Seminar

Institute for Plasma Research

Title : Structural, optical, magnetic and biological studies of undoped and doped ZnS nanoparticles

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Date : 26th September 2017 (Tuesday)

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract :

II-VI compound semiconductor nanoparticles (quantum dots) have been extensively studied since last 15 years to explore their unique properties and potential applications in the field of spintronics and optoelectronic devices. It is interesting to study their optical, electrical and magnetic behaviors which can be controlled and altered by doping process and through quantum confinement at the nanoscale. Among all II-VI semiconductors, ZnS is a good host material for most of the transition metal ions owing to its direct wide bandgap of 3.54 eV for Zinc Blende (cubic) structure and 3.91 eV for Wurtzite (hexagonal) structure (bulk form at room temperature). Doped semiconductor exhibits different optical as well as magnetic property than undoped semiconductors dependent heavily on the doping concentrations. These altered properties can be manipulated in various applications such as optoelectronics devices, flat panel display, sensor and spintronic, etc.

As a part of a thesis undoped and different concentrations doped (Mn, Co, Ni and Ag) ZnS nanoparticles are synthesized by microwave assisted chemical method and characterized by various characterization techniques. Doping induced different optical as well magnetic behavior in the ZnS. There is no remarkable change in the structural properties due to doping process. 15% doped (Mn, Co, Ni) ZnS nanoparticles do not show any antibacterial effect against two selected bacteria. Effect of Co doping in the host ZnS was studied and observed the emission at 519 nm due to Co doping also high doping concentration (15 %) Co doped ZnS sample shows paramagnetic behavior at low as well as room temperature. 15% Co doped ZnS nanoparticles are not susceptible against *E. Coli* bacteria [1]. Influence of Ag on the ZnS nanoparticles as studied. Up to 15 % Ag doping in ZnS nanoparticles shows a range of emissions [2]. Mn doping in the ZnS nanoparticles shows orange emission with enhanced intensity even in the low doping concentration (5% Mn) [3]. Ni doped ZnS nanoparticles shows a green emission. 15 % Ni doped ZnS nanoparticles shows a superparamagnetic like behavior at room temperature.

References

1. Kamakshi Patel, M. P. Deshpande, S. H. Chaki, J. Mater. Sci. - Mater. Electron., **28**, (2017), 5029-5036.
2. Kamakshi Patel, M. P. Deshpande, S. H. Chaki, Appl. Phys. A, **123**, (2017), 367(1-6).
3. M. P. Deshpande, Kamakshi Patel, Vivek P. Gujarati, and S. H. Chaki, AIP Conference Proceedings, **1728**, (2016), 020406(1-5).