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Title of the thesis: “*Synthesis and Characterization of Nanostructures*”

Abstract of thesis

The present thesis lays emphasis on the “*Synthesis and Characterization of Nanostructures*”.

The growth of different nanostructures involve their low temperature fabrication using Thermal Oxidation, thermal Condensation and Electron cyclotron resonance chemical vapour deposition (ECR-CVD) techniques. SEM has been used for topographical characterization of the nanotubes. The morphology as well as the crystallographic and compositional information has been obtained using TEM. For optical characterization UV-spectrometer is used. X-ray diffraction technique is employed to decide the nature of the grown structures whether it crystalline or amorphous. Electrical measurement is also performed for Zinc Oxide nanoneedles and carbon nanotubes.

The results are summarized as follows:

1. Synthesis And Characterization Of Needle Like Nano Structures Of ZnO At Low Temperature

ZnO nanostructures of various length and diameter has been successfully grown on Silicon by thermal oxidation. We have proposed the vapor solid growth mechanism for structures. The as grown samples are characterized by SEM, UV-visible spectrometer and X-ray diffraction. I-V measurement studies suggest the nano Schottky contact between the grown ZnO nanolayered film and silver, showing different ideality factor than the conventional Schottky contact.

2. Synthesis And Characterization Of ZnO Nano-particles

The nano-particles of ZnO are grown at a low temperature of 400°C. These nanoparticles are almost spherical in shape and the size varies from 40 nm to 100 nm. The growth mechanism of these nanoparticles involves the vaporization of material into a low density gas by resistive heating and the vapors migrate from the hot source to liquid nitrogen cooled substrate.

3. Optical Properties of Selenium–Tellurium Nano-structured Thin Film Grown by Thermal Evaporation

Nano-structures of Se-Te alloy system are successfully produced on a glass substrate by thermal evaporation method at low temperature. It is observed from SEM images that diameter of Se-Te nanostructure varies from 40 to 100 nm. The optical absorption measurements of $\text{Se}_{100-x}\text{Te}_x$ nano structured films is done.

4. Nano and Microstructures of Selenium Oxide by Thermal Evaporation.

Selenium oxide micro/nanostructures are grown on the glass substrate by thermal condensation/evaporation technique at 4 Torr in oxygen ambient.

It is observed from SEM images that diameter of Selenium Oxide nanostructure varies from 50 to 100 nm grown at liquid nitrogen temperature. The optical absorption measurements of selenium oxide nano structured films indicate that the absorption mechanism is due to indirect transition.

5. I-V Characteristics Of Multi-walled Carbon Nanotubes Synthesized Using ECR-CVD.

CNTs have been synthesized using remarkable low-temperature growth technique i.e. ECR-CVD. The SEM studies were also performed. The I-V characteristics show that the grown films are of semi conducting nature and there is possibility of formation of schottky junction in as grown MWCNTs films. The characteristics show semiconductor junction like behavior. The dc conductivity (σ_{dc}) is increases and activation energy decreases as the growth temperature of the CNT films increases. The dc conductivity increases approximately six times as the growth temperature increases and the conduction mechanism in the grown films is hopping conduction.