

Determination of the laterally homogeneous barrier height of palladium Schottky barrier diodes on n-Ge (1 1 1)

Abstract

We have studied the experimental linear relationship between barrier heights and ideality factors for palladium (Pd) on bulk-grown (1 1 1) Sb-doped n-type germanium (Ge) metal-semiconductor structures with a doping density of about $2.5 \times 10^{15} \text{ cm}^{-3}$. The Pd Schottky contacts were fabricated by vacuum resistive evaporation. The electrical analysis of the contacts was investigated by means of current–voltage (I – V) and capacitance–voltage (C – V) measurements at a temperature of 296 K. The effective barrier heights from I – V characteristics varied from 0.492 to 0.550 eV, the ideality factor n varied from 1.140 to 1.950, and from reverse bias capacitance–voltage (C^{-2} – V) characteristics the barrier height varied from 0.427 to 0.509 eV. The lateral homogeneous barrier height value of 0.558 eV for the contacts was obtained from the linear relationship between experimental barrier heights and ideality factors. Furthermore the experimental barrier height distribution obtained from I – V and (C^{-2} – V) characteristics were fitted by Gaussian distribution function, and their mean values were found to be 0.529 and 0.463 eV, respectively.