Correlation Between Barrier Heights and Ideality Factors of Ni/n-Ge (100) Schottky Barrier Diodes

Abstract

We computed the homogeneous Schottky barrier height (SBH) at ideality factor (n) = 1.0 of Ni/nGe (100) Schottky diodes (SDs). The SDs were identically prepared by using resistive evaporation of Ni on n-Ge (100). The SBHs and n of these diodes (24 dots) were calculated from their experimental forward bias current-voltage (I-V) and reverse bias capacitance-voltage (C-V) measurements at room temperature. Even though the Schottky diodes were identically prepared, the values of the SBH from the I-V characteristics varied from 0.487 to 0.508 eV, the ideality factor varied from 1.34 to 1.53, and the SBH from the C^{-2}-V characteristics varied from 0.358 to 0.418 eV. The Gaussian fits of the experimental SBH distributions obtained from the C^{-2}-V and the I-V characteristics yielded mean SBH values of 0.401 ± 0.015 and 0.503 ± 0.006 eV, respectively. Furthermore, a homogeneous SBH value of approximately 0.535 eV was also computed from an extrapolation of a linear plot of the experimental SBHs versus the ideality factors. The homogeneous SBHs, rather than the effective SBHs, of individual contacts or mean values should be used to discuss the theories and the physical mechanisms that determine the SBHs of SDs.