

The dependence of barrier height on temperature for Pd Schottky contacts on ZnO

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Abstract

Temperature dependent current–voltage (I – V) and capacitance–voltage (C – V) measurements have been performed on Pd/ZnO Schottky barrier diodes in the range 60–300 K. The room temperature values for the zero bias barrier height from the I – V measurements (Φ_{I-V}) was found to be 0.52 eV and from the C – V measurements (Φ_{C-V}) as 3.83 eV. From the temperature dependence of forward bias I – V , the barrier height was observed to increase with temperature, a trend that disagrees with the negative temperature coefficient for semiconductor material. The C – V barrier height decreases with temperature, a trend that is in agreement with the negative temperature coefficient of semiconductor material. This has enabled us to fit two curves in two regions (60–120 K and 140–300 K). We have attributed this behaviour to a defect observed by DLTS with energy level 0.31 eV below the conduction band and defect concentration of between 4×10^{16} and $6 \times 10^{16} \text{ cm}^{-3}$ that traps carriers, influencing the determination of the barrier height.