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On the interface properties of an oxidised Au/Ni/AlGaN MIS structure

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Abstract content
   (Max 300 words)

In the analysis of current-voltage measurements on Schottky barrier diodes, the thermionic emission (TE) model is routinely employed. In this scheme, the Schottky barrier height (SBH) and the ideality factor (n) are assumed to be the same throughout the metal-semiconductor contact and to be independent of measurement temperature. We examine these assumptions in the context of an oxygen annealed Au/Ni/AlGaN MIS structure and find the assumptions to be inadequate in the temperature range 60 K – 330 K. Our measurements reveal: (i) that, the SBH and n increase (0.20 – 0.81) eV and decrease (4.38 – 1.37) respectively, with increasing temperature; (ii)capacitance-voltage (C–V) characteristics show a frequency dispersion indicative of interface states, which peak around 2E12 cm-2 eV-1 (1.5 – 2.0) eV above the valence band. When a model that assumes an inhomogenous distribution of SBH in the barrier is used to analyse our Au/Ni/AlGaN structure, the SBH is found to follow two distinct Gaussian distributions, one either side of 180 K, with: and mean "high temperature" (HT) SHB = 1.123 eV with a HT standard deviation of 0.002 eV; and, and a "low temperature" (LT) mean SBH = 0.580 eV and LT standard deviation of 0.004 eV. Current transport is thermionic-field-emission (TFE) below 180 K and thermionic-emission (TE) with a "T0 anomaly" above 180 K. The "T0 anomaly" is linked explicitly to the voltage deformation of the standard deviation and thus the SBH distributions.

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