

Processing and Device Issues in GaN and Related Compounds

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Over the last decade, significant and rapid advances in the epitaxial growth of gallium nitride (GaN) and related wide bandgap materials have yielded exciting developments. Both optical and electronic devices have been demonstrated. Light emitting diodes (LEDs) and laser diodes (LDs) operating at various short wavelengths have been shown to be very reliable and are commercially available. AlGaIn/GaN heterostructure field effect transistors (HFETs) demonstrating high bandwidths and record microwave powers have also been demonstrated. In spite of these advancements, there are still many issues to be resolved in terms of materials quality, processing methodologies (etching, high temperature stability of ohmic and Schottky contacts, etc), and device design and fabrication.

In this talk, we will describe our work on photoelectrochemical (PEC) etching of GaN as a tool for material characterization and device fabrication. Revelations of defect structures especially edge and screw dislocations in n-GaN will be discussed. We will also describe our work on developing thermally stable ohmic and Schottky contacts, inductively-coupled-plasma reactive ion etching (ICP-RIE) for device fabrication. Lastly, results on DC, RF, CW power and microwave noise for AlGaIn/GaN HFETs will be presented and discussed in the context of GaN material quality.

Professor Ilesanmi Adesida (Ade) received the B.S., M.S., and Ph.D. degrees in Electrical Engineering from the University of California, Berkeley, in 1974, 1975, and 1979, respectively. He has worked at the Cornell Nanofabrication Facility and the School of Electrical Engineering at Cornell University and as Head of the Electrical Engineering Department at Tafawa Balewa University in Bauchi, Nigeria. He is currently at the University of Illinois at Urbana-Champaign, where he is the Donald Biggar Willet Professor of Engineering; Professor of Electrical and Computer Engineering and the Director of the Micro and Nanotechnology Laboratory. His research interests include nanofabrication, high-speed optoelectronic devices and circuits.

Dr. Adesida is currently the President-Elect of the IEEE Electron Devices Society. He is also the Past Chair of the TMS Electronic Materials Committee. He has been involved in the organizing committees of various international conferences serving as the Program Chair of the 1994 Electron, Ion, and Photon Beams Symposium; serving in the IEDM committee from 1994 to 1998; and serving as the Program Chair and General Chair of the Electronic Materials Conference from 2000 to 2003. Other conferences in which he has been involved include DRC, ISCS, IPRM and MNC Japan. He has served as an Associate Editor and a Guest Editor of the *Journal of Electronic Materials*. He has won many teaching and research awards at the University of Illinois. He is a Fellow of IEEE, OSA, AVS, and AAAS.