

3 - 42 Defects in U Ion Irradiated GaN Epi-layers

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GaN-related materials and devices have the extensively application potential in the irradiated environments. It's extremely important to understand the ion irradiation effects produced defects which influence the electrical properties of the GaN based devices. The defects induced by irradiation will influence the properties of the electrical characteristics of the device. The defects of the GaN epilayers irradiated by U ions were characterized through deep level transient spectra (DLTS) in this paper. 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. Fluences of ions were in the range from 1×10^9 to $5 \times 10^{11} \text{ cm}^{-2}$. The irradiation induce the N vacancy with an energy level at 0.0786 eV^[1] when the fluence reached 1×10^9 ions/ cm^2 . The energy level of the N vacancy is decrease with the fluence. It related to the screen of the N vacancy^[1]. Expressly, when the fluence reached 5×10^{10} ions/ cm^2 , the two defects energy levels were produced. One is 0.063 eV which is related to the screened N vacancy, the other is 0.028 eV which is related to the Si_{Ga} ^[2] or O_{N} . the Q-DLTS spectra of the specimen irradiated by 5×10^{10} ions/ cm^2 showed in Fig. 1. when the fluence reached 5×10^{11} ions/ cm^2 , the more defects are produced. The results are similar to the high energy (0.7~1.0 MeV) electron irradiated GaN epi-layers^[3]. The electron energy loss plays a dominant role in the 290 MeV U ions irradiation.

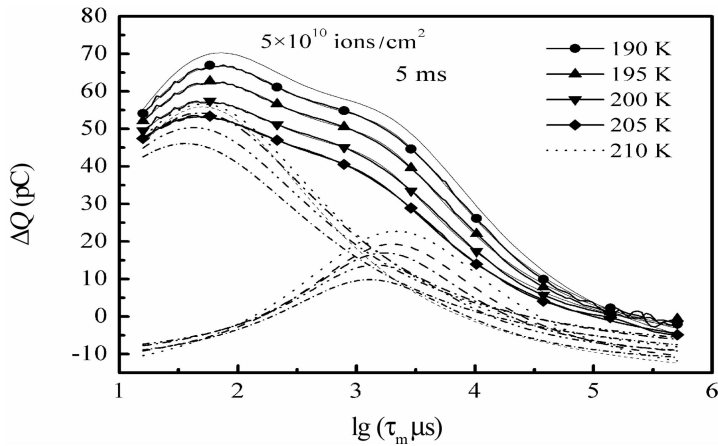


Fig. 1 The QDLTS spectra of the 290 MeV $^{238}\text{U}^{32+}$ irradiated sample with the fluence of 5×10^{10} ions/ cm^2 .

References

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