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Diagnostics of defects in AlGaN/GaN high electron mobility transitor (HEMT) epi-layers via spectroscopic photo current-voltage (IV) measurements with variable-wavelength ultraviolet (UV) and visible light excitation. MIN P. KHANAL, BURCU OZDEN, VAHID MIRKHANI, KOSALA YAPABANDARA, MUHAMMAD SHEHZAD SULTAN, MINSEO PARK[1], Dept. of Physics, Auburn University, LI SHEN, Dept. of Electrical and Computer Engineering, Auburn University — The reliability and performance of the nitride high electron mobility transistors (HEMTs) have been plagued by deleterious phenomena such as current collapse which is believed to be produced by electrically-active deep-level defects (or traps) that reside at the surface/interfaces and in the bulk of the AlGaN/GaN HEMT layers. Therefore, identification of their physical/spectral locations and understanding the nature of defects is very important to improve the reliability of AlGaN/GaN HEMTs. In this work, deep-level defects and traps located in the AlGaN/GaN HEMT epi-layers were investigated by using spectroscopic photo IV measurements. An array of Schottky contacts was constructed on the HEMT layer produced by metal-organic chemical vapor deposition (MOCVD). The photo IV measurement was performed by collecting the photo current generated by the variable-wavelength UV/visible light illumination. It was successfully demonstrated that this technique can provide the information on the distribution of electrically-active defects along the in-depth direction and across the HEMT wafers. Therefore, it can be concluded that the spectroscopic measurements can be useful to assess the uniformity of defect distribution both along the in-depth direction and across the AlGaN/GaN wafers.

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