

# 光電化學製程在氮化鎵發光二極體製作上之應用

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## 摘要

本論文中，我們證明利用偏壓輔助光電化學技術能夠提升氮化鎵/氮化鎵發光二極體之光取出效率。偏壓輔助光電化學製程為一高反應速率且能將n型氮化鎵的表面粗化並蝕刻邊壁形成倒梯形形狀外貌的方法。表面粗化與倒梯形形狀的晶粒能夠降低內部全反射而提升其光取出效率。在此我們使用兩種不同方向照光的光電化學反應，其一為垂直於表面照光，其二為平行於表面。利用垂直照光式光電化學法對於n型氮化鎵進行反應，能使其形成粗糙的表面；使用水平照光式光電化學反應能同時將n型氮化鎵表面進行粗化並將邊壁蝕刻形成倒梯形形狀的外貌。經由光電化學處理後的試片，我們使用掃描式電子顯微鏡以及原子力顯微鏡來觀察表面形貌，並對元件量測其電壓-電流特性曲線與電流-光輸出強度曲線。在本實驗中，嘗試改變不同的氫氧化鉀濃度與偏壓進行反應並對元件特性進行量測。利用2V偏壓輔助於0.1M、0.5M、1M與2M的氫氧化鉀中進行垂直照光式光電化學反應，反應後其發光效率分別能提升13.4%、33.87%、47.34%與29.7%。此外，利用2V偏壓輔助於1M的氫氧化鉀中進行水平照光式光電化學反應能將發光效率提升至52.23%。

關鍵詞：光電化學反應；n型氮化鎵表面；邊壁

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