

## **Electrical and Photo-Electrical Characteristics of a GaInNAs based p-i-n Diode with 10- undoped Quantum Wells**

### **ABSTRACT**

An electrical and photo-electrical characteristics of a dilute nitride GaInNAs p-i-n diode with 10-undoped quantum wells (10-QWs) were investigated at room temperature. The QWs consists of 10-nm thick and separated by 10 nm GaAs barriers. The dilute nitride-based p-i-n diode exhibits a good rectifying behavior and discloses that the fabricated devices has a Schottky property. The current-voltage (I-V) characteristics showed the forward-biased region of I-V curves exhibited an exponential dependence of current on applied bias, whereas the reversed-biased region shows the saturation current with negative reverse current value (leakage currents) under dark condition. As the device was exposed to photo-illumination, the electrical characteristic exhibited an increase of dark-current by four orders of magnitude to that of device under dark condition. Upon photo-illumination, there was also a shift in the threshold voltage from 0.58 V to 0.73 V. Ideality factor,  $n$  and barrier height,  $\phi_B$  are main electrical parameters were extracted using conventional forward bias I-V characteristics. The values of barrier height, which were obtained were in good agreement with other reported values. The value of  $n$  was found to be 1.95 and 28.56. Ideality factor approaches 2 indicated that fully trap-assisted recombination in quantum wells. While, high ideality factor at photo-illumination indicated that the charge transport mechanism is controlled by tunnelling emission.