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Theoretical Analysis of the Optical and Solid State Properties of Thin Film

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Abstract : Theoretical analysis of the optical and Solid State properties of ZnS thin film using beam propagation technique in which a scalar wave is propagated through the material thin film deposited on a substrate with the assumption that the dielectric medium is section into a homogenous reference dielectric constant term, and a perturbed dielectric term, representing the deposited thin film medium is presented in this work. These two terms, constitute arbitrary complex dielectric function that describes dielectric perturbation imposed by the medium of for the system. This is substituted into a defined scalar wave equation in which the appropriate Green's Function was defined on it and solved using series technique. The green's value obtained from Green's Function was used in Dyson's and Lippmann Schwinger equations in conjunction with Born approximation method in computing the propagated field for different input regions of field wavelength during which the influence of the dielectric constants and mesh size of the thin film on the propagating field were depicted. The results obtained from the computed field were used in turn to generate the data that were used to compute the band gaps, solid state and optical properties of the thin film such as reflectance, Transmittance and reflectance with which the band gap obtained was found to be in close approximate to that of experimental value.

Keywords : scalar wave, optical and solid state properties, thin film, dielectric medium, perturbation, Lippmann Schwinger equations, Green's Function, propagation
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