Homework #4
Computational Microelectronics

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1 Results

We have solved the Poisson equation of the heterogeneous structure, introduced in the Lecture 5 and 6. First, we calculate the Poission to obtain the initial potential ϕ_0. Then we calculate the electron density n_e given by

$$n_e = N_i \exp\left(q\phi_0/k_BT\right). \tag{1}$$

Next, we update the charge density; the charge density is given by

$$\rho(x) = -q(N_{acc} + n_e). \tag{2}$$

With the updated density, we solve again the equation to obtain the updated potential ϕ_1. We change the gate voltage from 0V to 1.0V and solve the equation.

Fig. 1 and Fig. 2 displays ϕ_0 and ϕ_1 respectively. Fig. 3 shows the difference, $\phi_0 - \phi_1$ and Fig. 4 shows the electron density. The result shows that the initial and updated potential have almost no difference, and the electron density is reduced as the gate voltage increases.

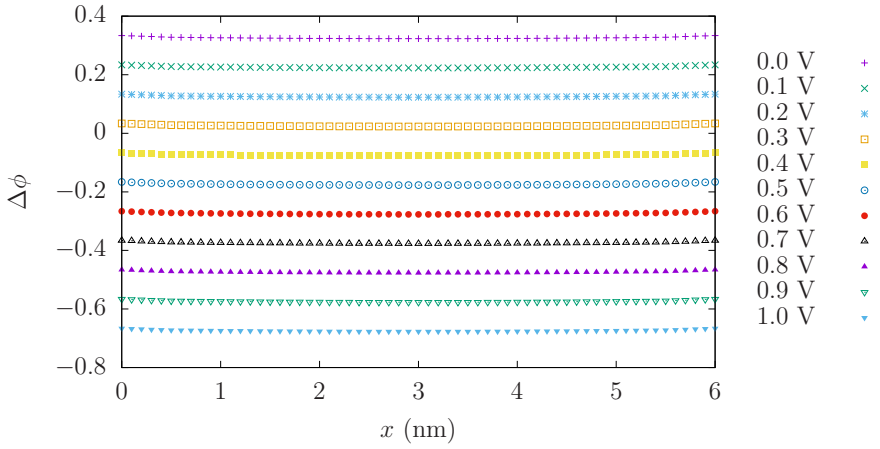

Figure 1: The initial potential ϕ_0.

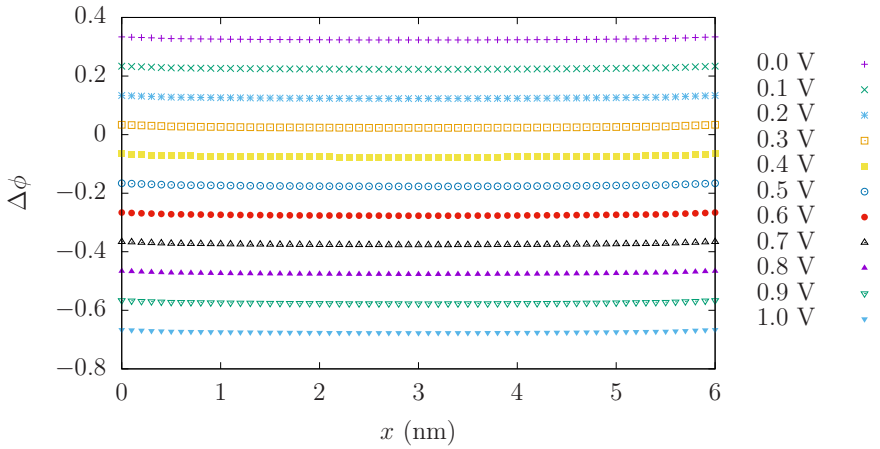

Figure 2: The updated potential ϕ_1.

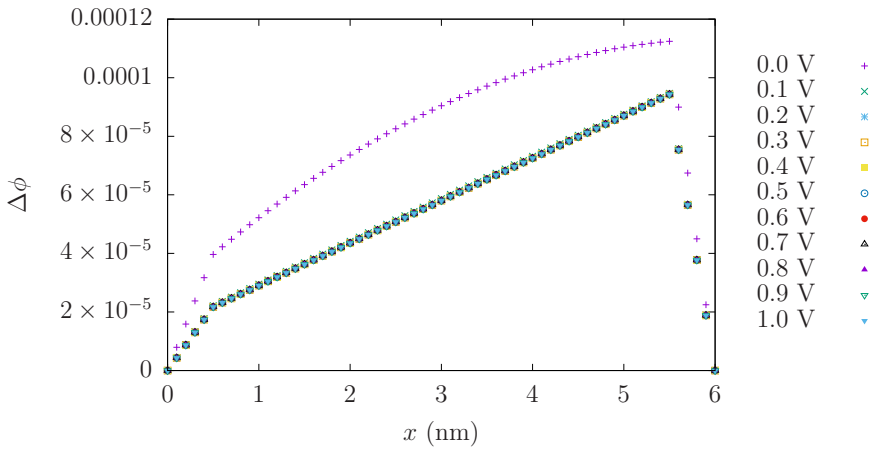

Figure 3: The difference between the potentials, $\Delta\phi = \phi_0 - \phi_1$.

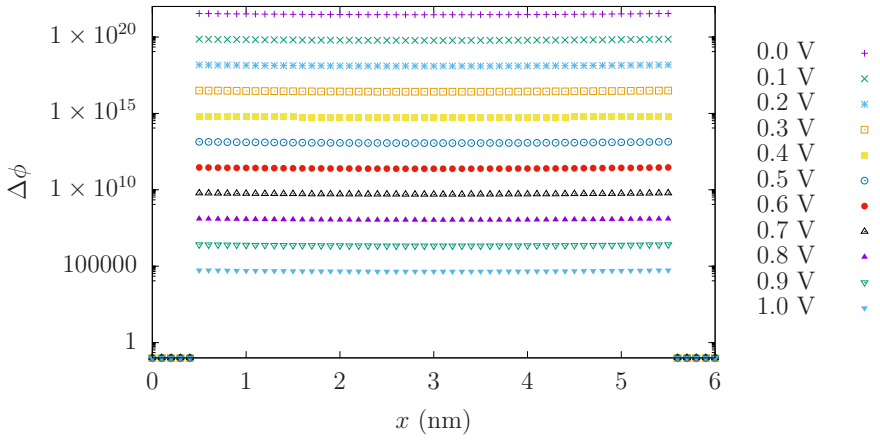

Figure 4: The electron density n_e.