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Determining the Richardson constant of Ni/4H-SiC and W/4H-SiC Schottky diodes via Current-Voltage-Temperature (IVT) characteristics

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Abstract content
   (Max 300 words)
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In this project the Richardson constant (A) *for metal-semiconductor contacts on 4H-SiC was investigated by means of current-voltage measurements as a function of temperature in the range of 300 K to 700 K. Multiple n-type 4H-SiC-based metal-semiconductor contacts, having an estimated carrier concentration of 3.70 x 10¹⁴ cm⁻³ were considered. The current-voltage-temperature (IVT) characteristics of Ni/4H-SiC and W/4H-SiC Schottky barrier diodes were studied, based on the thermionic emission model. The samples were prepared using various deposition techniques, (viz. Ni – resistive evaporation and electron-beam deposition (EBD); and W – RF sputtering and EBD) and diode parameters (such as ideality factor (η), Schottky barrier height (Φ_B), series resistance (R_s) and saturation current (I_s)) obtained were compared and found to be strongly dependent on temperature. The Richardson constant for 4H-SiC obtained from the intercept of a least squares fit through the Arrhenius plot data resulted in 3.72 x 10⁻⁶ A.K⁻².cm⁻² for W and 5.41 A.K⁻².cm⁻² for Ni – both deposited via EBD; 2.63 x 10⁻³ A.K⁻².cm⁻² for Ni deposited resistively, and lastly 6.31 x 10⁻¹² A.K⁻².cm⁻² for sputtered W. It was concluded that A* is dependent on the metal contact as well as the type of deposition technique utilized for the Schottky metal contacts.

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Main supervisor (name and email)
and his / her institution

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