Device Simulation Laboratory

(EE5195)

Problem Sheet-8

Take cross sectional area, A=1 μm^2, hole mobility, μ_P = 450 $cm^2 V^{-1}s^{-1}$ and electron mobility, μ_n = 1417 $cm^2V^{-1}s^{-1}$.

Q.1: Draw a simple n-type Si of dimensions 1 x 1 μm^2 on the sentaurus structure editor with uniform doping of $1x10^{16}$ cm^{-3} (use proper meshing).

Q.2: Use *****.tdr file (which is generated after meshing), in the sdevice command-

(a) Calculate I-V characteristics for a voltage range from -1 V to 1 V

(b) Calculate resistance, R of the given sample using I-V plot and using formula. Compare both the results.

(c) Include doping dependent mobility in the sdevice **.cmd file and calculate resistance, R of the given sample using I-V plot and using formula. See the change in resistance.

(d) Change the mobility, μ_n to 200 $cm^2V^{-1}s^{-1}$ (parameter file) as discussed in the class and again do (b). See the change in resistance with respect to change in mobility (1417 $cm^2V^{-1}s^{-1}$ to 200 $cm^2V^{-1}s^{-1}$ i.e. approximately 7 times).

(d) Draw energy band diagram in equilibrium (0V) and for 1V.