

# SESSION 9

## GaN ANNEALING/PASSIVATION

**Chairs: Paul Pinsukanjana, IntelliEPI**  
**Scott Sheppard, Cree, Inc.**

This is a process session that focuses on two extremely important aspects of III-Nitride device processing technology: thermal treatment and surface passivation. Thermal annealing is used in many aspects of GaN processing, so we highlight papers on ohmic contact formation, post-deposition gate dielectric anneal and thermal oxidation of AlGaN/GaN HEMTs. Two aspects of AlGaN/GaN HEMT surface passivation are also highlighted. The first paper of Session 9 covers the extremely interesting topic of ALD for GaN. In this contribution, a key issue of achieving low defect densities at interfaces of III-nitride materials will be addressed, as well as several relevant ALD processes and surface treatments. Our second paper will give a detailed comparison of LPCVD- and PECVD-SiNx passivation for AlGaN/GaN HEMTs, showing some exciting benefits of the LPCVD-SiNx method such as improved RF power performance and significantly reduced gate leakage current. The third paper in our session is the first of two student papers in Session 9. High-quality (smooth), high-performance (low RCON) are still important topics for AlGaN/GaN HEMT device manufacturers, and S.C. Shen's group from GTRI adds extremely valuable new data to this topic by ejecting the standard ohmic metallurgy to demonstrate "Low-Annealing-Temperature Process Using Si-Incorporated Contact Stacks for n-Type III-Nitride Semiconductors." Their paper reports that the addition of Si to ohmic metallurgy enables contact sintering at temperatures much less than conventionally used. Our fourth paper in the session is also a student submission with another result that is germane to development of advanced devices. From the University of Alberta, D. Barlage's group reports on advantages of the incorporation of low temperature deposition of PE-ALD ZrO<sub>2</sub> followed by post fabrication annealing to improve the gate dielectric interface in GaN MOSFETs. A very important final paper in our session from Japan covers another aspect of proper thermal treatments of the AlGaN/GaN HEMT technologies. In this work, they demonstrate the effective suppression of current collapse in AlGaN/GaN HEMTs that are subjected to High Pressure Water Vapor Annealing (HPWVA) prior to SiN passivation.

