Homework #4

Source Free Poisson's Equation for Heterostructure

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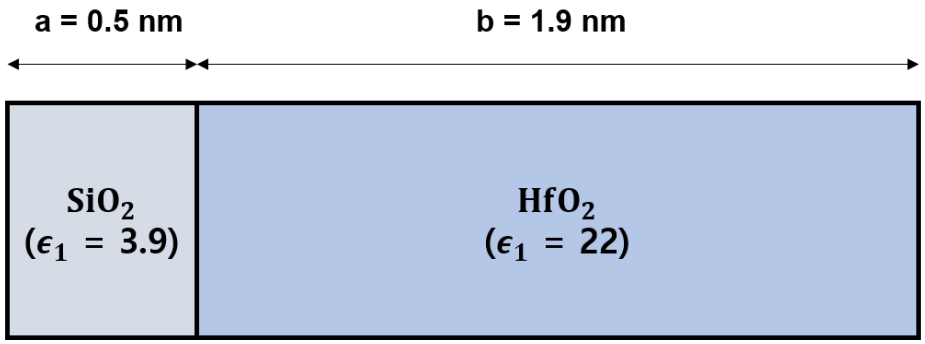
Problem 1

- Heterostructure

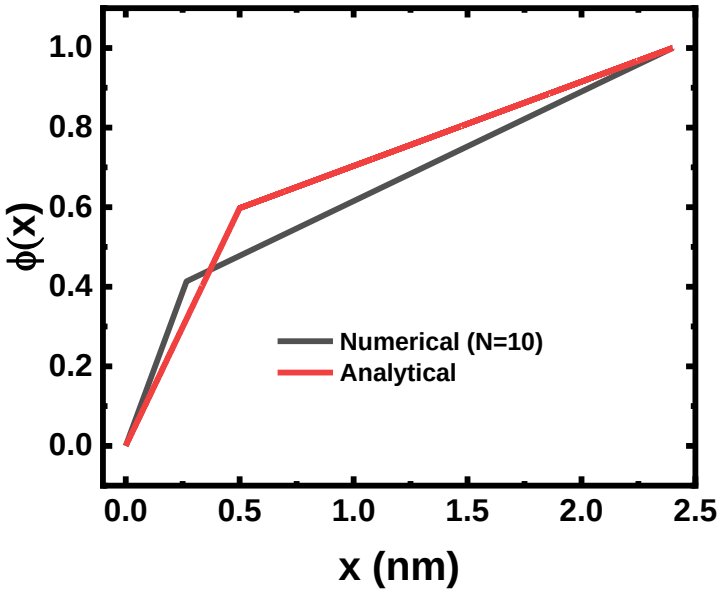


- Capacitance per area (F/cm^2)
  - $C = \frac{1}{\frac{a}{\epsilon_1}+\frac{b}{\epsilon_2}} = 4.12\ \text{mF/cm}^2$

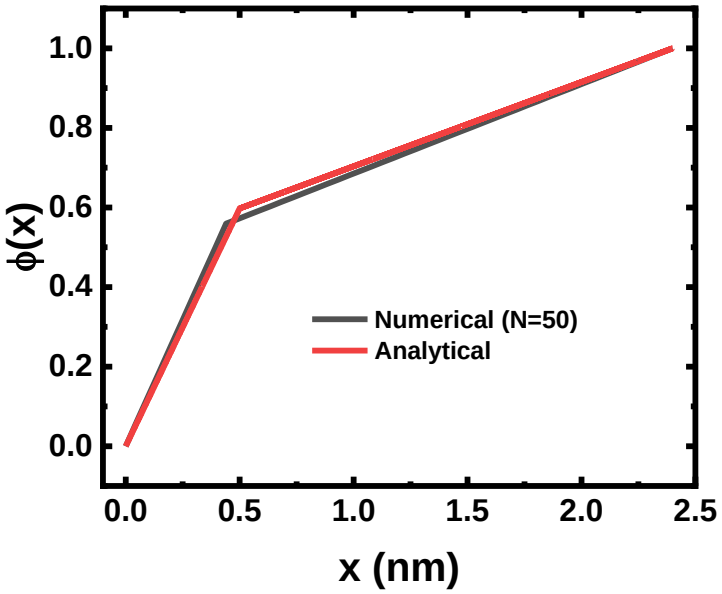
- Electrostatic potential (Numerical vs Analytical)
  - Analytical solution

$$\phi(x) = \begin{cases} \frac{\epsilon_2}{\epsilon_1 b + \epsilon_2 a} x, & 0 < x < a \\ \frac{\epsilon_1}{\epsilon_1 b + \epsilon_2 a} x + \frac{\epsilon_2 a - \epsilon_1 a}{\epsilon_1 b + \epsilon_2 a}, & a < x < a + b \end{cases}$$

- Analytical solution vs numerical solution (N = 10)



- Analytical solution vs numerical solution (N = 100)



- Analytical solution vs numerical solution (N = 500)