and Nanocrystals, Nanoparticles, Colloidal particles, Wire, Films, Layers and coating, Porous materials, Molecules - Fullerenes, Dendrimers, Micelles, superlattices, Introduction to crystal structure, Thermodynamics of small systems: Nucleation growth theory, Gibbs energy, Chemical potential, Enthalpy.

~~601102~~ Synthesis of Nanomaterials

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~~Synthetic procedures and their significance~~, Types of nanomaterials synthesis processes; ROHS and WEEE guidelines; Physical method: Advanced Ceramics (Solid-state reaction method), Ball milling method; Chemical method: Co-precipitation technique, Sol-gel method, Soft chemical technique (citrate, tartarate, etc.); Hydrothermal method; Bio-chemical method; Thin film Technology: Thermal Evaporation method, Sputtering (RF and DC), Spray pyrolysis method, Spin coating method, Pulsed laser deposition method, vacuum arc discharge, Chemical vapor deposition method (CVD), MOCVD, MBE, Ion beam deposition, Electron-beam lithography.

~~601201~~ Properties of Nanomaterials

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1. General Shape and Size dependent properties.
2. **Electrical properties** - Resistivity, Dielectric & ferroelectric properties, Conductivity behavior.
3. **Magnetic Properties** - Magnetic parameters variation, susceptibility, permeability eddy current loss, Superparamagnetic effect, etc.
4. **Optical properties** - Photoconductivity, Optical absorption & transmission. Photoluminescence, Fluorescence, Phosphorescence, Electroluminescence.

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