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TOPIC:

Ammonia MBE based GaN-HEMT growth on Silicon

ABSTRACT:

GaN based HEMTs (high electron mobility transistors) have received extensive interest in the research community over the last two decades for high frequency and high power applications. Growth of these heterostructures by MBE technique has been found advantageous due to the low impurity incorporation, sharp interfaces and the capability of in-situ growth monitoring. However, the III-nitride growth on Si substrate as a possible cost-effective solution is challenging due to high lattice and thermal mismatch, which results in cracking of these epitaxial layers. This presentation focuses on the growth and optimization of AlGaIn/GaN HEMT heterostructures on high resistivity Si(111) substrates using ammonia-MBE growth process. Some comparison will be made with respect to conventional plasma assisted MBE process. The stress management in device structures using different stress mitigating layers (SMLs) to obtain crack-free epilayers will be discussed. 2DEG properties and GaN-HEMT device results will be presented. The talk will also address and present recent results on AlGaIn/GaN/AlGaIn double heterojunction (DH) HEMTs to obtain improved confinement of 2DEG and higher buffer break-down voltage compared to SH-HEMTs.

PROFILE:

K. Radhakrishnan received his M. Tech in Materials Science from IIT Kanpur, and PhD in Physics from National University of Singapore in 1989. He joined Nanyang Technological University, Singapore in 1993, where he is an Associate Professor in the School of Electrical and Electronic Engineering. His research interests include MBE growth and characterization of III-V and III-N materials for various applications including high speed and high power devices and MMICs. Other areas of interest include oxide based solar cells, gas sensors, and nanostructures. He has organized international symposium and conferences in the area of III-V Semiconductors and Nanoelectronics. He has published more than 200 papers in International Journals and Conference Proceedings.