

Abstract Submitted  
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**Temperature dependence of the InGaPN conduction band structure** K.I. LIN, T.S. WANG, J.S. HWANG — Material properties of III-N-V alloys, such as GaAsN, InGaAsN, and InGaPN, have been intensively studied, because a small amount of nitrogen (N) incorporation results in very large bandgap bowing and dramatic change in the band structure.<sup>1,2</sup> Recently, temperature dependence of the parameters, *i.e.* the localized states energy  $E_N$  introduced by an isolated N and the interaction potential  $V$ , of the band anticrossing (BAC) model in GaAsN epilayers has been reported.<sup>3</sup> These properties have never been studied for InGaPN. In this work, temperature-dependent photorefectance (PR) measurements are employed to characterize the conduction band structure of  $\text{In}_{0.54}\text{Ga}_{0.46}\text{P}_{1-y}\text{N}_y$  ( $y = 0$  and  $0.02$ ) grown on GaAs substrates. The band gap and the upper subband  $E_+$  are observed in InGaPN as predicted by the BAC model. To investigate the energetic positions of the features in the PR spectra, a Kramers-Kronig analysis is proposed. Based on these PR data and the BAC model, we find  $E_N = 2.054$  eV and  $V = 1.513$  eV at 293 K. With decreasing temperature, the energy of  $E_N$  shifts significantly to higher energies. Simultaneously, the interaction potential  $V$  between the N states and the host conduction band also rises to higher values. The thermal shifts of  $E_N$  and  $V$  are  $dE_N/dT \approx -0.43$  meV/K and  $dV/dT \approx -0.67$  meV/K, respectively. 1.APL **88**, 031907 (2006). 2.APL **89**, 192116 (2006). 3.APL **89**, 202105 (2006).

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