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Introduction to Nanoscience and Nanotechnology

Review-3

Topic	**:**	**Synthesis of Zinc Sulphide Nanoparticles**
Slot	**:**	**E2**
Course Code	**:**	**ECE1006**
Class number	**:**	**VL2018195001566**
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Introduction:

During the past two decades, the “small-particle” research hasbecome quite popular in various fields of chemistry and physics. The ‘‘small-particles’’ now we call nanostructured materials are very interesting materials both for scientific reason and practical application. In the case of semiconductor nanoparticles, radiative or non-radiative recombination of an exciton at the surface states becomes dominant in its optical properties with a decrease of particle size. Therefore, the decayof an exciton at the surface states will influence the qualities of the material for an optoelectronic device.

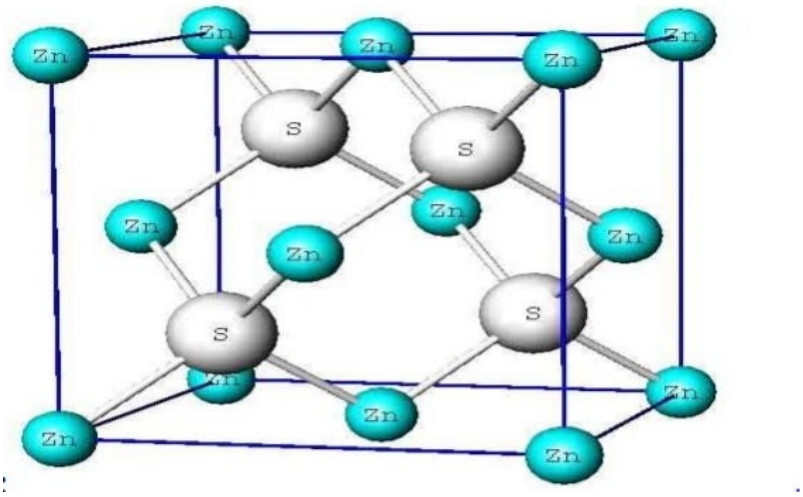
These size dependentoptical properties have many potential applications in the areasof solar energy conversion, light emitting devices, chemical/biological sensors and photo catalysis.
Wide band gap II–VI semiconductors are expected to be the novel materials for the optoelectronic devices . ZnS has been used widely as an important candidate for photoluminescence(PL),electroluminescence (EL) and cathodoluminescence (CL) devices due to its better chemical stability compared to other chalcogenides such as ZnSe.

In optoelectronics, it finds use as light emitting diode, reflector, dielectric filter and window material. Research on nanocrystalsof ZnS containing Mn, Fe, Ni and Cu has been in full swing as the solubility limit for these transition metals in II–VI host lattice is high. Many techniques can be used for preparingof (ZnS) nanoparticles ,such as soft chemical method, chemical precipitation, sol–gel method ,co-precipitation, microwave irradiation method and colloidal micro emulsion , these methods are the most important due to their important nonlinear optical properties, as well as physical and chemical property that differ noticeably from features of ZnS as bulk, semiconductor Quantum dots or nanocrystals (NCs) formed in colloidal solutions, these the nanocrystals have suspended in a solvent during the chemical preparation.

In present work, we use a chemical method to preparation ZnS nanoparticles,this route was chosen due to its simplicity and inexpensive .The structural and optical properties were studied by XRD ,UV-VIS spectrum ,and PL analysis , the energy band gap values have been calculated by using the UV-visible spectrophotometry andfluorescence , the particle sizes have been obtained from XRD pattern.

Structure of Zns:

It is same as the diamond structure. In diamond all the bondedatoms are of same type i.e., carbon(c) but in Zns is connected by different atoms i.e., zinc and sulphur.



Possible Methods for Preparing the ZnS Nanoparticles:

1. Soft Chemical Method
2. Chemical Precipitation
3. Sol-gel Method
4. Co-Precipitation
5. Microwave irradiation Method
6. Colloidal micro emulsion

In all these methods Chemical precipitation is easier andinexpensive.

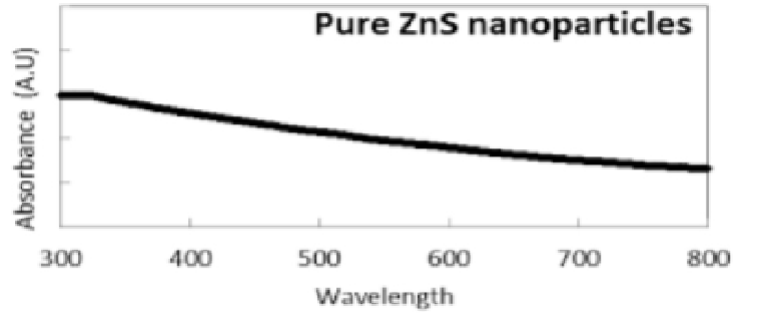
Methodology:

To prepare samples of ZnS nanoparticles by using the chemicalmethod , it can be mixed two aqueous solutions , the first solution 0.1M Zinc Chloride powder ZnCl2 (0.27g) dissolving in 20 ml distilled water ,put on stirrer to complete stirring for 20 min , then add slowly drops of Na2S solution from Ammonium hydroxide to the ZnCl2 in order to create pH of the solution to the required level of (pH=8) at room temperature.

While the another solution was obtained from using (0.156g) sodium sulphide powder dissolving Na2S in20 ml distilled water. The first,Na2S Solution added drop by drop to ZnCl2 solution ,the mixture of two solutions were mixed in a three-neck flask and were placed on magnetic stirrer at the room temperature ,it is mentioned that the argon gas are continued flowing through the synthesis for 3hours.

In the final step the ZnS NPs production white color precipitation this agreement with other researcher, X-Ray Diffraction (XRD) pattern of ZnS nanoparticleswere measured by(SHIMADZU XRD-6000 X-ray diffractometer (CuKα radiation λ=0.154nm) in 2θ range from (20-80).

The absorption spectrum of the samples is recorded by using OPTIMA SP-3000 supply by Optima Company ,UV–VIS spectrophotometer covering a range from (200 – 1100) nm by using colloidal solution. The photoluminescence spectrum of ZnS colloidal solution is plotted using SL 174 SPECTROFLUOROMETER supply by ELICO Company ,covering range from (200–600)nm.



Summary:

We successfully created Zinc sulphide Nanoparticles usingChemical Precipitation method.