Influence of strontium doping on the indirect band gap and optical constants of ammonium zinc chloride crystals

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Abstract:

Optical transmittance measurements near the absorption edge in the energy range 3.4–6.4 eV have been carried out on (NH4)2ZnCl4:xSr2+ single crystals with x=0.000%, 0.020%, 0.039%, 0.087% or 0.144%. The introduction of Sr2+ in low concentration, x=0.02% or 0.039%, little bleach the intense charge transfer band observed for the undoped sample with a maximum at 5.30 eV. Doping with Sr2+ in a little bit higher concentration, x=0.087% or 0.144%, led to the disappearance of this band. While doping with Sr2+ has no effect on the indirect allowed type of optical transition in AZC, the optical energy gap decreased with increasing Sr2+ concentration. Measuring reflectance of AZC permitted the calculation of the refractive index n, the extinction coefficient K and both the real r and imaginary i components of the dielectric permittivity as functions of photon energy. The validity of Cauchy-Sellimaier equation was checked in the wavelength range 5.45–5.8 eV and its parameters were calculated. Applying the single-effective-oscillator model, the moments of (E) could be estimated. Electric susceptibility, as a measure of intraband transition, was calculated and its dependence on photon energy was considered.

Keywords:

Ferroelectrics; Ammonium zinc chloride; Optical properties; Sr2+-doping

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