

Estimation of the Dispersion and Absorption Parameters of Thermally Evaporated Magnesium Phthalocyanine Thin Films

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Abstract. Magnesium phthalocyanine MgPc thin films are prepared at room temperature by thermal evaporation technique. The spectral absorption parameters are determined by applying the molecular orbital theory but the other optical parameters are deduced using band-model consideration. The optical constants n and k are evaluated using spectrophotometric measurements of transmittance and reflectance at nearly normal incidence of light in the wavelength range 190-2500 nm. The absorption spectrum recorded in the UV-VIS region shows two absorption bands of phthalocyanine molecule, namely the Soret band (B) and the Q-band. The Q-band shows its characteristic splitting (Davydov splitting), and ΔQ is 0.17 eV. The absence of a distinct peak near 4.27 eV in MgPc could be due to the absence of d-electrons of the Mg atoms. The analysis of the spectral behaviour of the absorption coefficient in the absorption region near fundamental edge reveal indirect transitions. The fundamental and the onset energy gaps could also be estimated as 2.73 ± 0.01 eV and 1.40 ± 0.15 eV, respectively, for the as deposited films. From analysis of dispersion curves, the dielectric constants and other dispersion parameters are also obtained. All previous parameters are obtained for as deposited and annealed films at 350°C for two hours. Discussion of the obtained results and comparison with the previously published data are also given.

Keywords: Organic thin film; optical absorption; optical constants.