

3 - 43 I-V and C-V Characteristics at Variable Temperatures of High Energy U Ion Irradiated GaN Epi-layers

Gou Jie, Zhang Chonghong, Zhang Liqing, Song Yin, Wang Lanxi, Li Haixia, Li Jianjian
Meng Yancheng, Ma Yizhun and Zhang Hengqing

In the present work, the I-V and C-V characteristics at variable temperatures are showed in this paper. An Au/GaN schottky junction was fabricated on the GaN epi-layer before irradiation. The irradiation fluence is $1 \times 10^9 \text{ ions} \cdot \text{cm}^{-2}$. The irradiation with high energy $^{238}\text{U}^{32+}$ (1.22 MeV/u) ions was performed in a terminal chamber of the sector-focused cyclotron (SFC) in the National Laboratory of Heavy-ion Accelerators in Lanzhou. The rectification effect are still existed when the fluence reached $1 \times 10^9 \text{ ions} \cdot \text{cm}^{-2}$, which the energy deposition density is 2.09 eV/nm^3 . Fig. 1 shows the G/I-G plot^[1] from the I-V characteristics at variable temperature. The series resistances increase with the decrease of the temperature. The thermal emission mechanism plays a dominant role when the temperature reached 293 K and the composite current mechanism plays a dominant role at the low temperature. Fig. 2 shows that the peak of the C-V characteristic moves to 0.2 V at low temperature. The peak is related to the energy level site of the surface state. From the platform region in forward bias of the C-V plot^[2], we can get the C_{sc} (293 K) is larger than C_{sc} ($<180 \text{ K}$), it show that the dielectric constant increase when the temperature reached room temperature.

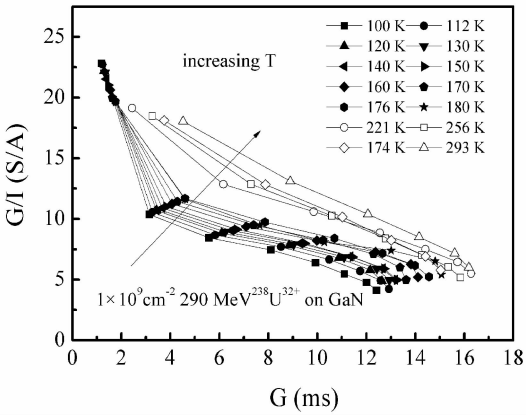


Fig. 1 The G/I-G plot of $1 \times 10^9 \text{ cm}^{-2}$ 290 MeV $^{238}\text{U}^{32+}$ ions irradiated GaN epi-layer at variable temperatures.

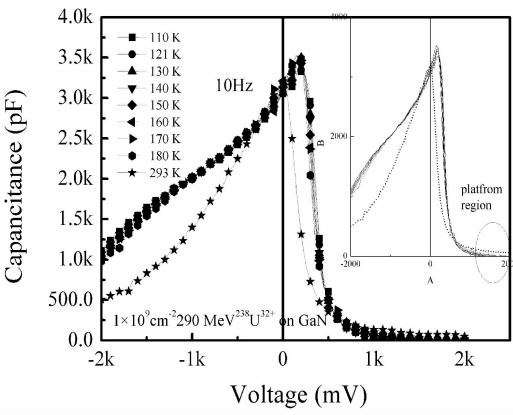


Fig. 2 The C-V plot of $1 \times 10^9 \text{ cm}^{-2}$ 290 MeV $^{238}\text{U}^{32+}$ ions irradiated GaN epi-layer at variable temperatures.

References

[1] J. H. Werner, Applied physics, A47(1988)291.
[2] S. J. X. R. X. Wang, S. L. Shi, C. D. Beling, et al. , Applied Physics Letters, 89(2006)3.