

## ABSTRACT

### **Fabrication and characterization of GaAs and InGaP based Schottky barrier diodes and impact of barrier height on device performance**

Modification of barrier height (SBH) to enhance the performance of Schottky barrier diodes (SBD) and the impact on barrier height on the noise associated with the SBDs are studied in this thesis. Two types of III-V semiconducting materials, viz. GaAs and InGaP are grown by MOCVD for making SBDs. From the electrical measurements it is found that the barrier height increases with increase in temperature, applied voltage and carrier concentration. Barrier height of Al/GaAs SBD is found to be enhanced by 0.8 eV with a polyaniline (PANI) layer inserted between Al and GaAs. It is shown that such a SBD can be used as a photovoltaic device. InGaP based SBDs are fabricated with Zn-Pd alloy to study the hydrogen sensing properties. It is found that Zn-Pd creates a higher dipole polarization at the Zn-Pd/InGaP interface than the Pd which reduces the barrier height. From the transient response it is found that this diode can detect as low as 10 ppm of hydrogen. Flicker noise reduction of space charge limitation region for a Zn-Pd/n-InGaP Schottky barrier diode (SBD) has been investigated. A suitable model has been suggested to explain the barrier height dependence of Fano factor. Zn-Pd/n-InGaP/n<sup>+</sup>-InGaP SBD has been fabricated to study the noise associated with GHz level application. From the noise spectral density studies it is found that both returning carrier resonance and plasma frequency increase with temperature but the intensity of the noise remained same. However, noise spectrum frequencies remain constant for different applied voltage though the noise intensity increases.

**Keywords:** Barrier height, Fano factor, hydrogen Sensor, metal-semiconductor contact, noise, Schottky barrier diode.