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Electronic transport in semiconductors ALEXANDER LARIN — The ultimate goal of this work is the Monte-Carlo simulation of electronic transport in semiconductors. As a special case, the effect of the adsorbed surface change on conductivity in the ambient air was investigated. The classical equation of electronic transport for semiconductors must be solved numerically since the analytical solution can be derived only for limited number of relatively simple cases. There are several numerical methods to describe the electronic transport in semiconductors. The One particle Monte Carlo simulation is widely used technique to obtain the exact solution for Boltzmann Transport Equation (BTE). During the simulation several assumptions were made: electron is a particle and its motion can be described by classical mechanics equations, the only interactions the electrons have are those with ions, the collisions/scattering of electrons with ions are elastic, and the outside electric field is uniform inside of the semiconductor device. The quantity of interest in the simulation is current density. The current density was calculated as an integrated result from contributions of individual paths of electrons as they travel from one ohmic contact to another. The simulation can also be used to predict the electronic transport under the influence of nonuniform electric and magnetic fields. The special case of oxygen adsorption was investigated in this work. It was found that an increase in the oxygen concentration in the ambient air can decrease the conductivity of some semiconductor materials.

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