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Analysis of temperature dependent I-V characteristics of Pd/n-4H-SiC Schottky barrier diodes and the determination of the Richardson constant in a wide temperature range

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Schottky barrier diodes (SBDs) made on 4H-SiC have been commercially available for a considerable time but their properties and applications are still not thoroughly understood. Consistent control of metal contact properties is yet to be established so as to optimize reliability. As a result, the inability to physically reproduce the Schottky barrier height is a technologically important concern which is continuously being researched. The current voltage (I-V) characteristics of Pd/n-type 4H-SiC Schottky barrier diode in the 300-800 K temperature range have been analysed. Barrier height and ideality factor were found to be strongly temperature dependent. Barrier height was observed to increase whilst ideality factor decreased with an increase in temperature and the conventional activation energy plot showed some deviation from linearity. This was attributed to barrier inhomogeneities at the metal-semiconductor interface which resulted in a distribution of barrier heights at the interface. From the modified Richardson plot, the Richardson constant, A** was found to be 155 A cm-2K-2 and 87 A cm-2K-2 in the 300-525 K and the 550-800 K temperature ranges respectively.

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