

Capacitance and current – voltage characterization of nitride p-n junctions

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Poor conductivity of p-type regions has been an obstacle in developing nitride devices that could in future replace Si based electronics. Use of tunnel junction (TJ) can provide an effective way of injecting holes into p-type region of LDs and LEDs.

Plenty of information on electric transport through p-n junction can be obtained through analyzing its current – voltage (I-V) and capacitance – voltage (C-V) characteristics [1]. However electric methods of characterization of nitride p-n junctions pose a challenge as it is difficult to process a low leakage p-type contact for GaN. In this work we present polarization engineered TJs grown by plasma-assisted molecular beam epitaxy with low resistivity p-type contacts of which we examine the I-V and C-V curves. From I-Vs we report negative differential resistance (NDR) beginning at around 2.9 V.

C-V curves have been drawn for various measurement frequencies and analyzed using an equivalent circuit representation, figuring out contribution of net-bound charges and free carriers to the junction capacitance [2].

Results are discussed for various realizations of TJs and in comparison with measurements conducted on p-n diodes without TJs.

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