

Schottky Barrier Height Dependence on the Metal Work Function for p-type Si Schottky Diodes

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We investigated Schottky barrier diodes of 9 metals (Mn, Cd, Al, Bi, Pb, Sn, Sb, Fe, and Ni) having different metal work functions to p-type Si using current-voltage characteristics. Most Schottky contacts show good characteristics with an ideality factor range from 1.057 to 1.831. Based on our measurements for p-type Si, the barrier heights and metal work functions show a linear relationship of current-voltage characteristics at room temperature with a slope ($S = \phi_b / \phi_m$) of 0.162, even though the Fermi level is partially pinned. From this linear dependency, the density of interface states was determined to be about $4.5 \cdot 10^{13}$ 1/eV per cm², and the average pinning position of the Fermi level as 0.661 eV below the conduction band.

Key words: Schottky Diodes; Barrier Height; Series Resistance; Work Function; Miedema Electronegativity.