ELECTRICAL CHARACTERIZATION OF INHOMOGENEOUS AU/N-INP SCHOTTKY CONTACTS

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Temperature dependence of current-voltage (I-V) characteristics of the Au/n-InP Schottky barrier diodes has been measured in the temperature range of 60-300 K. The forward I-V characteristics have been interpreted on the basis of standard thermionic emission (TE) theory and assumption of a Gaussian distribution of the barrier height. The apparent barrier height and the ideality factor derived by using thermionic emission theory have been found to be strongly temperature dependent. That is, it has been understood that the ideality factor (n) decreases while the zero bias barrier height (Φb0) increases with increasing temperature. It has been shown that the conventional ln(Jo/Tr2) versus 1000/T plot exhibits a non-linearity below 160 K with the linear portion corresponding to an activation energy of 0.465 eV. It is demonstrated that these anomalies result due to the barrier height inhomogeneities prevailing at the metal-semiconductor interface. The mean barrier height (Φb0) and the Richardson constant (A*) values were obtained as 0.53 eV and 15.90 AK-2cm-2, respectively, by means of the modified Richardson plot, [ln(Jo/Tr2) - (q2σo2/2k2T2)] versus 1/T. The value of Richardson constant A* obtained from this plot is close to the theoretical value of 9.4 AK-2cm-2 for n-InP. Moreover, the temperature coefficient of the barrier height is found to be -5.32x10-4 eVK-1 for Au/n-InP. As a result, it can be concluded that the temperature dependent I-V characteristics for Au/n-InP structures can be successfully explained on the basis of TE mechanism with Gaussian distribution of the barrier height.