Analysis of barrier inhomogeneities of p-type Al/4H-SiC Schottky barrier diodes

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Abstract: The diffusion welding (DW), known as direct bonding technique could be more used as an alternative approach to develop silicon carbide (SiC) Schottky rectifiers to existing mainstream metallization contact technologies. Measured results for p-type 4H-SiC Schottky barrier diodes (SBD) are presented. And comprehensive numerical study to characterize the device has been performed. The simulations are carried out with ATLAS software (Silvaco). The measured and numerically simulated forward current-voltage (I–V) and capacitance-voltage (C–V) characteristics in a large temperature range are analyzed. Some of the measured p-type 4H-SiC Schottky diodes show deviation in specific ranges of their electrical characteristics. This deviation, especially due to excess current, dominates at low voltages (less than 1 V) and temperatures (less than room temperature). To verify the existence of electrically active defects under the Schottky contact, which influences the Schottky barrier height (SBH) and its inhomogeneity, the deep level transient spectroscopy (DLTS) technology was applied. DLTS measurements show the presence of a deep-level defect with activation energy corresponding typically for multilevel trap clusters.

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