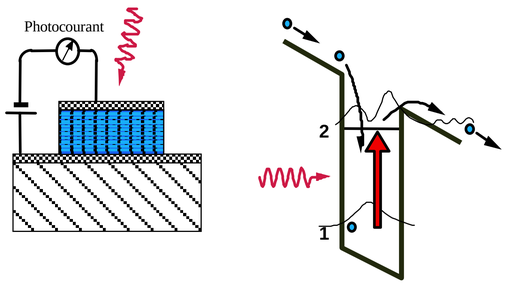
Journées J3N — Réseau National en Nanosciences et en Nanotechnologies — 6 au 8 novembre 2006

Ingénierie des Transitions Optiques Intrabandes des Nanostructures à base de III-V Nitrures

ACI I2N2
6th EFP STREP Nitwave (# 004170)

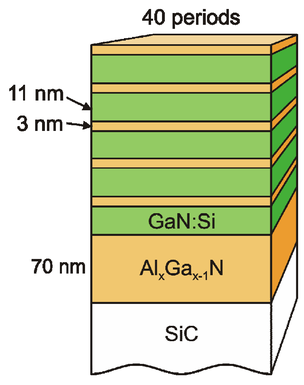
Pourquoi ralentir la relaxation ISB ?



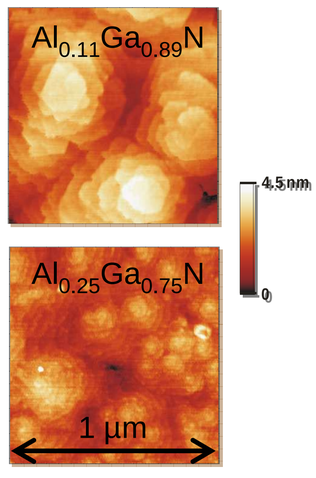
Détecteur Photoconducteur à Puits Quantiques (QWIP)

Réponse QWIP ∝ durée de vie τ_0 des électrons e_2
Contrôler τ_0 en contrôlant $(e_2 - e_1)$ > ou < LO
GaN LO = 92 meV (~ 13.5 µm)

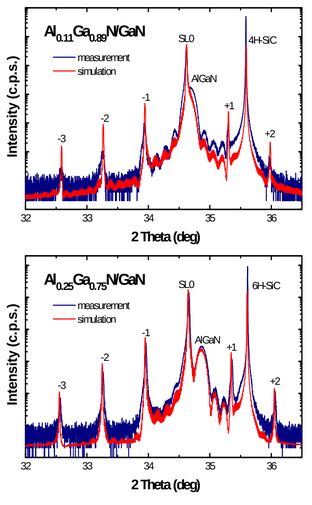
MPQ GaN/AlGaN Caractérisation structurale



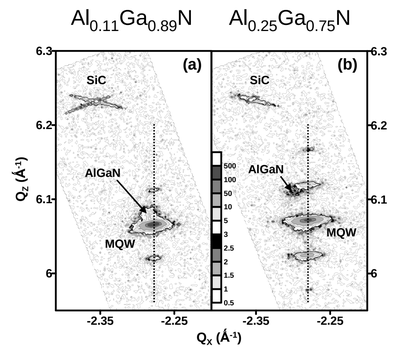
EJM plasma
Substrat SiC Novasic



Rugosité
RMS ~ 1 nm

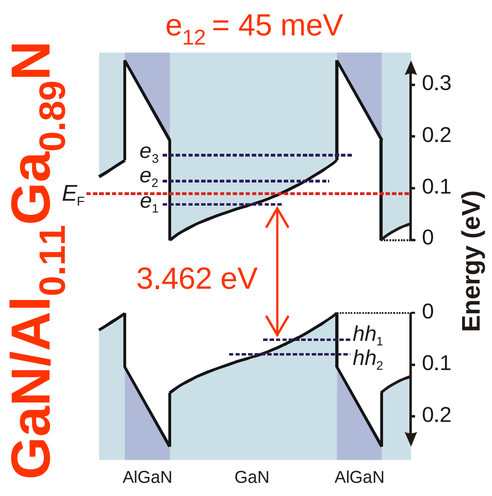


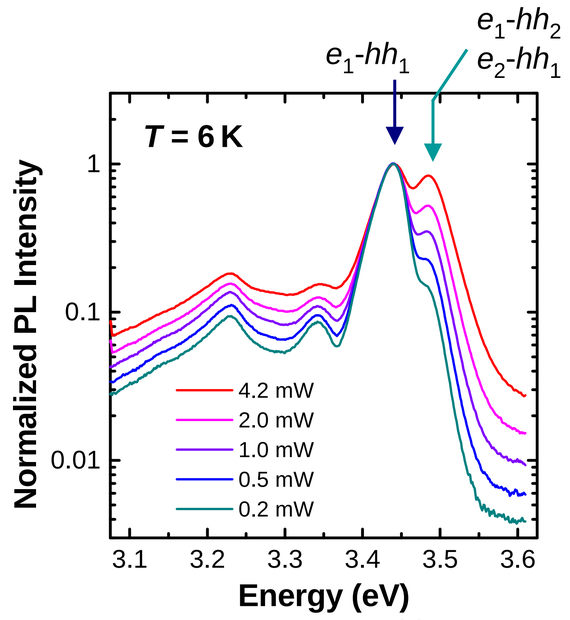
Buffer AlGaN relaxé à 90% avec substrat SiC
Barrère AlGaN cohérent avec GaN relaxé dans MPQ

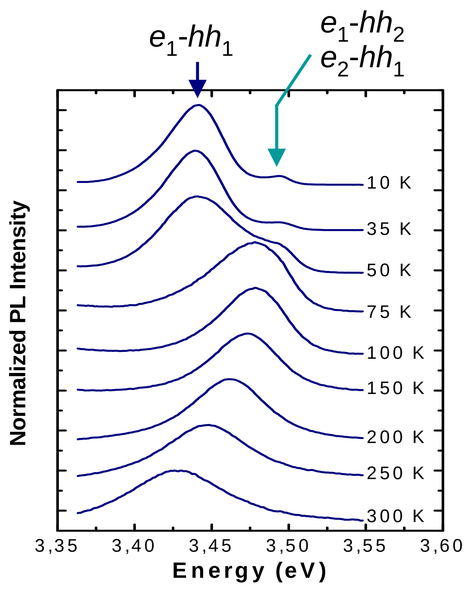


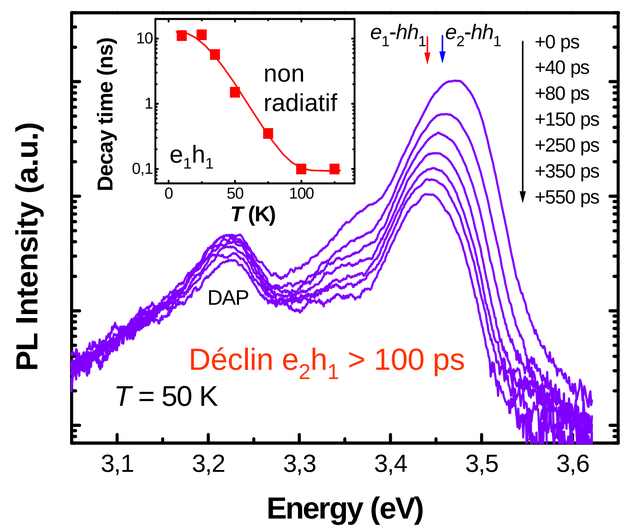
Reciprocal space map (-1015) reflection

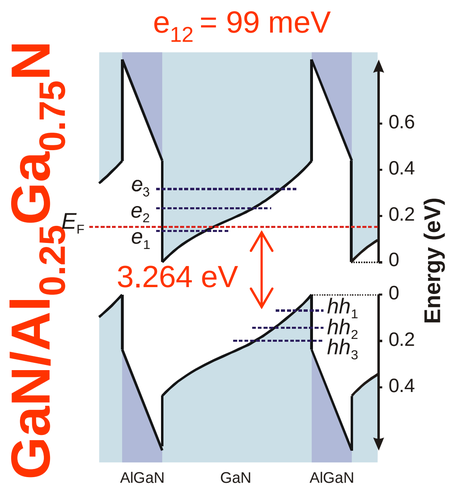
Modélisation des MPQ GaN/AlGaN Caractérisation optique

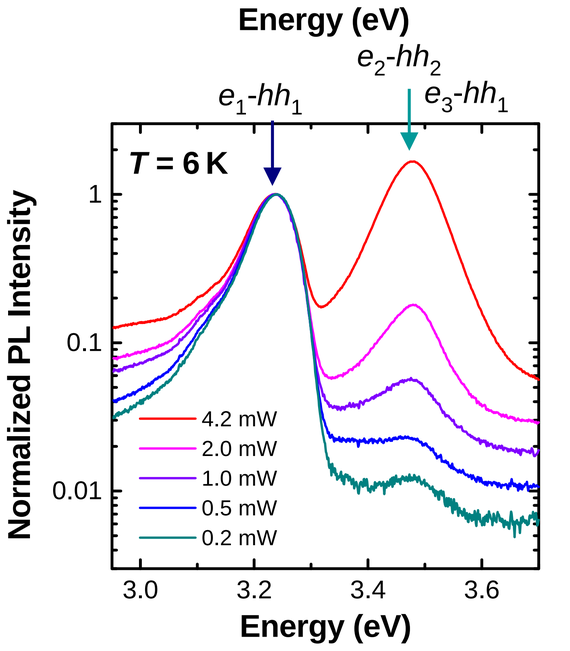


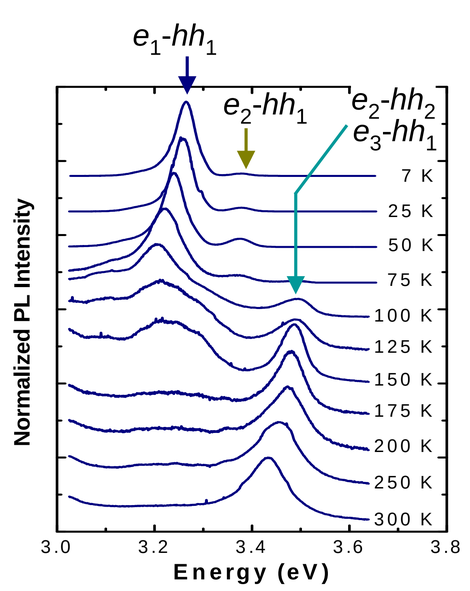


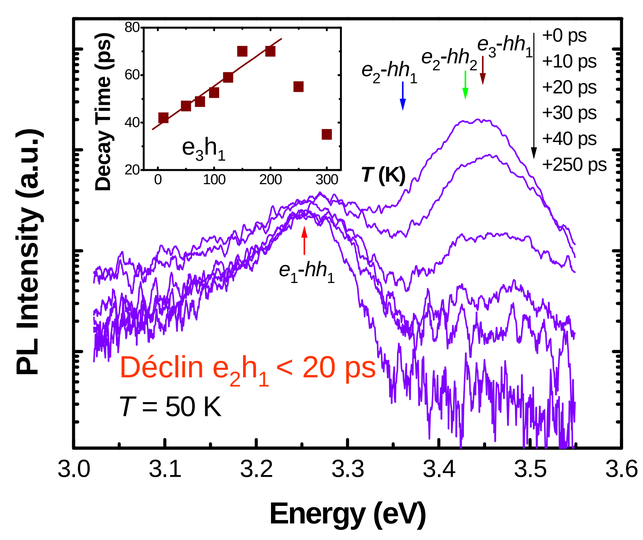












Poisson + Schrödinger auto-consistant
Force d'oscillateur $e_1h_1 << e_1h_2, e_2h_1, e_2h_2$

PL sous forte excitation Nd:Yag
Saturation de e_1h_1

PL en fonction de la température
"Quenching" de e_1h_1, activation thermique des états excités

Dynamique de la PL
Relaxation de e_2 fortement dépendant de e_{12}

CONCLUSIONS *Modélisation satisfaisante de MPQ GaN/AlGaN*

Relaxation ISB fortement ralentie si $(e_2 – e_1) < LO$

Observation of hot luminescence and slow ISB relaxation in Si-doped GaN/AlGaN MQW structures

E. Monroy et al., J. Appl. Phys. 99, 093513 (2006)

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