

AllInGaN Based Light Emitters

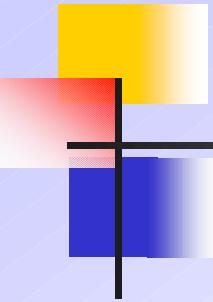
by

Dr. Asif Khan

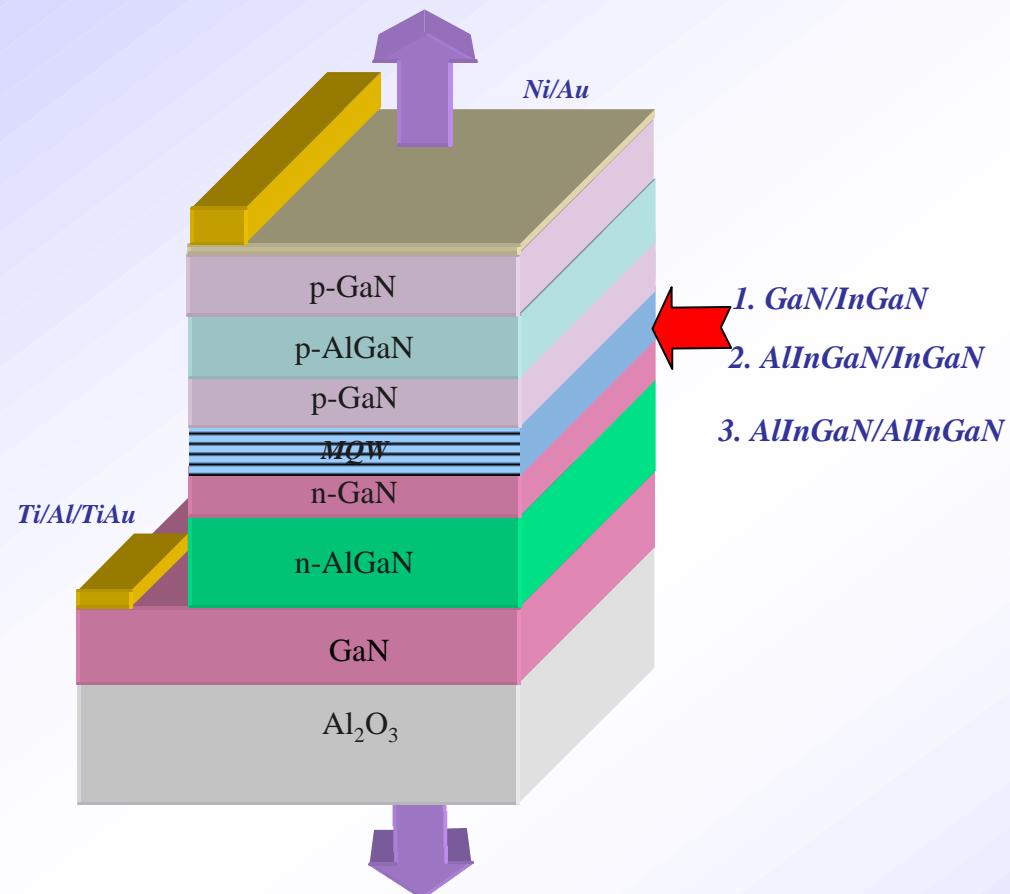
Chairman, Dept. of Electrical Engineering,
College of Engineering and Information Technology,
University of South Carolina.
asif@engr.sc.edu

Work sponsored by: Army/BMDO, NASA, CIA, and industrial collaborators

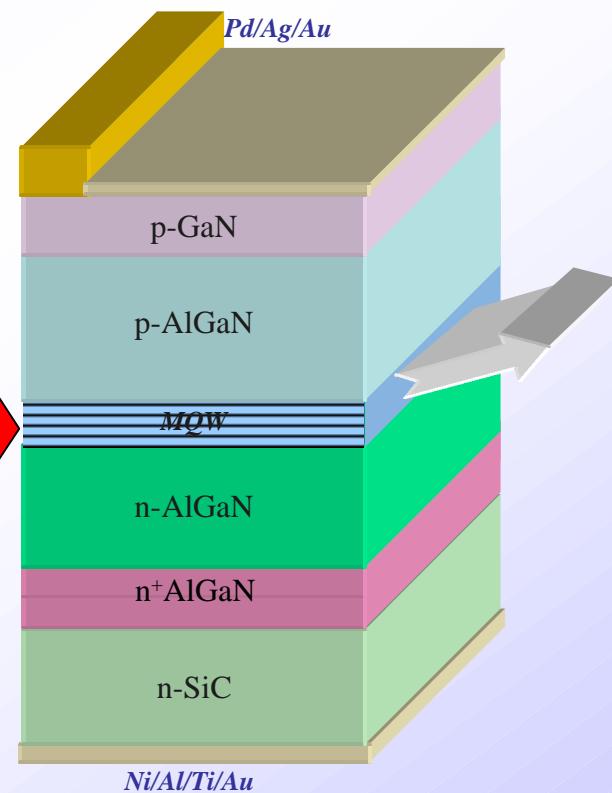
MQW LED structures on Sapphire and n-SiC

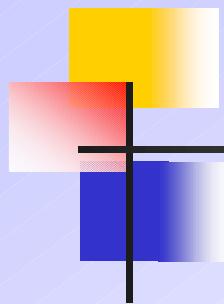


Purple Emission 420-440 nm



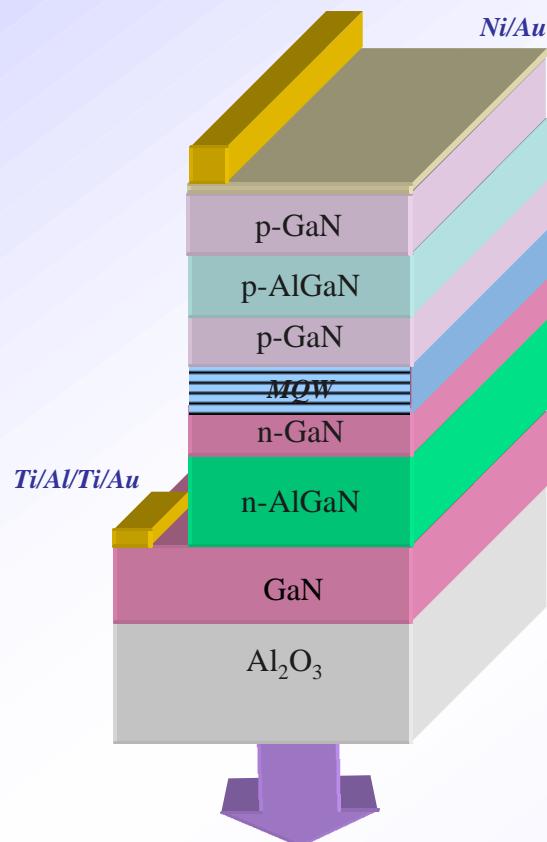
Ultraviolet emission <360 nm



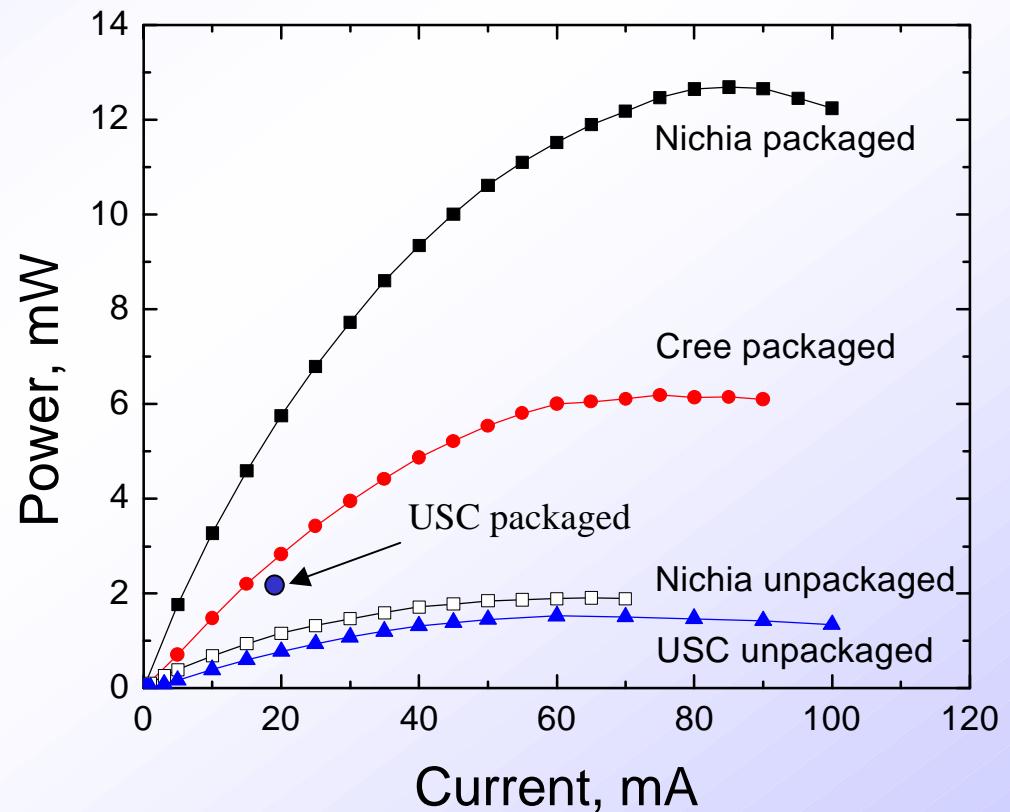


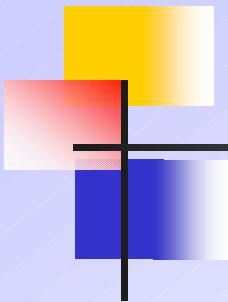
GaN-InGaN MQW LED structures on Sapphire

Emission 420 nm



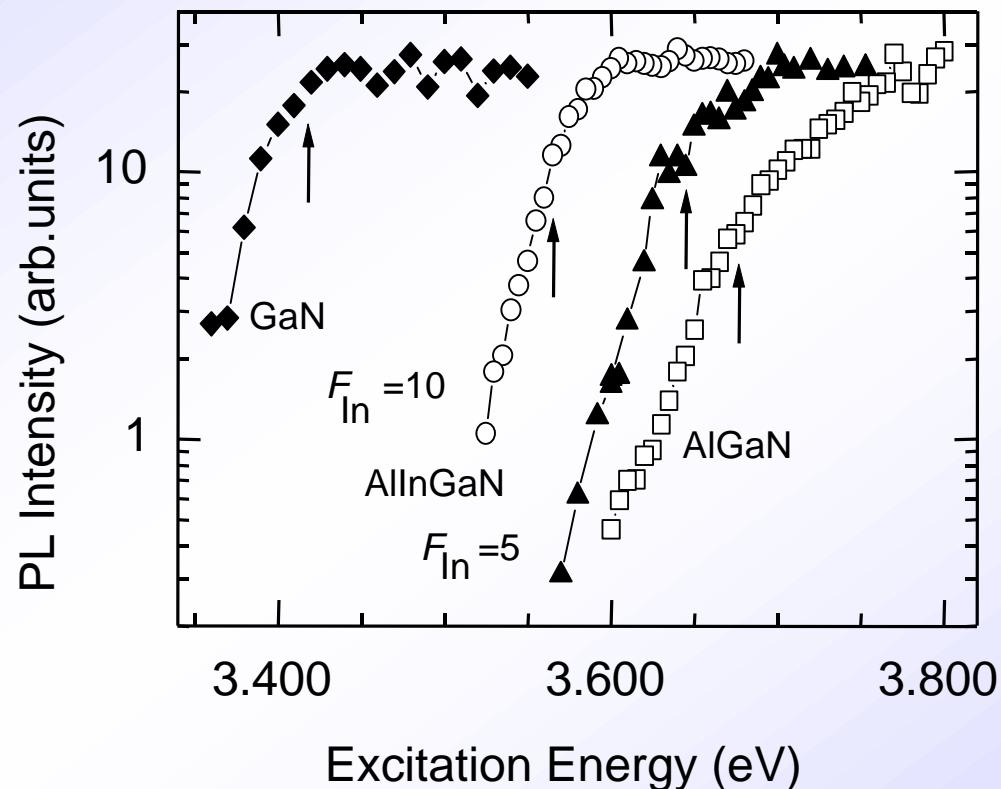
4 x GaN(50 A)-InGaN(25 A) MQWs



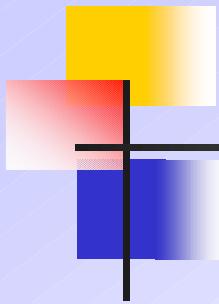


Optical Band Gap Formation in AlInGaN Alloys

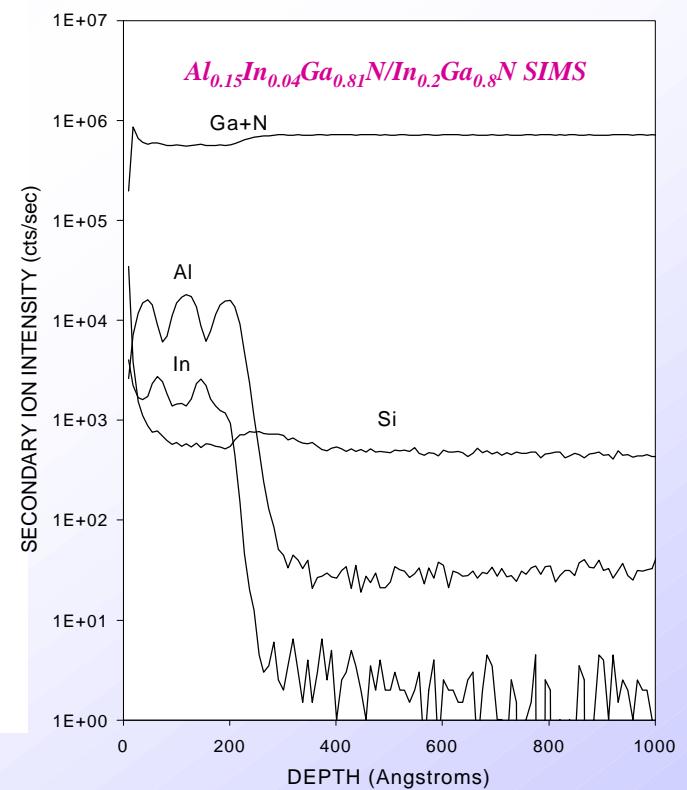
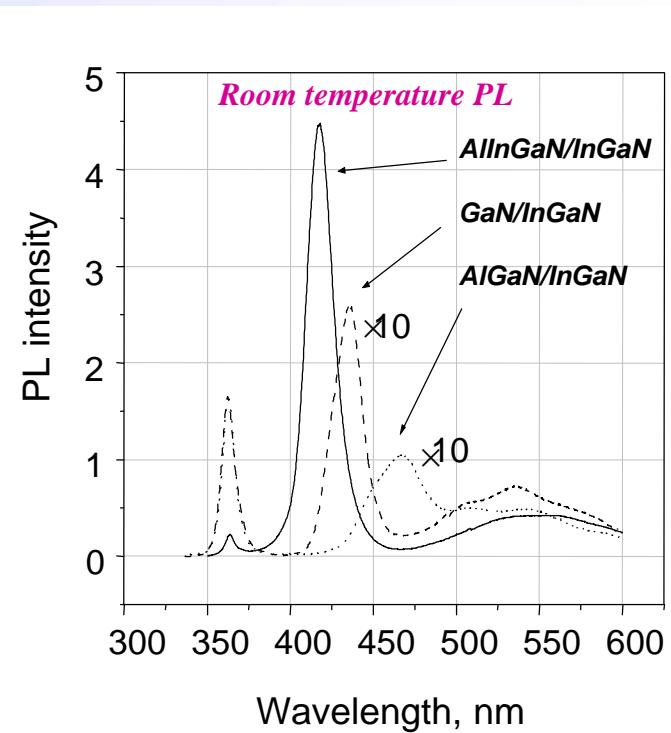
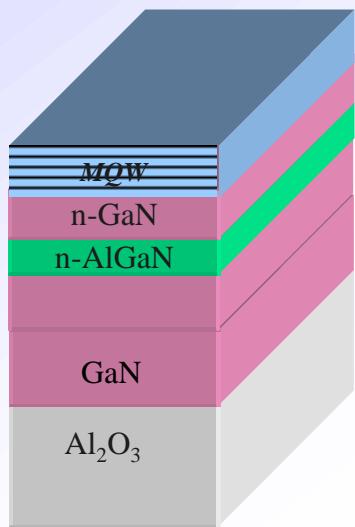
Room temperature PLE Study-AlInGaN layers over GaN on sapphire



“Optical Band Gap Formation in AlInGaN Alloys” G. Tamulaitis, K. Kazlauskas, S. Juršėnas, and A. Žukauskas, M. A. Khan, J. W. Yang, Jianping Zhang G. Simin, R. Gaska and M. S. Shur,, APL Oct. 9, 2000

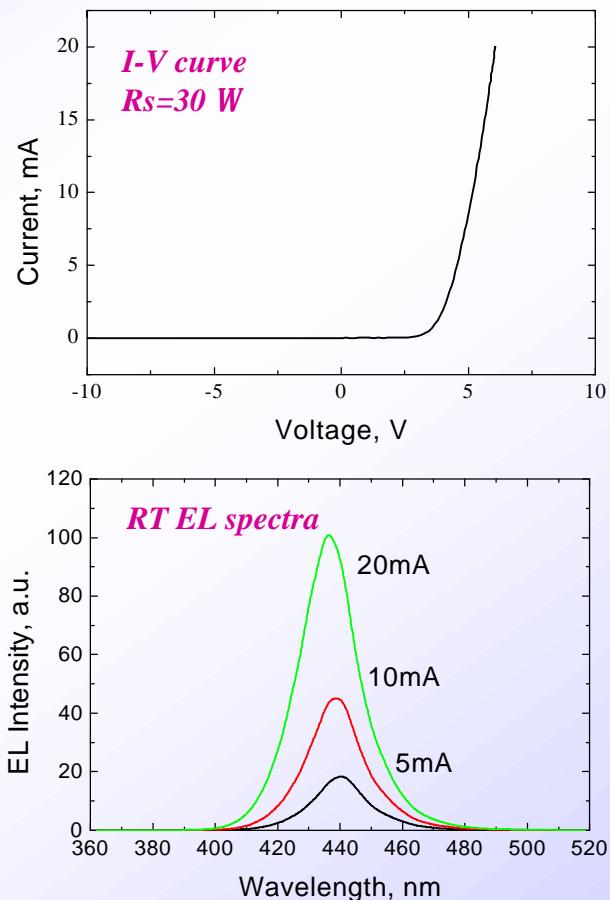
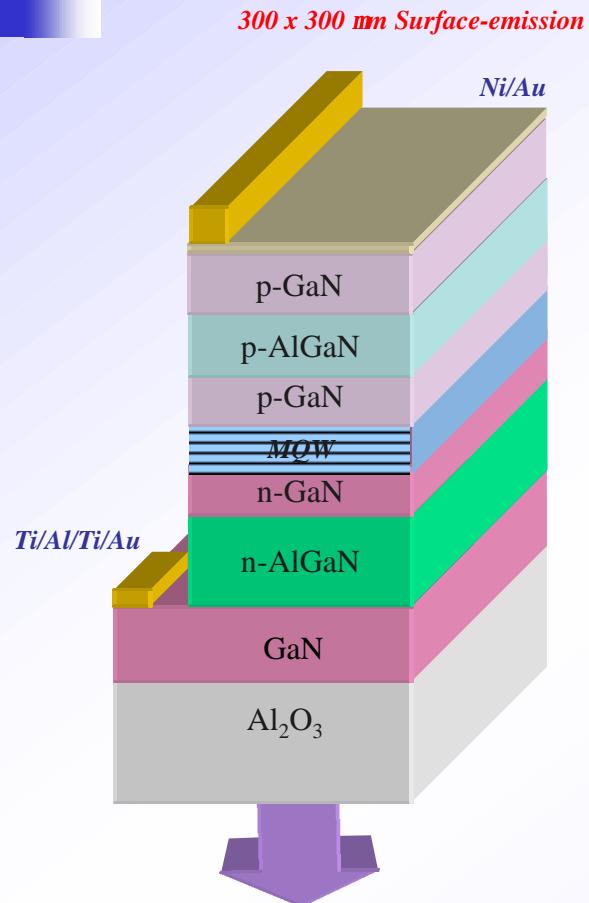
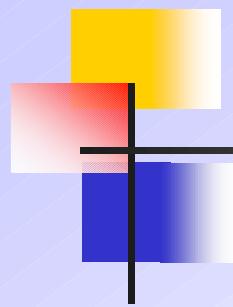


AllInGaN-InGaN MQWs over sapphire



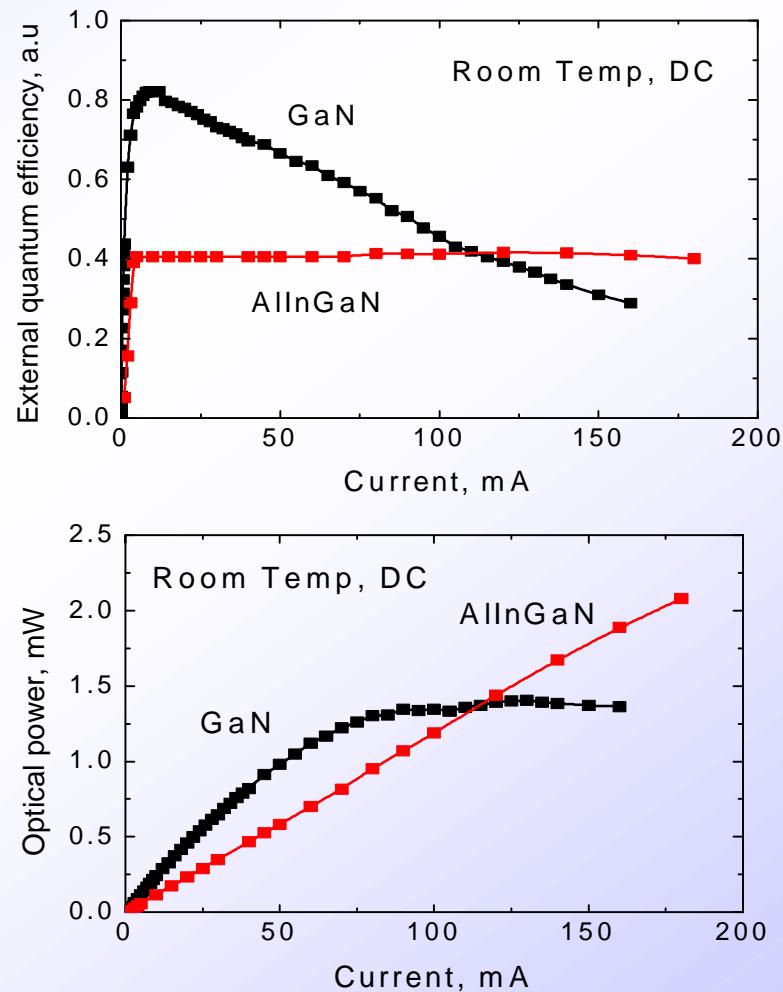
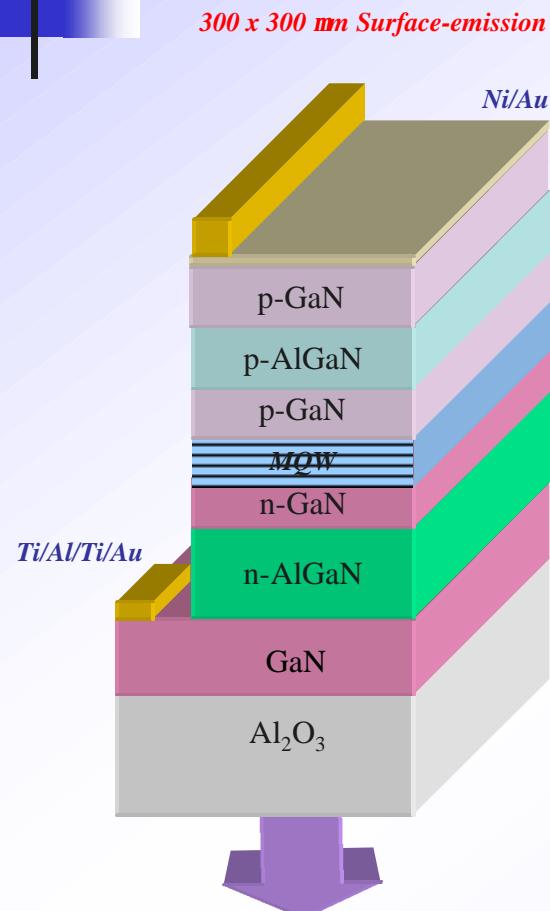
"Enhanced Luminescence in InGaN Multiple Quantum Wells with Quaternary AlInGaN Barriers" Jianping Zhang, J. Yang, G. Simin M. Shatalov, M. Asif Khan, M.S. Shur and R. Gaska Appl. Phys. Lett. V. 77, N 17, pp. 2668-2670 (2000)

AlInGaN-InGaN MQW LEDs over Sapphire



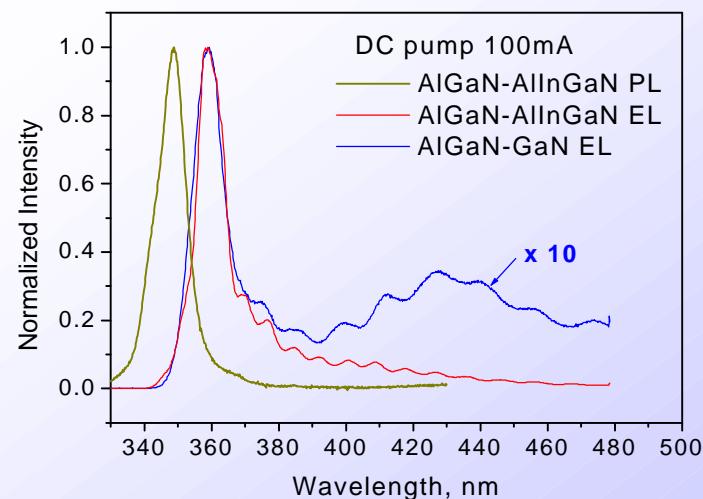
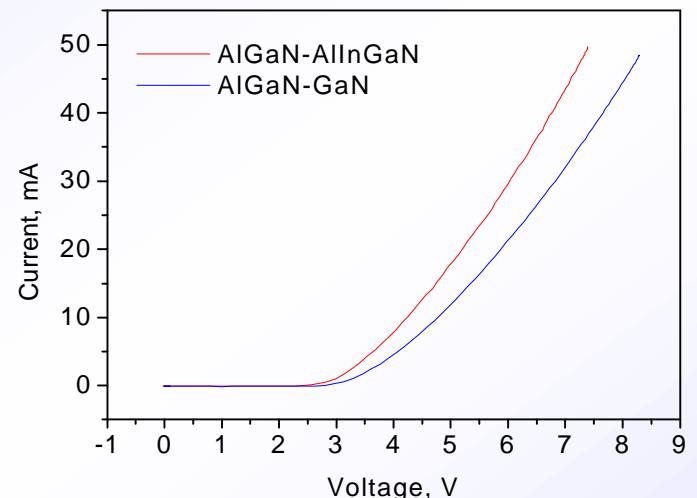
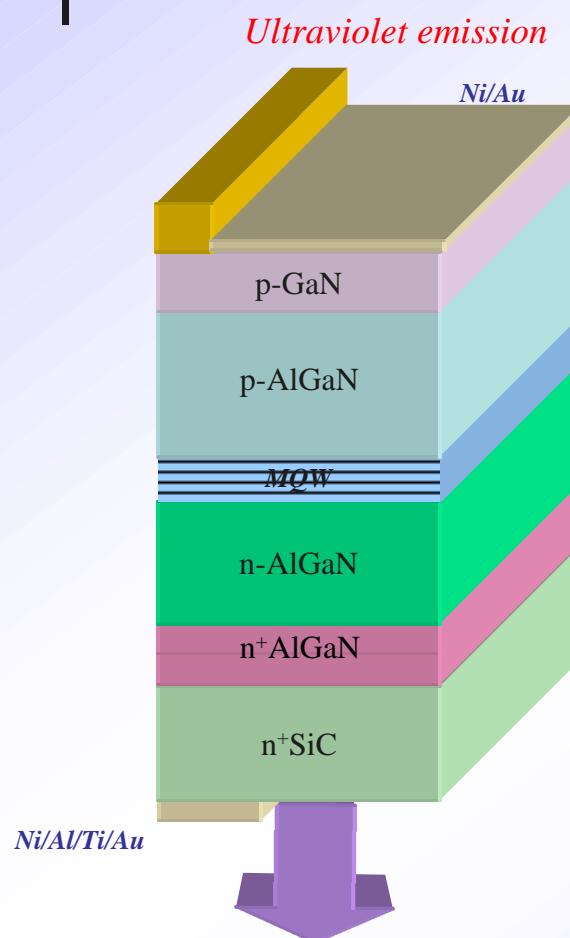
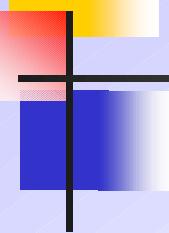
"High-Quality p-n Junctions With Quaternary AlInGaN/InGaN Quantum Wells", A. Chitnis, A. Kumar, M. Shatalov, V. Adivarahan, A. Lunev, J. W. Yang, G. Simin, M. Asif Khan, R. Gaska and M. Shur, *Appl. Phys. Lett.*, v77, pp 3880-3802(2000)

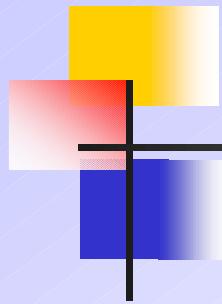
Emission characteristics of AlInGaN/InGaN and GaN-InGaN MQW LEDs



"Band Edge Luminescence in Quaternary AlInGaN Light Emitting Diodes", M. Shatalov, A. Chitnis, V. Adivarahan, A. Lunev, J. Zhang, J. W. Yang, Q. Fareed, G. Simin, A. Zakheim*, M. Asif Khan, R. Gaska, M. S. Shur, *Appl. Phys. Lett.* 78, 817-819 (2001)

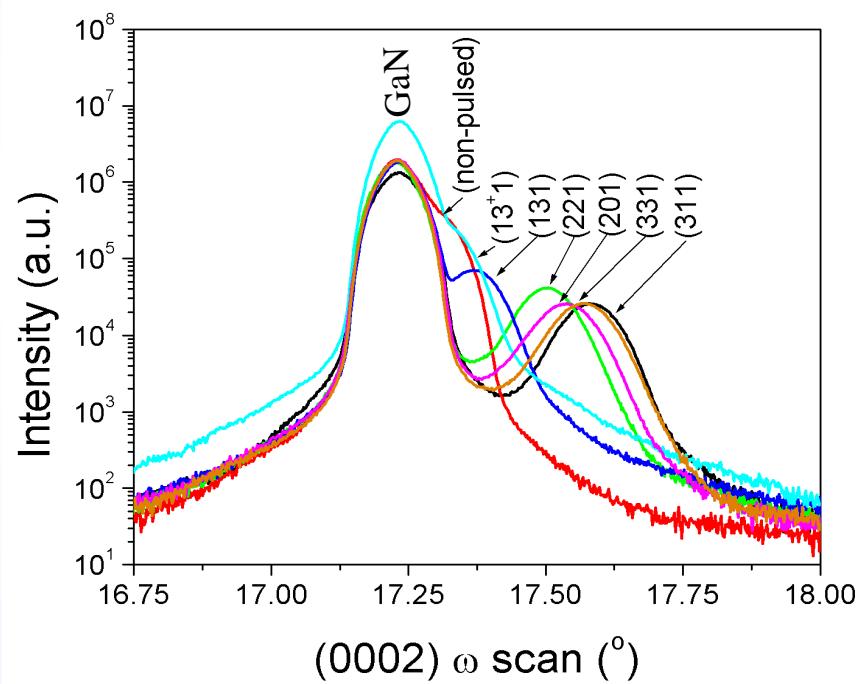
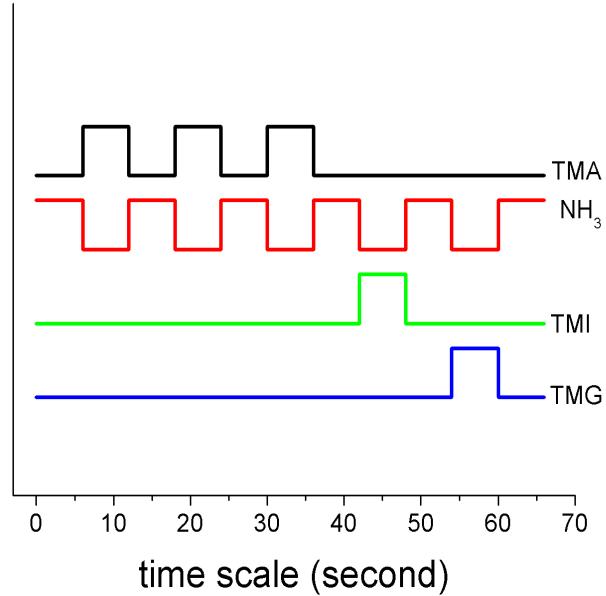
Surface Emitting LED structures using AlGaN-AlInGaN and AlGaN-GaN MQWs

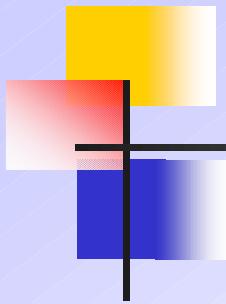




Pulsed Atomic Layer Epitaxy of Quaternary AlInGaN Materials

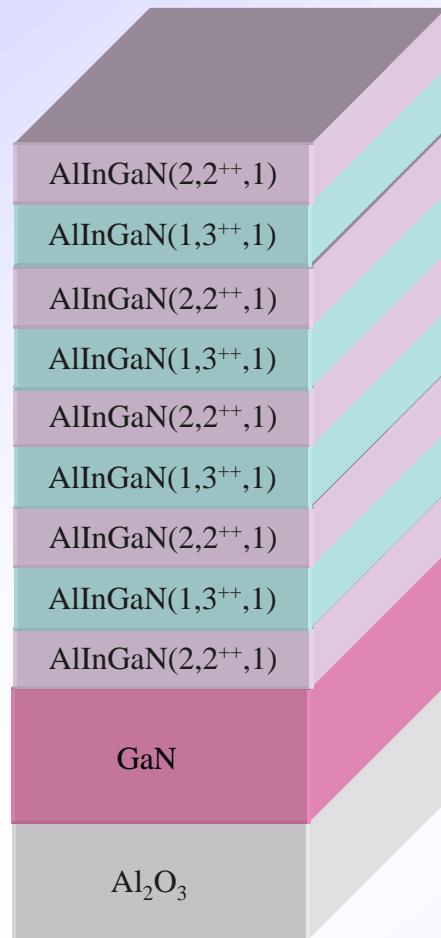
Growth sequence and XRD data



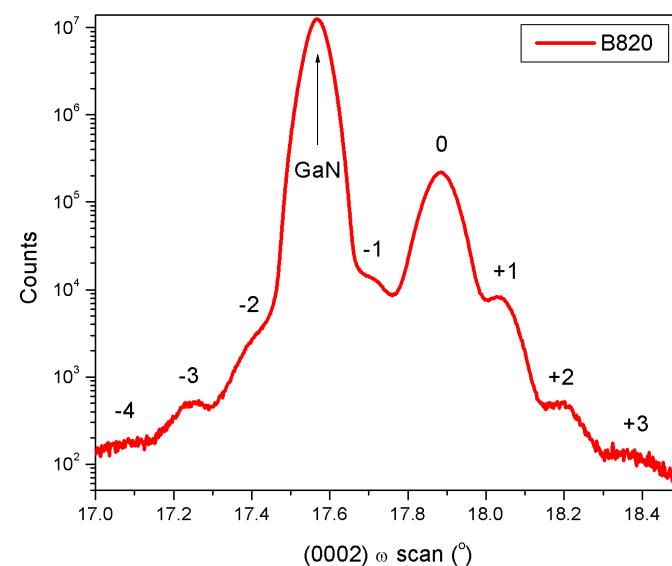


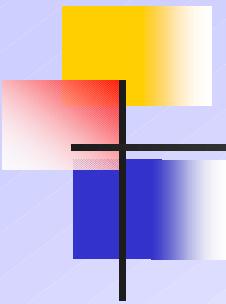
Pulsed Atomic Layer Epitaxy of Quaternary AlInGaN MQWs

XRD data



**4(AlInGaN/AlInGaN)QWs/I-GaN/Sapp.
(2,2⁺⁺,1)/(1,3⁺⁺,1)**





Pulsed Atomic Layer Epitaxy of Quaternary AlInGaN MQWs

Room temperature PL

