Modeling the optical constants of $Al_xGa_{1-x}As$ alloys

This paper appears in:
Optoelectronic and Microelectronic Materials Devices, 1998. Proceedings. 1998 Conference on
Date of Conference: 1999
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Page(s): 396 - 399
Product Type: Conference Publications

ABSTRACT

Extension of Adachi's model with a Gaussian-like broadening function instead of a Lorentzian one is used to model the optical dielectric function of the alloy $Al_xGa_{1-x}As$. Gaussian-like broadening is accomplished by replacing the damping constant in the Lorentzian line shape with a frequency dependent expression. In such a manner, the comparative simplicity of analytic formulae of the model is preserved, while the accuracy becomes comparable to more intricate models, and/or models with a significantly greater number of parameters. The employed model describes accurately the optical dielectric function in the spectral range from 1.5 to 6.0 eV in the entire alloy composition range. Relative rms error obtained for the refractive index is below 2.2% for all compositions

INDEX TERMS

- **IEEE Terms**
  Aluminum alloys , Damping , Dielectrics , Frequency dependence , Gallium alloys , Gaussian processes , Optical refraction , Optical variables control , Refractive index , Shape memory alloys

- **INSPEC**
  - **Controlled Indexing**
    Gaussian distribution , III-V semiconductors , aluminium compounds , dielectric function , gallium arsenide , refractive index , spectral line breadth , ultraviolet spectra , visible spectra

  - **Non Controlled Indexing**
    1.5 to 6 eV , Adachi model , $Al_xGa_{1-x}As$ alloys , AlGaAs , Gaussian-like broadening , Gaussian-like broadening function , accuracy , damping constant , frequency dependent expression , optical constants , optical dielectric function , refractive index , rms error

Additional Details | References (16)

Meeting Date : 14 Dec 1998-16 Dec 1998
Conference Location : Perth, WA
Print ISBN: 0-7803-4513-4
INSPEC Accession Number: 6504033
Digital Object Identifier : 10.1109/COMMAD.1998.791672