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Structural and optoelectronic properties of amorphous GaN thin films

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Amorphous gallium nitride (a-GaN) thin films were deposited on glass substrate by electron beam evaporation technique at room temperature and high vacuum using N₂ as carrier gas. The structural properties of the films were studied by X-ray diffraction (XRD) and scanning electron microscope (SEM). It was clear from XRD spectra and SEM study that the GaN thin films were amorphous. The absorbance, transmittance and reflectance spectra of these films were measured in the wavelength range of 300-2200 nm. The absorption coefficient spectral analysis in the sharp absorption region revealed a direct band gap of $E_g = 3.1$ eV. The data analysis allowed the determination of the dispersive optical parameters by calculating the refractive index. The oscillator energy E_0 and the dispersion energy E_d , which is a measure of the average strength of inter-band optical transition or the oscillator strength, were determined. Electrical conductivity of a-GaN was measured in a different range of temperatures. Then, activation energy of a-GaN thin films was calculated which equalled $E_a = 0.434$ eV.

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