Developing of Low-resistance Ohmic Contact on GaN HEMTs for High Operating Frequency Applications

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Introduction:
GaN high-electron-mobility transistors (HEMTs) technology currently offers exceptional device properties for next-generation high power and high frequency applications [1]. This is attributed to their high breakdown voltage and current capabilities. However, the formation of low source/drain contact resistance is required to lower the access resistance and thus enhance DC and RF performance [2].

Research Goal:
The purpose of this project is to investigate an efficient technique to produce low ohmic contacts $R_C$. This could be achieved by reducing the Schottky barrier height $(q \varnothing_{bm})$ across a metal-semiconductor junction, which results in the formation of efficient tunneling contact mechanism.

Material and Devices:

![Figure 2: Schematic diagram of AlGaN/GaN HEMT grown on Si.](image1)

Table 2: Summary of the development process.

Analysis & Results:
Transfer length method (TLM) was used to characterize ohmic contacts.

![Figure 3: Optical microscope image of TLM test structure 150 × 150 μm pads with the spacing 2.5, 5, 10, 15, 20, 25, 30, and 35 μm.](image2)

![Figure 4: Contact resistance for non-recessed & recessed metal stacks.](image3)

Since non-recessed Ti/Al/Mo/Au metal scheme resulted in the best ohmic contacts, Gate wrap-around d-mode devices were fabricated.

![Figure 5: devices characteristic.](image4)

Conclusion & Future Work:

- Development of low ohmic contact resistance with good surface morphology was realized on AlGaN/GaN on LR Si substrate.
- Recessed ohmic contacts with lower annealing temperatures could be adopted for better contact resistance $R_C$.

References: