ABSTRACT

The present thesis entitled “Development of Novel Nano Metal Oxide Thin Film for Solar Energy Harvesting Application” comprises ten chapters. The first chapter gives a general introduction to Solar Cell and the objective of the work has been clearly detailed in this chapter.

Chapter 2 deals with the crystal structure, properties and application of both cuprous and cupric oxide. It includes a complete review of the work done on Cuprous and Cupric Oxide and Heterojunction layers using these oxides. Also, it focuses on the advantage of electrodeposition among various methods used for the preparation of thin films.

The preparation procedure of Cuprous oxide, Cupric Oxide and Heterojunction layers is presented in Chapter 3, which consists of the details of the type of electrodes, particularly the substrate used for the present study and the composition of the electrolyte used. While Chapter 4 briefing the electrochemical analysis of the electrolyte prepared for developing copper oxide thin films, Chapter 5 explains the surface morphology of the prepared samples studied from SEM and EDAX images. The structural characterisation is analysed from XRD and RAMAN spectra and is included in Chapter 6. The grain size, the lattice constant, the dislocation density, the phase of the grown crystals and the micro strain values are calculated from the XRD data. The microstructure of the prepared samples analysed from RAMAN spectra are also explained in this chapter.
UV-Vis and Photoluminescence (PL) spectra are recorded for all the prepared samples and from the UV-Vis spectra, the band gap values, the cut off wavelength, extinction coefficient, refractive index and the dielectric constants are also calculated. The PL spectrum confirms the nature of the developed oxide thin films. These optical studies are included in Chapter 7. The electrical property of the samples is analysed by four probe technique and is noted in Chapter 8. This chapter also includes the current voltage characterisation of the prepared heterojunctions using CuO and Cu$_2$O. The summary of the present work is given in Chapter 9 that leads to conclusion of the thesis. The future scope of the research is specified in Chapter 10. And, the references are given at the end of each chapter.

Thus the research work is a comprehensive attempt to prepare a thin layer of copper oxide on a transparent conducting substrate which has a wide scope for preparing solar cell with better efficiency.