



DEPARTMENT OF ELECTRICAL ENGINEERING

Graduate Seminar Guest Speaker

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“Active Micro/Nano Heterojunction GaN/ZnO White LEDs and GaN Nanorods“

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ABSTRACT

Currently, ZnO/III-nitride heterojunction semiconductors are of considerable technological interest as one of the most important semiconductor materials for applications in optoelectronics, sensors and light emitting diodes. However, the properties of ZnO/III-nitride heterojunction devices are still an unexplored area of research that have great potential for scientific impact. Herein, I present the observation and origin of phosphor-free white electroluminescence in ZnO/III-nitride heterojunction devices. The origin of electroluminescence spectra of yellow, green and blue light is directly correlated with photoluminescence spectral features. However, this is not true for reddish-orange emission. It is found that the observed reddish-orange emission is related to recombination of electrons from the conduction band of InGaN active layer with holes in a quantum well formed from a large valence band offset on the ZnO side of the interface. Furthermore, micro/nano scale dot emissions of blue, green, yellow and reddish-orange were observed and correlated with electroluminescence spectral features. An immature model is suggested to explain micro/nano dot emission. Finally, self-aligned GaN nanorods have been investigated using InGaN buffer layers on ZnO substrates. Formation of GaN nanorods is strongly related with the stacking faults induced at the interface of InGaN buffer layers at higher In flux. Finally, the optical properties of GaN nanorod and film have been compared

BIOGRAPHY

Dr. Gon Namkoong received his B.S. in the Department of Physics in South Korea in 1996. He was selected as the best qualified student at the Chonbuk National University in South Korea and received the honor of being invited to the Korean President's Presidential Residence of South Korea as one of the future young scientists. Upon his graduation from the Department of Physics, he continued his graduate study and received the Ph.D. in the Department of Electrical and Computer Engineering at the Georgia Institute of Technology in 2003. Since 2003, Dr. Namkoong is continuing his researches as a research faculty at the same institute. His principal interest is in the development of nitride-based materials and devices on innovative substrate materials as well as applying new growth techniques to facilitate material and device improvements. Dr. Namkoong has been intimately involved in the creation of novel optoelectric/electronic devices and novel integration technologies to overcome current device performance limitations allowing for new levels of multifunctional devices. He has authored/co-authored over 60 research papers/presentations as well as numerous technical reports and invention disclosures. Dr. Namkoong is currently a Member of IEEE and TMS.