SESSION 11: EMERGING GaN-BASED BARRIER STRUCTURES

Chair: Dave Via, *Air Force Research Laboratory*

AlGaN/GaN HEMT technology has matured significantly over the past few years with many companies now offering a variety of discrete devices and circuits for power amplifier applications. While this technology offers significant advantages in power density and total power over competing technologies, performance is generally limited to Ka-band and below. New GaN-based barrier structures are being explored that will enable higher power levels at higher frequencies and offer new application opportunities such as enhancement mode operation. The first paper of the session comes from the Sensors Directorate of the Air Force Research Laboratory at Wright Patterson AFB, OH. James Gillespie will describe recent work on InAlN barrier structures. Growth, materials characterization, device fabrication, and test results will be discussed. The second paper is a student paper and comes from Dr. Tomas Palacios' group at the Massachusetts Institute of Technology. Han Wang will discuss the work at MIT exploring the design space of InAlN/GaN devices through a study of the scaling behavior of $In_{0.17}Al_{0.83}N$/GaN HEMTs as a function of InAlN thickness, gate recess and gate length. Record transconductance results will be presented. The third paper of the session, also a student paper, comes from Dr. Umesh Mishra's group at the University of California, Santa Barbara. Man Hoi Wong will describe the N-polar growth being investigated at UCSB. These GaN/AlGaN HEMTs may provide a solution the problems of poor electron confinement and high ohmic contact resistance in highly-scaled GaN transistors since the two-dimensional electron gas (2DEG) is induced on top of the heterojunction. Power and efficiency data will be presented. The fourth paper, the final student paper of the session, comes from Dr. Huili Xing's group at the University of Notre Dame. Chuanxin Lian will discuss how the group at Notre Dame is using selective area regrowth to overcome the difficulty in achieving ohmic contacts in AlN/GaN HEMTs. Process flow and contact optimization results will be presented. The final paper of the session is from the Naval Research Laboratory in collaboration with the University of Maryland. Travis Anderson of NRL will describe a novel AlN/ ultrathin AlGaN/GaN HEMT structure that is being explored which will enable enhancement mode operation. The fabrication process and device results will be discussed