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.\textsuperscript{1,2} Recently, temperature dependence of the parameters, \textit{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.\textsuperscript{3} These properties have never been studied for InGaPN. In this work, temperature-dependent photoreflectance (PR) measurements are employed to characterize the conduction band structure of In$_{0.54}$Ga$_{0.46}$P$_{1-y}$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 \textbf{88}, 031907 (2006). 2.APL \textbf{89}, 192116 (2006). 3.APL \textbf{89}, 202105 (2006).

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Date submitted: 20 Nov 2007

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