

Figure 3-1 Schematic of ICP Etcher

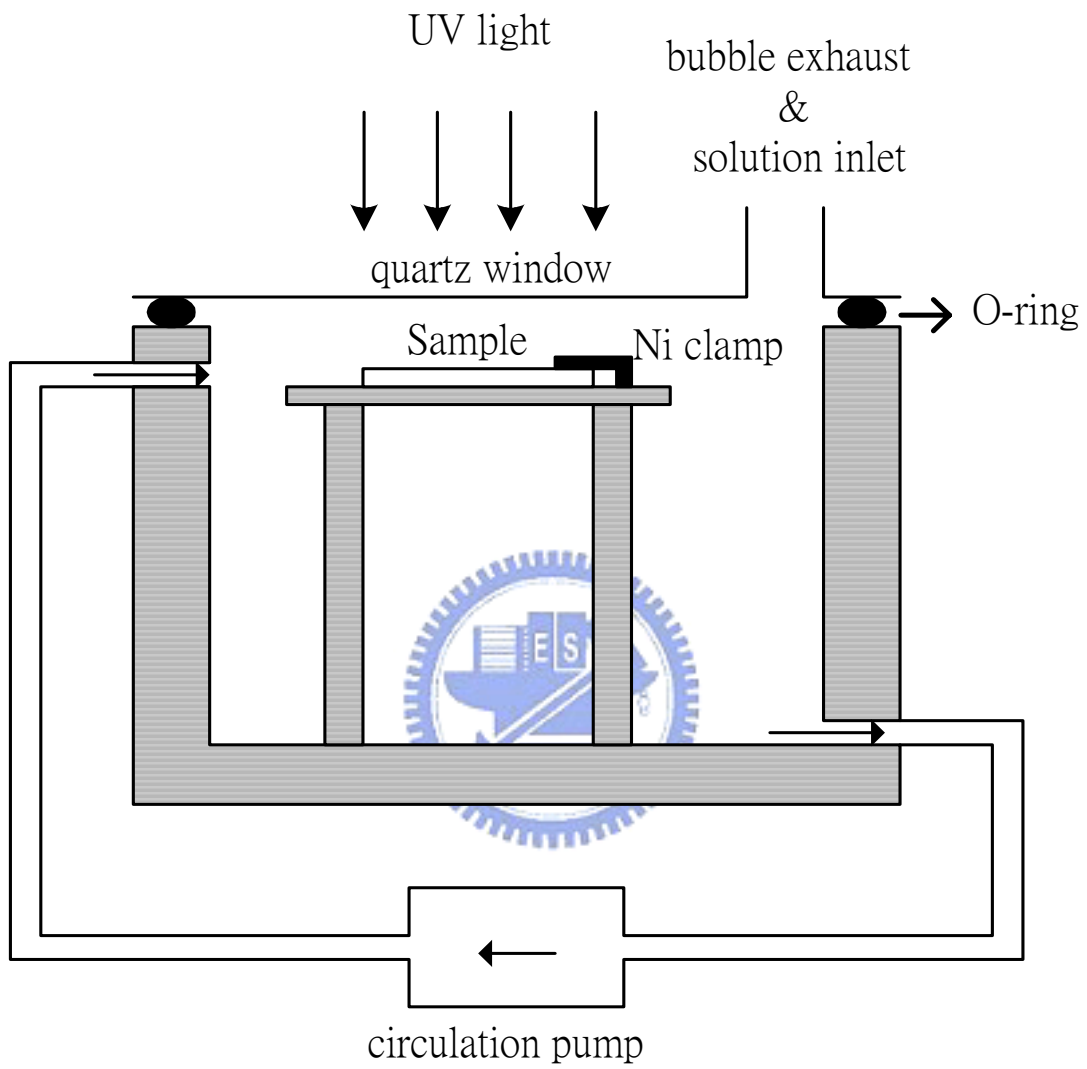


Figure 3-2. Schematic of PEC wet etcher

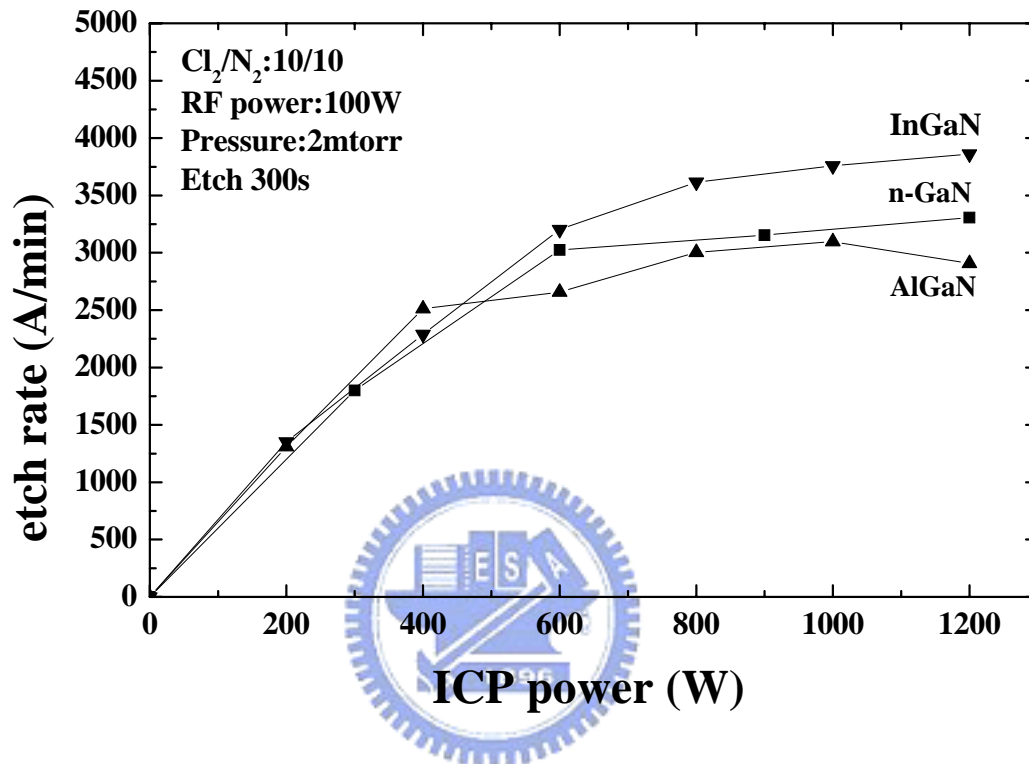


Figure 3-3. Etch rate as a function of ICP power for InGaN, GaN and AlGaN. The controlled conditions are 10/10 sccm of Cl₂/N₂, 600W of RF power, 2 mtorr for 300 s.

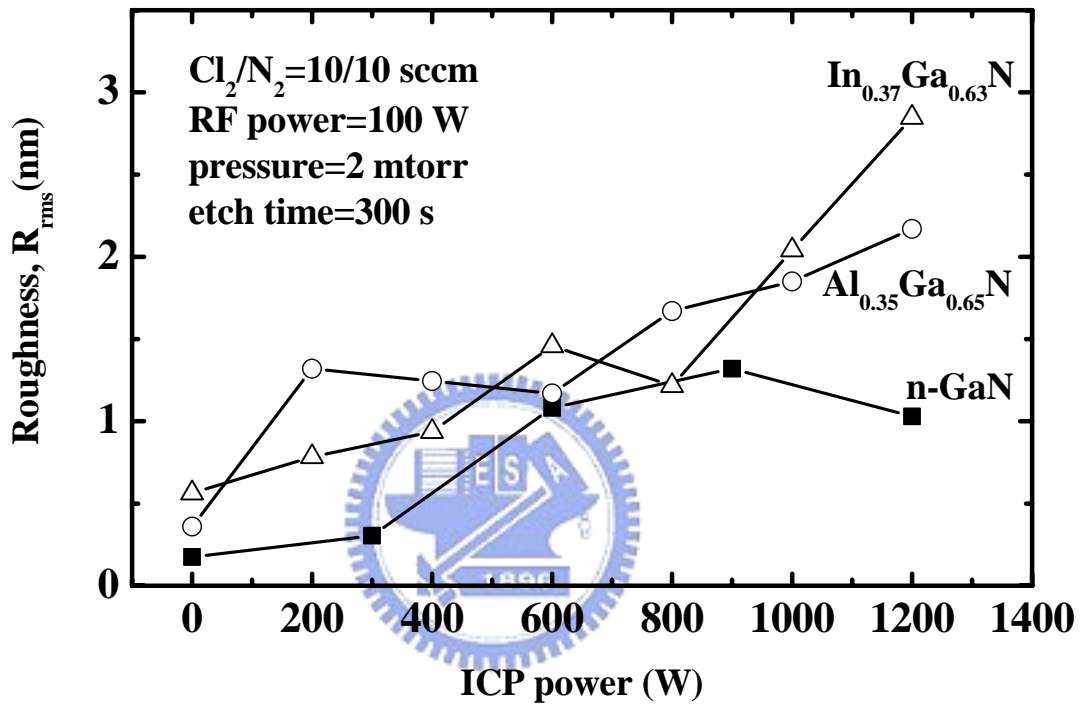


Figure 3-4. Surface roughness as a function of ICP power for In_{0.37}Ga_{0.63}N, n-GaN and Al_{0.35}Ga_{0.65}N. The controlled conditions are 10/10 sccm of Cl₂/N₂, 600W of RF power, 2 mtorr for 300 s.

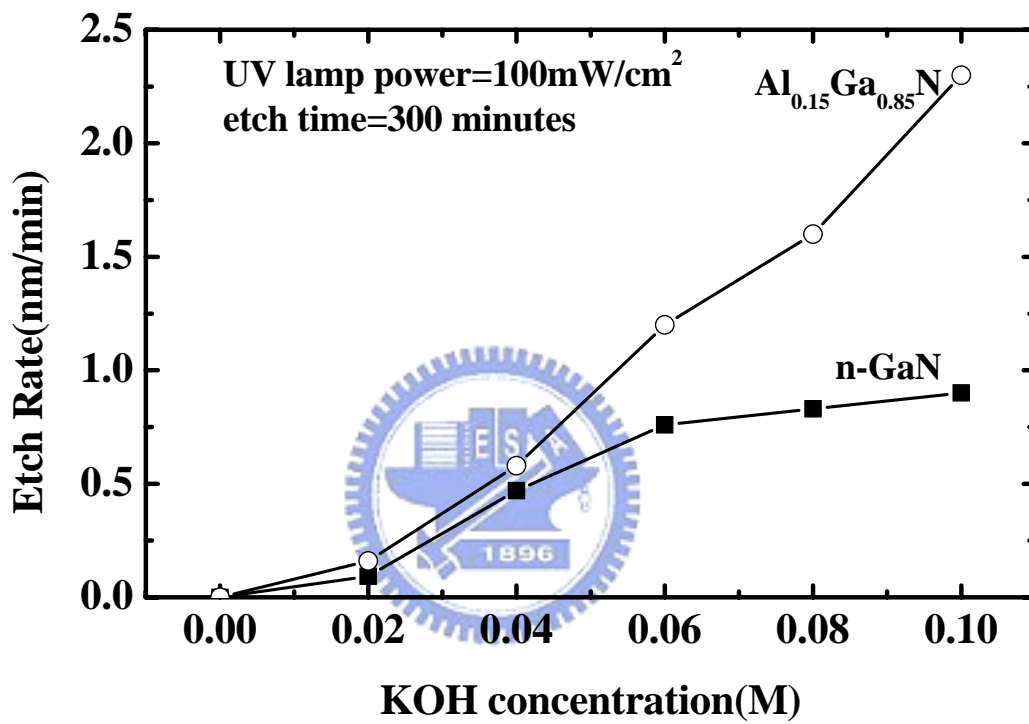


Figure 3-5. Etch rate as a function of KOH_(aq) concentration under 100 mW/cm² of UV exposure.

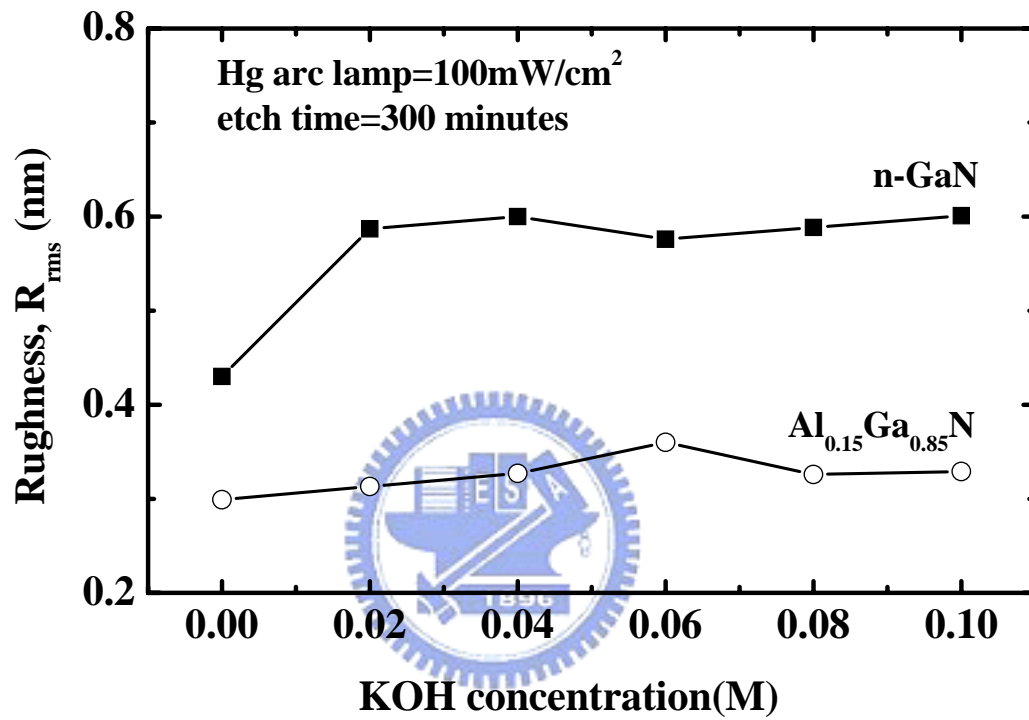


Figure 3-6. Surface roughness as a function of KOH_(aq) concentration under 100 mW/cm² of UV exposure.

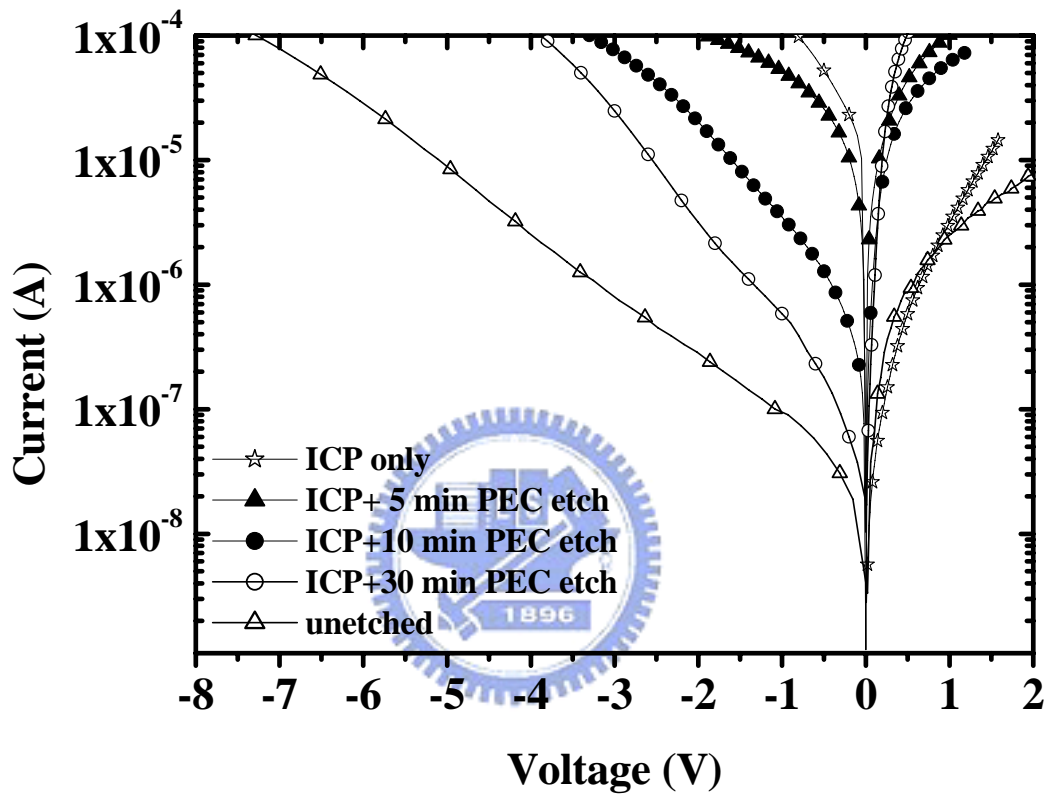


Figure 3-7. I - V curves of Schottky diodes after hybrid etch for GaN.

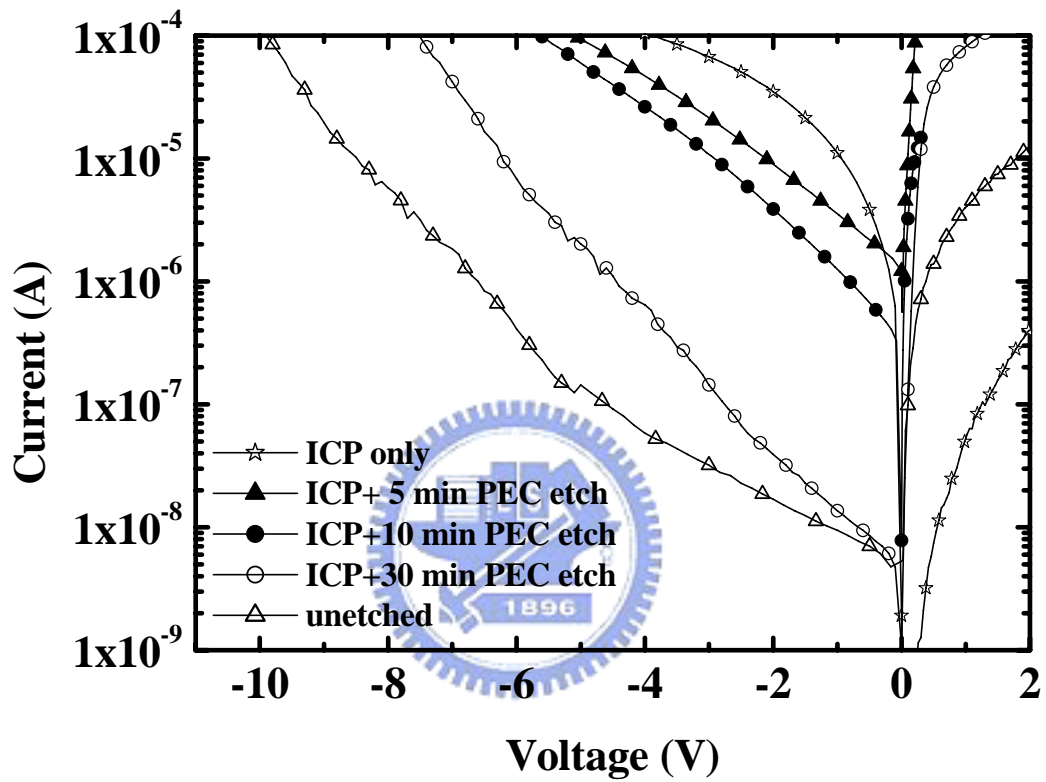


Figure 3-8. *I-V* curves of Schottky diodes after hybrid etch for AlGaN.

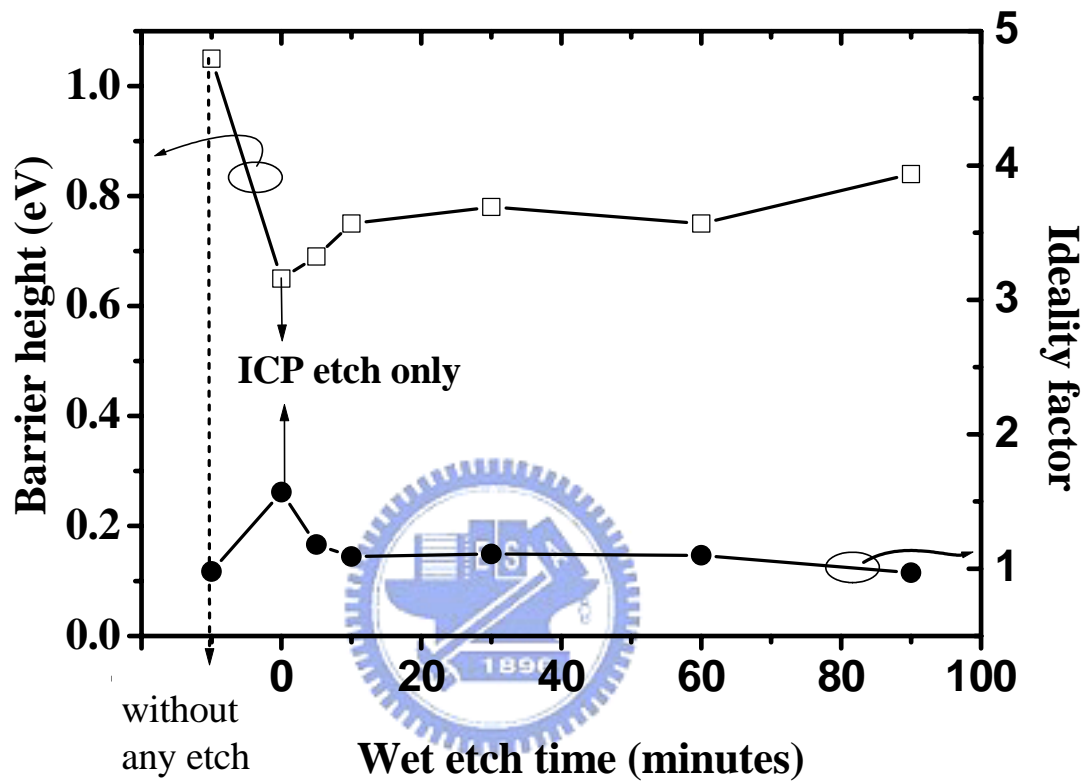


Figure 3-9. Barrier heights (Φ_b) and ideality factors (n) of Schottky diodes after hybrid etch for n-GaN.

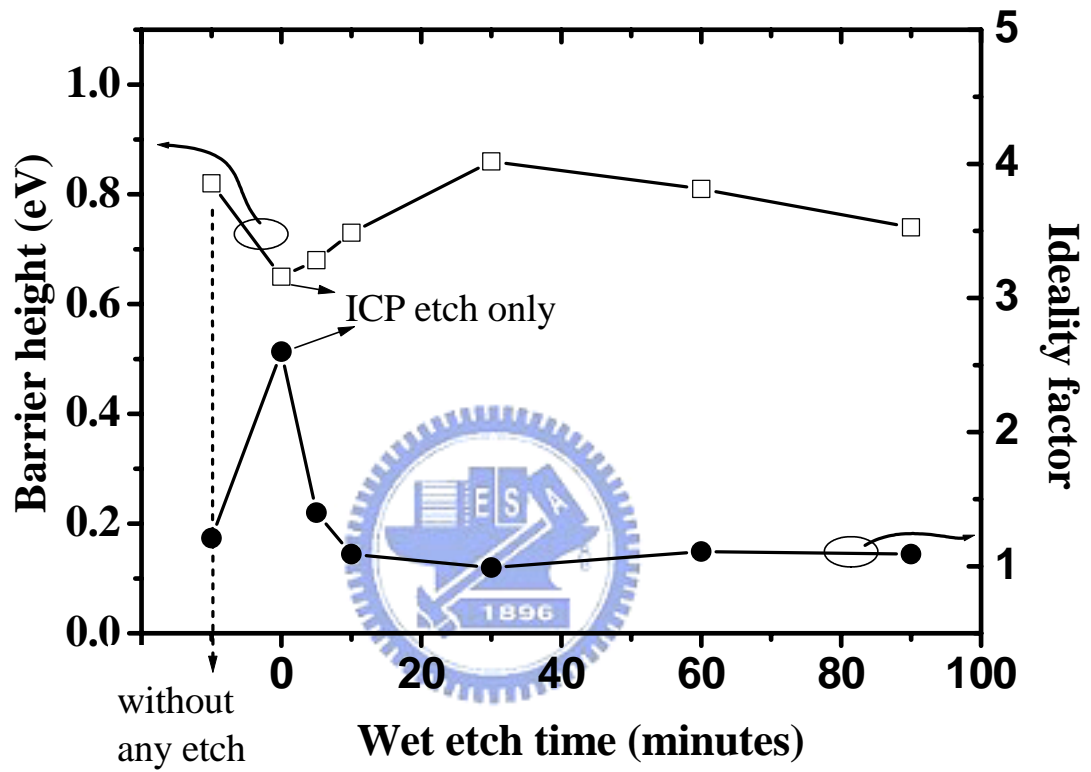


Figure 3-10. Barrier heights (Φ_b) and ideality factors (n) of Schottky diodes after hybrid etch for $\text{Al}_{0.15}\text{Ga}_{0.85}\text{N}$.

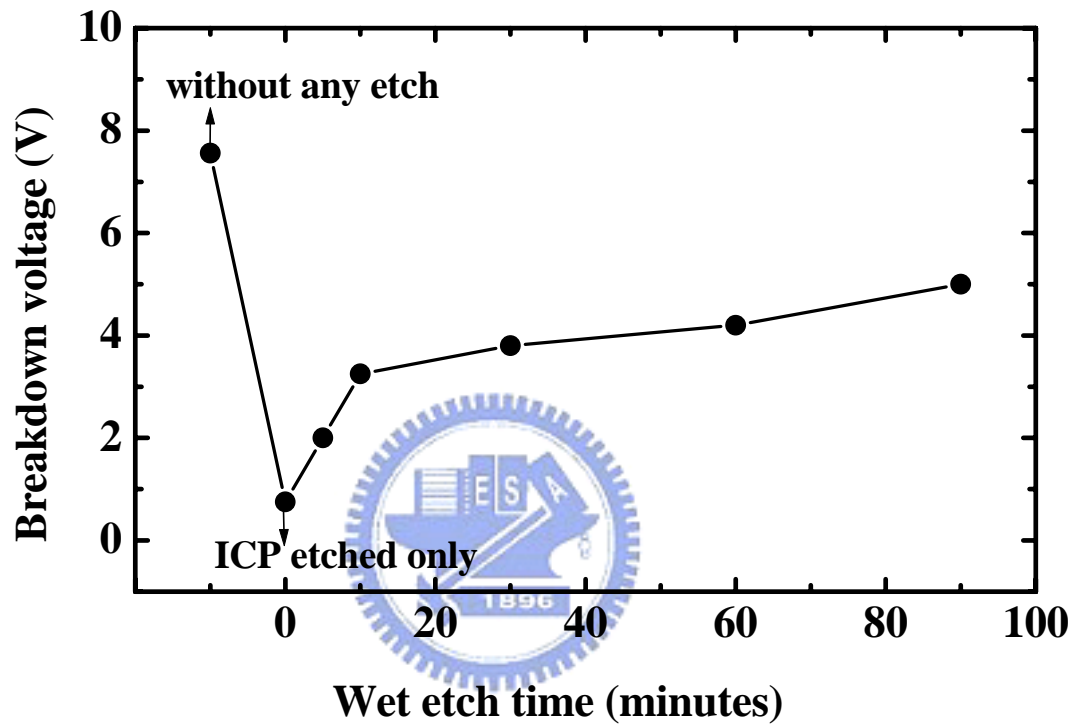


Figure 3-11. Breakdown voltages (V_B) after hybrid etch of Schottky diodes for n-GaN. All samples were etched by ICP with the flow rate of $\text{Cl}_2/\text{N}_2=10/10$ sccm, ICP/RF powers of 600/100 W, pressure 100 mtorr for 60 s followed by PEC etch by 0.04 M $\text{KOH}_{(\text{aq})}$ under $100 \text{ mW}/\text{cm}^2$ of UV exposure.

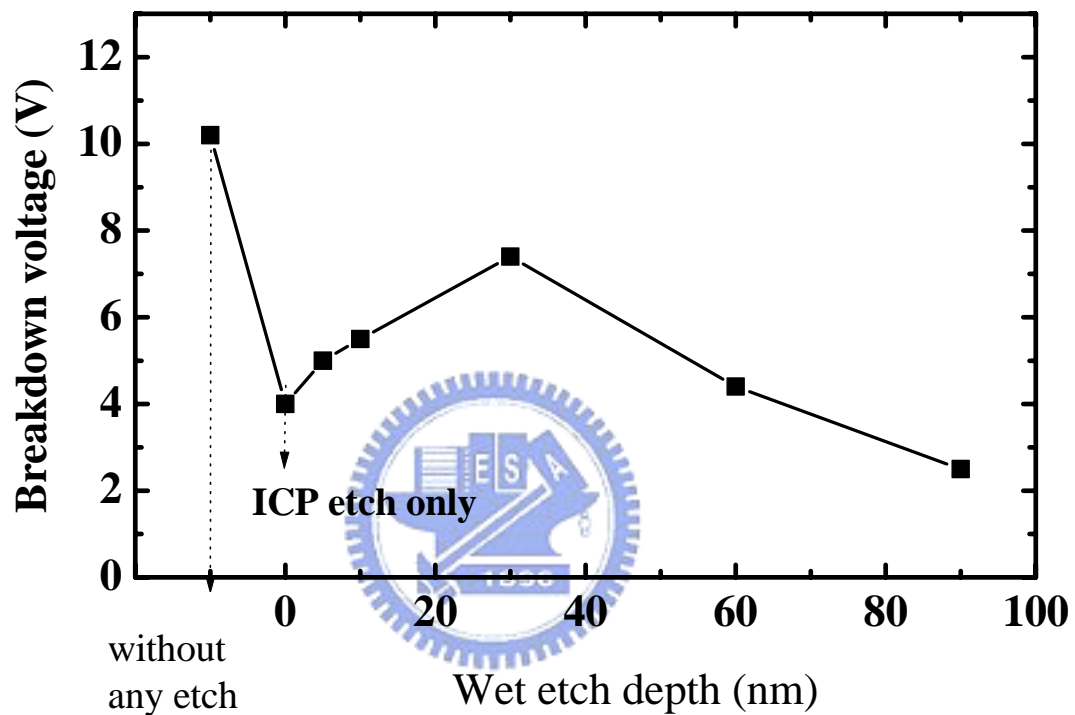


Figure 3-12. Breakdown voltages (V_B) after hybrid etch of Schottky diodes for $\text{Al}_{0.15}\text{Ga}_{0.85}\text{N}$. All samples were etched by ICP with the flow rate of $\text{Cl}_2/\text{N}_2=10/10$ sccm, ICP/RF powers of 600/100 W, pressure 100 mtorr for 60 s followed by PEC etch by 0.04 M $\text{KOH}_{(\text{aq})}$ under $100 \text{ mW}/\text{cm}^2$ of UV exposure.

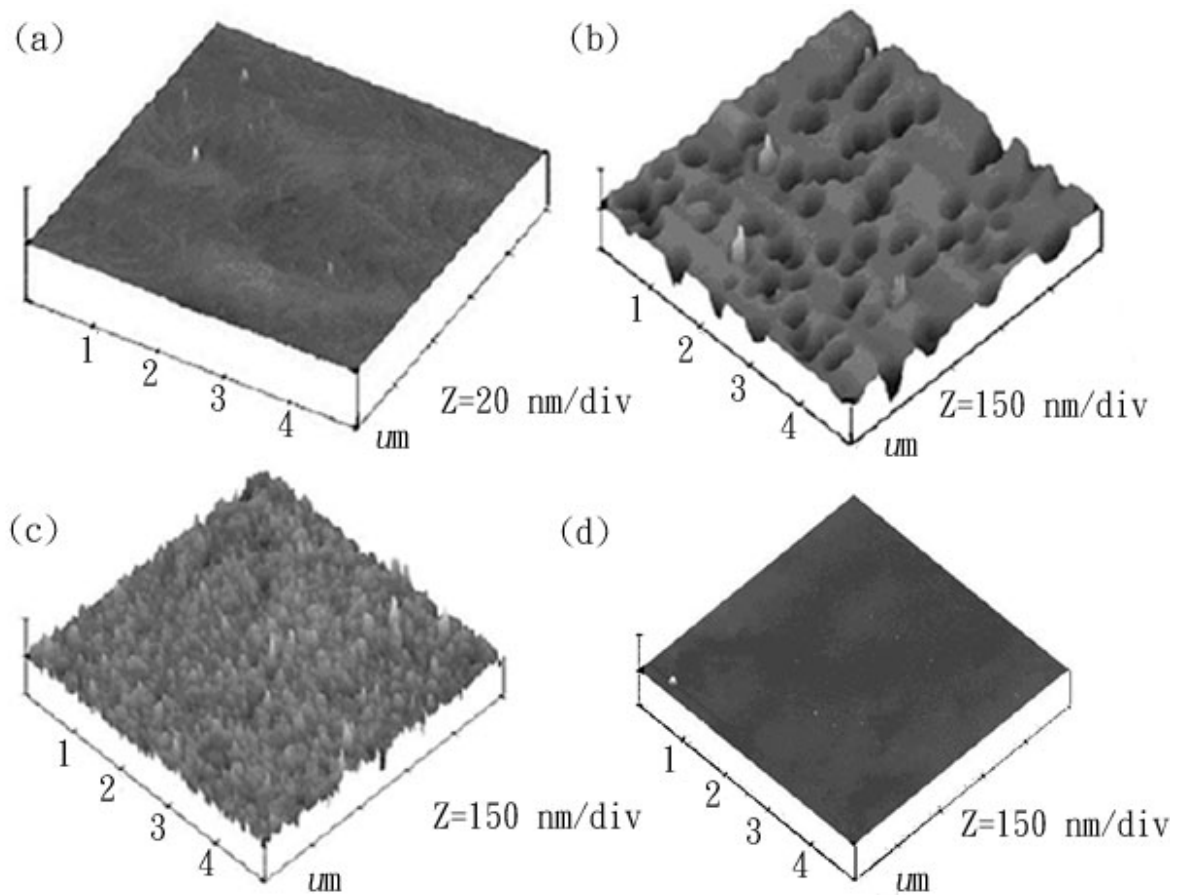


Figure 3-13. Surface morphologies of n-GaN. (a) as-grown, (b) ICP etch only, (c) ICP etch followed by 30 min of PEC etch, and (d) ICP etch followed by 60 min of PEC etch.

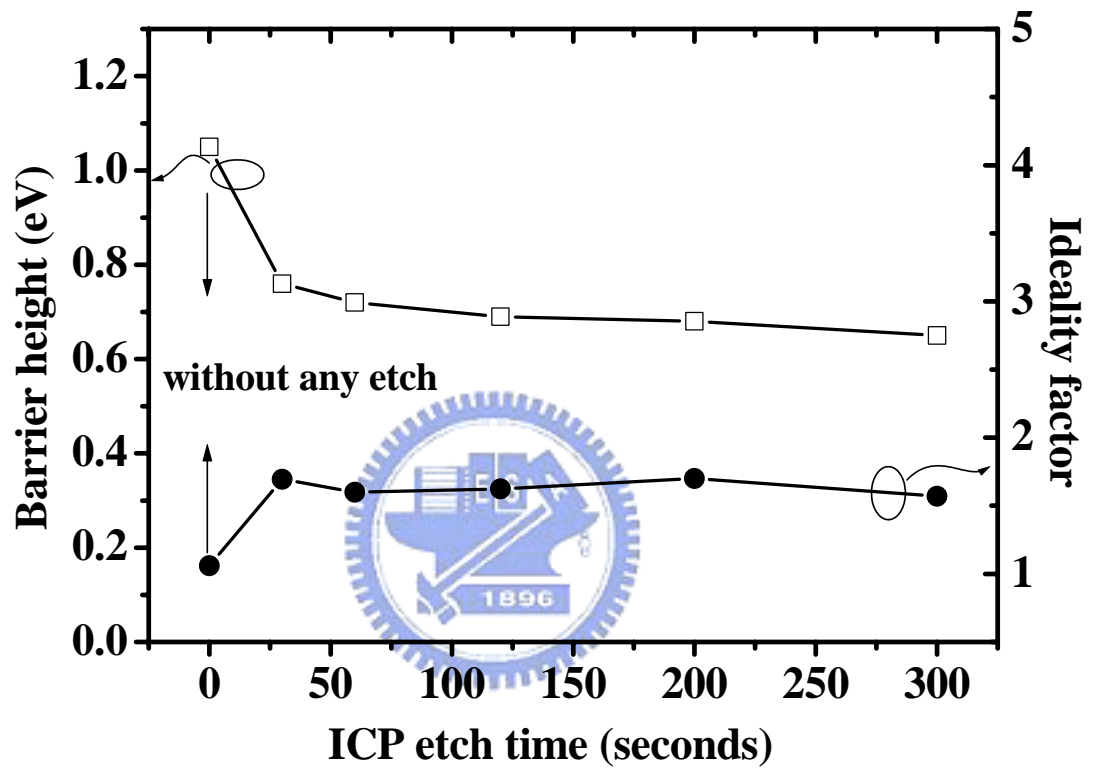


Figure 3-14. Barrier heights and ideality factors as a function of ICP etch time for GaN

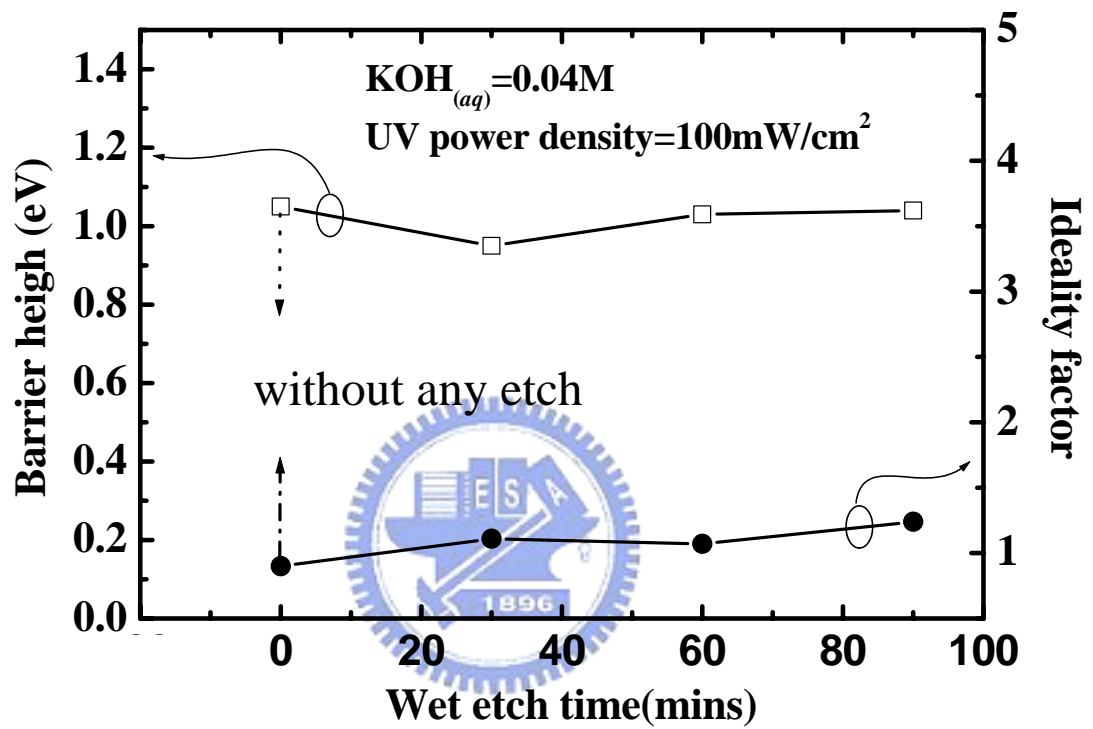


Figure 3-15. Barrier heights and ideality factors as a function of PEC wet etch time for GaN

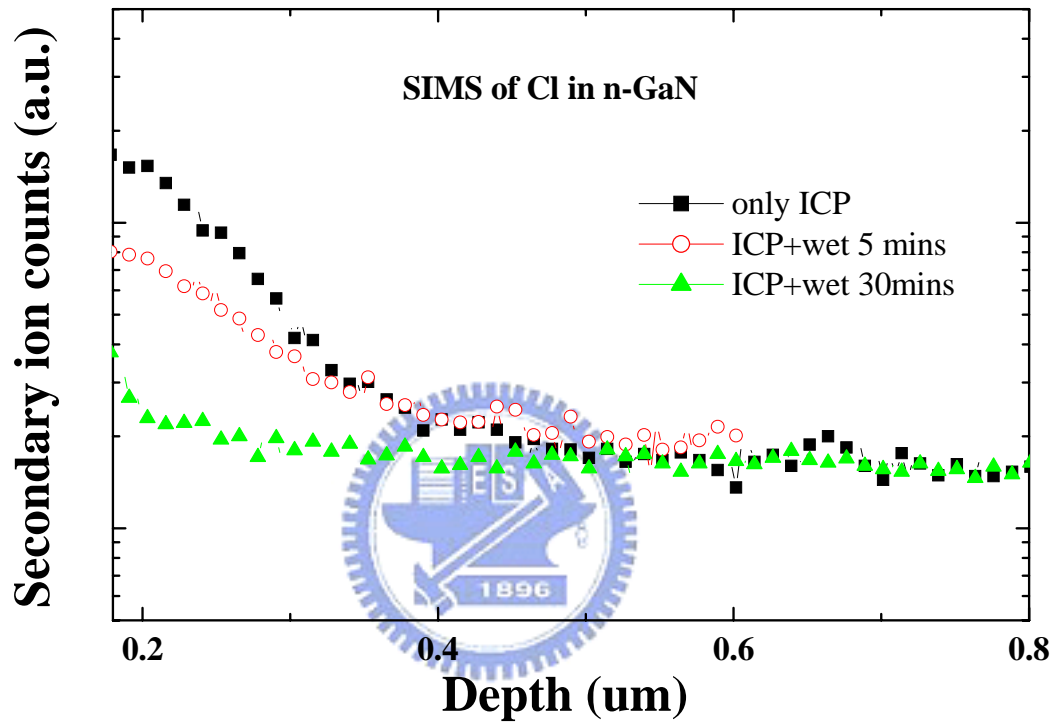


Figure 3-16. SIMS analysis of Cl atoms in GaN after hybrid etch. The penetration depth of Cl atoms were estimated about 1500 Å.

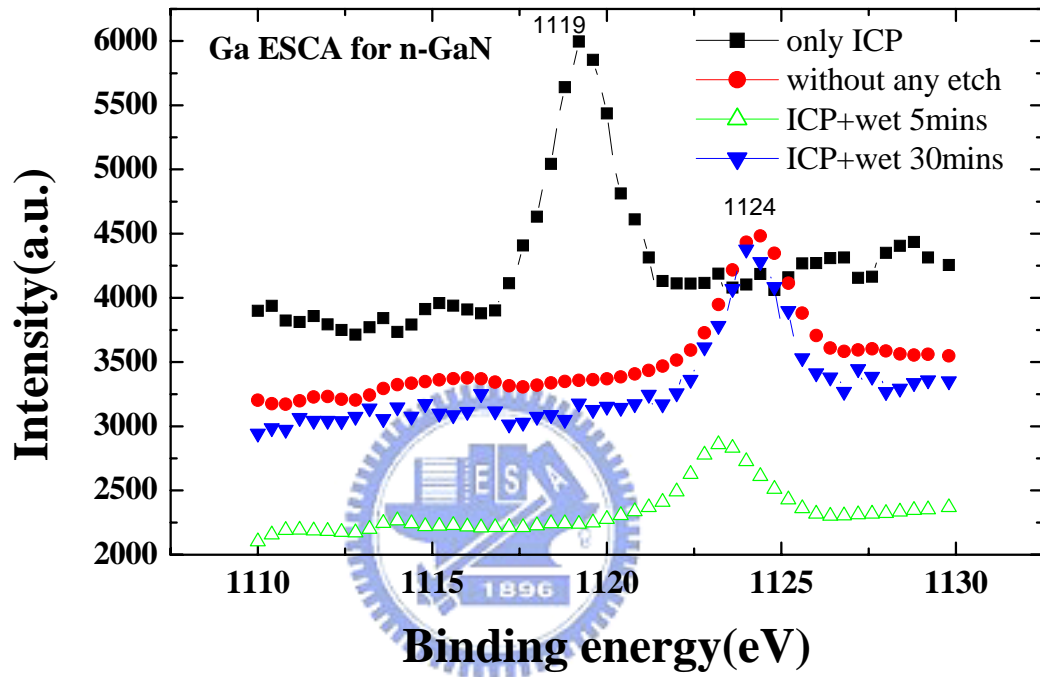


Figure 3-17. ESCA spectra of Ga atoms in n-GaN after hybrid etch.

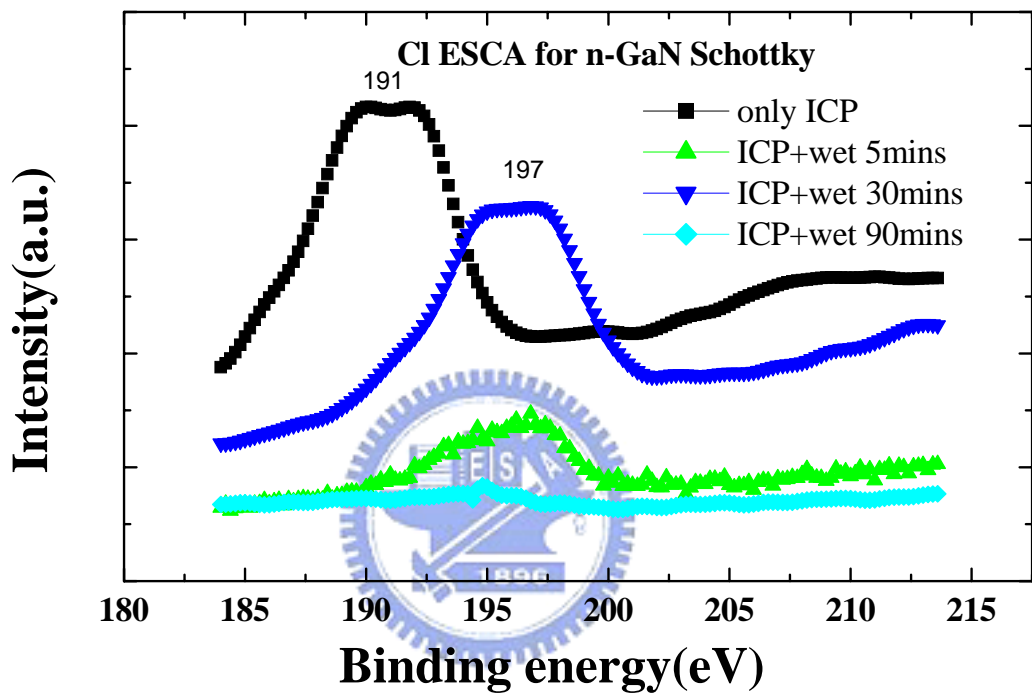


Figure 3-18. ESCA spectra of Cl atoms in n-GaN after hybrid etch.