ABSTRACT

Organic Semiconducting thin films are important for applications in optical and electronic device fabrications. Titanium phthalocyanine dichloride ($TiPcCl_2$), Silicon phthalocyanine dichloride ($SiPcCl_2$), Tin phthalocyanine dichloride ($SnPcCl_2$), and Tin phthalocyanine (SnPc) are organic semiconducting materials prepared by thermal evaporation technique, to form thin films. Post deposition annealing of the thin films is done, both in air and vacuum at different temperatures. To study the optical properties of these films, the analysis of absorption and reflection spectra and the determination of the fundamental and excitonic energy levels are done. The variations in optical energy band gap with annealing temperature and substrate temperature are investigated. Variation of refractive index n, extinction coefficient k and the real and imaginary parts of the dielectric constants ε_1 and ε_2 respectively are also studied. Electrical characterization of thin films is done, by determining the activation energies and their dependence on film thickness, annealing temperature, in air and vacuum, and substrate temperature. Variation of structural parameters *viz,* average grain size, micro strain, and dislocation density with annealing temperature is also investigated. Effect of substrate temperature on average grain size is studied. Scanning electron micrographs are taken and analyzed to study the development of surface morphology of these thin films during annealing. To probe the applicability of using phthalocyanine thin films as radiation dosimeters, effects of gamma ray irradiation on these thin films have also been investigated. The variation of optical energy gap and the thermal activation energy on gamma ray irradiation for different dosages and exposure times are reported in this thesis.

Key words: Metallo-phthalocyanines, thin films, optical band gap, thermal activation energy and radiation dosimeters.