

# Study of GaN Metal - Semiconductor - Metal Photodetectors

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## ABSTRACT

In this thesis, Ni/Au Schottky contacts on n-GaN were fabricated and characterized. The barrier height and ideality factor were extracted from the I-V and C-V measurements. In order to enhance the barrier height and evaluate the thermal stability, the Schottky diodes were treated with various annealing temperatures and annealing times. The thermal annealing processes were conducted under nitrogen ambient in a furnace tube. The temperatures and times used for thermal annealing were from 300 to 550 and from 5min to 60min, respectively. From the results, we found that thermal annealing at 300 and 400 can be used to increase about 0.19eV (I-V) and 0.17eV (C-V) of barrier height. However, thermal annealing at 500 and 550 for a periodic of time will make barrier height degrade. Based on X-ray diffraction studies, the re-crystallization of metal film and the formation of Ni gallide phase could be the reasons for the improvement of barrier height of Ni/Au Schottky contact on n-GaN at 300 ~ 400 annealing temperature. The degradation of the Schottky barrier heights for the contacts annealed above 500 was mostly due to interface phase changes. By the way, GaN MSM photodetectors with Ni/Au contacts annealed at 400 showed a reduction in the leakage current by three orders of magnitude than the as deposited sample.

Keywords : GaN ; Schottky contact ; Ni/Au ; Schottky barrier height

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