Figure 2-1 The calculated binary phase diagram of GaN
Figure 2-2. Schematic diagram of the in-situ monitoring system.
Figure 2-3. (a) A diagram of thin-film interference with dielectric materials. Coherent light illuminates the wafer surface during the film deposition and the reflected light is sampled with a photodiode. (b) The reflectance spectrum for single layer epitaxy in constant growth rate case.
Figure 2-4 Thermal profile for the growth of GaN epitaxial layer. The ramping time $t_1$ varied from 525°C to 1025°C after the grown LT-GaN buffer layer.
Figure 2-5. The FWHM of XRD for (0004) diffraction from the GaN epitaxial layer as a function of the temperature ramping rate between 525°C and 1025°C after grown LT-GaN buffer layer.
Figure 2-6. The Hall mobility and carrier concentration measured at 300K as a function of the temperature ramping rate between 525°C and 1025°C after grown LT-GaN buffer layer.
Figure 2-7. 10K photoluminescence linewidths (FWHM) for GaN epitaxial layer as a function of the temperature ramping rate between 525°C and 1025°C after grown LT-GaN buffer layer.
Figure 2-8. The thickness and surface morphology of AlGaN/GaN double layers were observed from the SEM photograph. The GaN (0004) and Al$_x$Ga$_{1-x}$N (0004) peaks were showed in x-ray diffraction curve.
Figure 2-9. The AlGaN peak, GaN peak and yellow peak were observed from PL and CL Spectrums at RT
Fix the V/III (N/(Al+Ga)) ratio at 10000
Varied the Al/(Al+Ga)mole flow ratio from 0 to 1
- Al/(Al+Ga)mole flow ratio calculated by Vegard's law

Figure 2-10. The dependence of Al mole fraction on TMAI flow rate for $A_{x}Ga_{1-x}N$ epitaxial growth.
Figure 2-11. Sketch of the construction of the exciton states from the combination of conduction and valence band Bloch state for epitaxy on C-plane.
Figure 2-12. Schematic of PL measurement system.
Figure 2-13. Typical PL spectra near the band edge emissions at low temperatures.
Figure 2-14. PL spectra of the high quality UID GaN at different temperature.
Figure 2-15. Energy splitting at the top of the valence bands of GaN under the influence of crystal-field and spin-orbit coupling. (The figure is not drawn to scale.)
Figure 2-16. Typical reflection spectrum of U-GaN and AlGaN/GaN HEMT.
Figure 2-17. PL Spectra at 10 K for different structures of $\text{Al}_{0.06}\text{Ga}_{0.94}\text{N} / \text{Al}_{x}\text{Ga}_{1-x}\text{N} / \delta$-doping /$\text{Al}_{0.15}\text{G}_{0.85}\text{N} / \text{GaN}$ HEMTs.
Figure 2-18. Temperature dependent PL spectra for the sample (c). Notice that the peak red-shift of the GaN D^0X is larger than that in 2-DEG.
Figure 2-19. Temperature dependence of the energy separation ($\Delta E$) of the 2DEG subbands PL peak form the GaN D$^0$X emission where $\Delta E_i = E_{D^0X} - E_i$, and so on.
Figure 2-20. The CV plots of HEMT for (a) sample-c and (b) sample-d.