Device Simulation Laboratory

(EE5195)

Problem Sheet 6

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1) State the Fick's laws of diffusion and the continuity equation.

2) For each of the cases listed below, provide the analytical solutions, and compare them with numerical solutions. Assume steady state and D=30 cm^2/s

(a) Consider diffusive transport of particles between two points A & B separated by 100 μm. The concentration of particles at A is 10^{12} cm^{-3} & at B is 0 cm^{-3}. Assume $\tau=\infty$. Find the concentration profile for particles from A to B. What is the particle flux from A to B?

(b) Solve (a) with $\tau=10^{-7}$ s and other conditions remaining the same.

(c) For the configuration in part (a), assume that the boundary condition at B is such that the particle flux F there is equal to kC, where k=10^3 cm/s and C is the concentration there. Assume $\tau=\infty$. Find the concentration profile for particles from A to B.

(d) Solve (c) with $\tau=10^{-7}$ s and other conditions remaining the same.

(e) For the configuration in part (a), assume that a particle flux is introduced at x=30 μm at the rate of 10^{12} cm^{-2}/s. Assume that the particle density at A & B are held constant at 0 and $\tau=\infty$. Find the concentration profile for particles from A to B.