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Numerical simulation study of inhomogeneous metal-semiconductor contact with discrete distribution of varying barrier heights patches PRIYANKA KAUSHAL, SUBHASH CHAND, Department of Physics, National Institute of Technology, Hamirpur-177005, (HP) India — The Poisson's equation and the drift diffusion equations were solved by numerical simulation to calculate the potential and electron and hole concentrations inside the bulk semiconductor near the metal-semiconductor contact. The current density was then estimated from the calculated potential and electron-hole concentrations using the continuity equations. The current as a function of bias was calculated by imposing external bias through the boundary condition during the numerical simulation using silicon parameters to obtain the current-voltage characteristics of metal-semiconductor contact. From the simulated current-voltage characteristics the diode parameters were extracted by fitting the current-voltage data into the thermionic emission diffusion current equation. The simulations were performed for the inhomogeneous metal-semiconductor contact having randomly distributed patches of varying barrier heights. The patch size was varied to see its effect of the current-voltage characteristics and the derived apparent barrier parameters. The derived barrier parameters were analyzed to study the effect of inhomogeneities on the current-voltage characteristics on metal-semiconductor contact. The simulations were carried out for discrete distribution of barrier height patches at the metal-semiconductor contact. It is observed that the apparent barrier height of the inhomogeneous contact decreases and ideality factor increases with increasing the deviation of barrier heights in the distribution.

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