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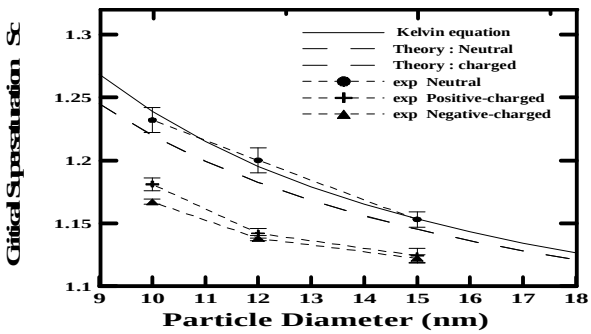
Research Interests:

Nucleation phenomena, Thin Film Technology, Laser Technology, Air Pollution Control, Semiconductor Gas Sensor

I Nucleation Phenomena

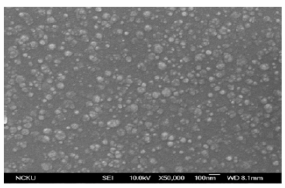
Fine particles are an important component of natural and anthropogenic aerosols. Cloud formation processes are strongly influenced by heterogeneous nucleation on these aerosols. Recently, an electrospray aerosol generator was developed to generate nanoparticles (e.g., SiO_2、TiO_2、D-Mannose) and a flow cloud chamber (FCC) was employed to examine the sign preference and the effects of particle size and charge on the critical supersaturation, S_{cr}, for the condensation of a supersaturated vapor on particles with a diameter of tens nanometer or less than, each carrying a single positive, negative charge, or no charge.



Variation in the experimental S_{cr} as a function of particles diameter for SiO_2 particles, each carrying a single positive +, negative charge▲, or no charge●. The solid and dashed lines indicate the theoretical S_{cr} evaluated by Kelvin equation and classical nucleation theory, respectively.

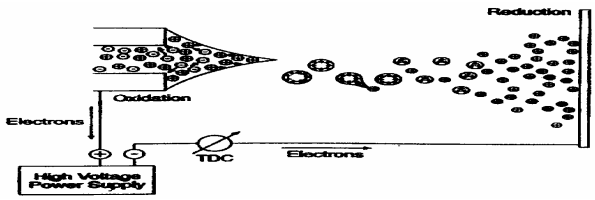
Luminescent Semiconductor Thin Film

Light-emitting diodes (LEDs) have the advantages of small volume, long lifetime, no mercury pollution, low energy loss, and high emission efficiency. A study focused on the development of a luminescent thin film is carrying out, where the synthesis of CdS nanoparticles using microwave heating and formation of thin film by a electrospray method are under test. CdS nanoparticles as small as 3 nm have been successfully synthesized and deposited.



(b) 收集電壓 500V(50k 倍)

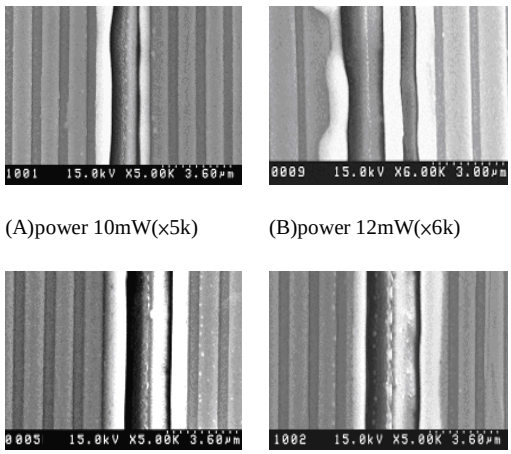
A SEM for the morphology of CdS nanoparticles deposited on a silicon substrate(×50K).



A diagram for an electrospray method

Rewritable Phase-Change Optical Recording Media

In rewritable phase-change optical recording media, the data are recorded based on the phase transformation between amorphous and crystalline phase. The recording rate and density is determined by the nucleation rate, heating rate, cooling rate, and the properties of the phase change material, etc. In the present study, In_2Te_3 alloy film was prepared by vacuum co-deposition, following by a heat-treatment at N_2 atmosphere and the scanning of a diode laser.



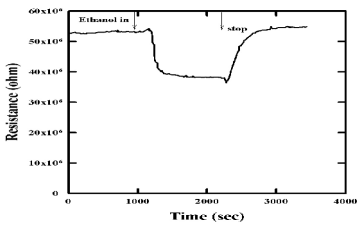
(A)power 10mW(×5k) (B)power 12mW(×6k)

(C)power 16mW(×5k) (D)power 18mW(×5k)

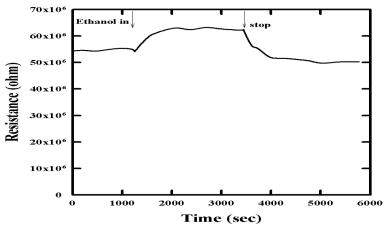
SEM micrograph of scanned In_2Te_3 recording Film

Semiconductor Gas Sensor

Gas sensors are used in various fields such as security, environment, control, automotive and domestic applications. Many thick film metal oxide semiconductor gas sensors, such as SnO_2 and Ga_2O_3 , have been commercially designed to detect toxic gases (e.g., CH , CO, and NO). The development of a gas sensor with high sensitivity, selectivity, stability, and durability is highly desirable. Various semiconductor thin films (e.g., Ga_2O_3, ZnO) are prepared by vacuum deposition of metal film followed with thermal oxidation and their electric properties are tested.



(a) resistance change of n-type semiconductor sensor



(b) resistance change of p-type semiconductor sensor