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**Department** : **Physics**  
**Topic of Research** : **Synthesis and Characterization of ZnO  
Nanostructure**

Abstract

Zinc oxide is a unique semiconductor with a direct band gap of  $\sim 3.3$  eV (387 nm, deep violet/borderline UV) and having high exciton binding energy of 60 meV (which is larger than the thermal energy at room temperature) [6], which makes it a possible candidate for many applications.

Our work is basically described in two parts:-

*(i) Synthesis of different ZnO nanostructure.*

*(ii) Different characterization of the as grown ZnO nanostructure.*

**(i) Synthesis of different ZnO nanostructure**

For different ZnO morphology basically two methods was used though out our research work, (a) Physical vapor deposition and (b) Rapid thermal chemical vapor deposition (RTCVD).

**(ii) Different characterization of the as grown ZnO nanostructure**

We have been carried out different characterization techniques for the as grown ZnO nanostructure, which confirms the basic properties and parameter of the as grown ZnO nanostructure. It also guides us towards the application aspects of these different nanostructures. Following are the characterization which have been carried out during our research work; X-ray Diffraction (XRD), Scanning Electron Microscope (SEM), Field Emission Scanning Electron Microscope (FESEM), UV-VIS spectroscopy, High Resolution

Transmission Electron Microscope (HRTEM), X-ray Photoelectron Spectroscopy (XPS) and Raman Spectroscopy.

Based on our work the thesis is divided into seven chapters and each chapter describe about different aspects of ZnO, its synthesis and characterization.

*Chapter 1* reveals about the general introduction about the ZnO, its synthesis, characterization and its different applications. *In Chapter 2* we discuss about a general review related to ZnO. In this we give a broad review about ZnO and its different properties; mechanical properties, electrical properties and optical properties with different challenges in ZnO research. *Chapter 3* gives detailed information about experimental work; synthesis and characterization. This chapter describe about the experimental techniques which have been carried out during our research work like thermal evaporation and rapid thermal chemical vapor deposition (RTCVD). *Chapter 4* is about the result and discussion of our experimental work. This chapter basically deals with the morphological and structural properties of ZnO nanostructures grown by RTCVD. Different parameters used during experimental work are reveled in this chapter. *Chapter 5* is about the optical studies of the amorphous ZnO film. Different characterization (XRD and UV-VIS) of the as prepared ZnO samples have also been done. *Chapter 6* deals with conclusion of the whole research work. *In Chapter 7*, deals with the scope for future work.