

Different Techniques for CdS Nano Particles and Nanocrystalline Thin Films

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Abstract: *An appropriate characterization of any material plays a very crucial role in determining its various properties. A number of techniques can be used to analyze and characterize any material in nanoparticle, thin films and bulk form. In the present work to determine the purity, stoichiometric composition, structural determination, microscopy to get particle size and shape, optical studies, thermal studies of CdS nanoparticles and CdS thin films, In CdS thin films we used techniques such as EDMX (Energy dispersive analysis of X-rays), XRD (X-ray diffractometer), TEM (Transmission electron microscopy).*

Keywords: scanning electron microscope, X-Ray detector, Pulse generator, Production of X-ray, charge pulses, surface science technique

1. Introduction

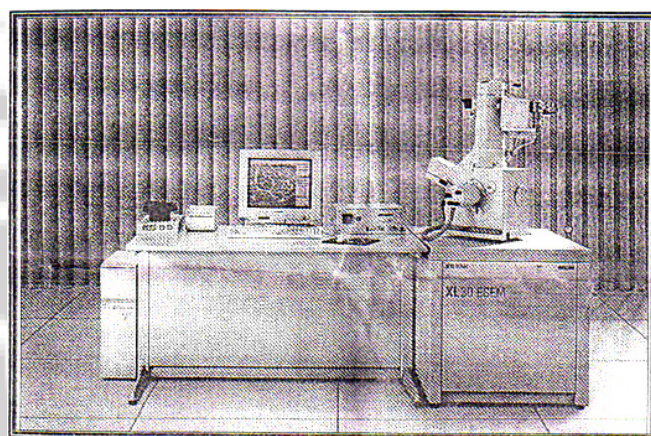
Last several years, study of Nanostructured materials is very important. Generally Nanoparticles have a large number of surface atoms compared to the bulk. So the properties of surface atoms are very important. Due to surface atoms, we can get more and more characteristics of nano-particles. A number of techniques can be used to analyze and characterize of any Nanoparticles materials. Among all these techniques, we are discussing about EDX (Energy dispersive analysis of X-rays). Sometime EDX can be known as EDS also.

2. Basic Principle

EDS is a chemical microanalysis technique. EDS is used in Conjunction with scanning electron microscopy Electron beam is bombarded on the sample of material. So X-rays are emitted from the sample. Due to this technique X-rays are emitted and we can study the characteristic of the material. Quantitative data can also be obtained by comparing peak heights in the unknown with a standard material. EDS Method is relatively very quick and simple. We can get complete spectrum of energies.

We can get resolution of about 1 μm for that resolution; one can do microanalysis which is localized excitation of a small area at the sample surface. In EDS practical, substance should be continuously in moving state, so that we get distribution of the element. The X-rays are generated in a region about 2 to 3 microns in depth. So EDS is not a surface science technique. If incident beam of X-ray continuously moving, then we obtain an image of each element in the electron beam is typically in the sample can be get. The energy of the electron beam is typically in the range of 10-25 KeV. Due to this high amount of energy, we can get X- ray.

3. Experimental Setup



Energy dispersive analysis of X-ray contain four basic parts (1) the beam sources (2) the X-Ray detector (3) The pulse generator (4) The analyzer. These four components must be working in simultaneously. The energy dispersive analysis of X-ray is attached with an SEM (scanning electron microscopy). With the help of detector, we can draw a graph of the relative abundance of emitted X-ray verses their energy. The detector is made from lithium – drifted silicon device. When the X-rays are incident on the detector, at that time charge pulses are produced. Produced charge pulses are proportional to the energy of the X-ray. If the energy of the X-ray is larger, produced charge pulses are larger. These charge pulses are converted into voltage pulses. This conversion of charge pulses into voltage pulses is possible with the help of charge sensitive preamplifier. Then these voltage pulses are given to multichannel analyzer. In this analyzer, pulses are collected in the form of voltage pulses. The energy, as determined from the voltage measurement, for each incident X-ray is sent to a computer for display and further data evaluation. The spectrum of X-ray energy versus counts is evaluated to determine the elemental composition of the sample volume.

4. Difficulties

Elements of low atomic number cannot be detected by EDX. Because Si (Li) detector is protected by Beryllium windows, the absorption of the soft x rays by the Be precludes the detection of elements below an atomic number of $Z=11$ (Na). Of course in the case of Non-window system, we can detect the elements as $Z=4$ (Be). But some difficulties are produced so widows must be necessary [1][2].

5. Future Implication of Study

This technique is quick and easy, so it will be more useful.

6. Conclusion

EDAX analysis confirms that the synthesized nanoparticles are of CdS and do not contain any foreign element in them. In case of CdS nanocrystalline thin films we observe some extra elements viz Si, O, Na, Mg, and they are due to the amorphous glass substrate used.

References

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