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Conductance Deep-Level Transient Spectroscopy and Current Transport Mechanisms in Au|Pt|*n*-GaN Schottky Barrier Diodes

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The current transport mechanisms in Au|Pt|*n*-GaN Schottky barrier diodes are investigated in a temperature range of 40−325 K. The calculated barrier height and ideality factor are 1.12 eV and 2.13, respectively, and it is observed that the barrier height Φ_b increases and the ideality factor n decreases with temperature increase. The apparent barrier height and the ideality factor derived by using thermionic emission theory are found to be strongly temperature- dependent. The increase in barrier height with increasing temperature has been explained as an effect of barrier inhomogeneity. This behavior has been interpreted based on the assumption of a Gaussian distribution of barrier heights due to barrier height inhomogeneity at the interface between the metal and semiconductor. The abnormal behavior of all these parameters can be attributed to the presence of deep levels thermally activated. Conductance deep-level transient spectroscopy (CDLTS) results shows that the two deep-level defects are observed in as-grown sample with activation energies of $E_1 = 0.18$ eV and $HL_1 = 0.87$ eV.

Keywords: Schottky barrier diodes, $I(V)$ characteristics, HEMT, AlGaN, GaN, interface state density, barrier height inhomogeneity, traps, CDLTS.