Computational Microelectronics
Lecture 15 Poisson Equation

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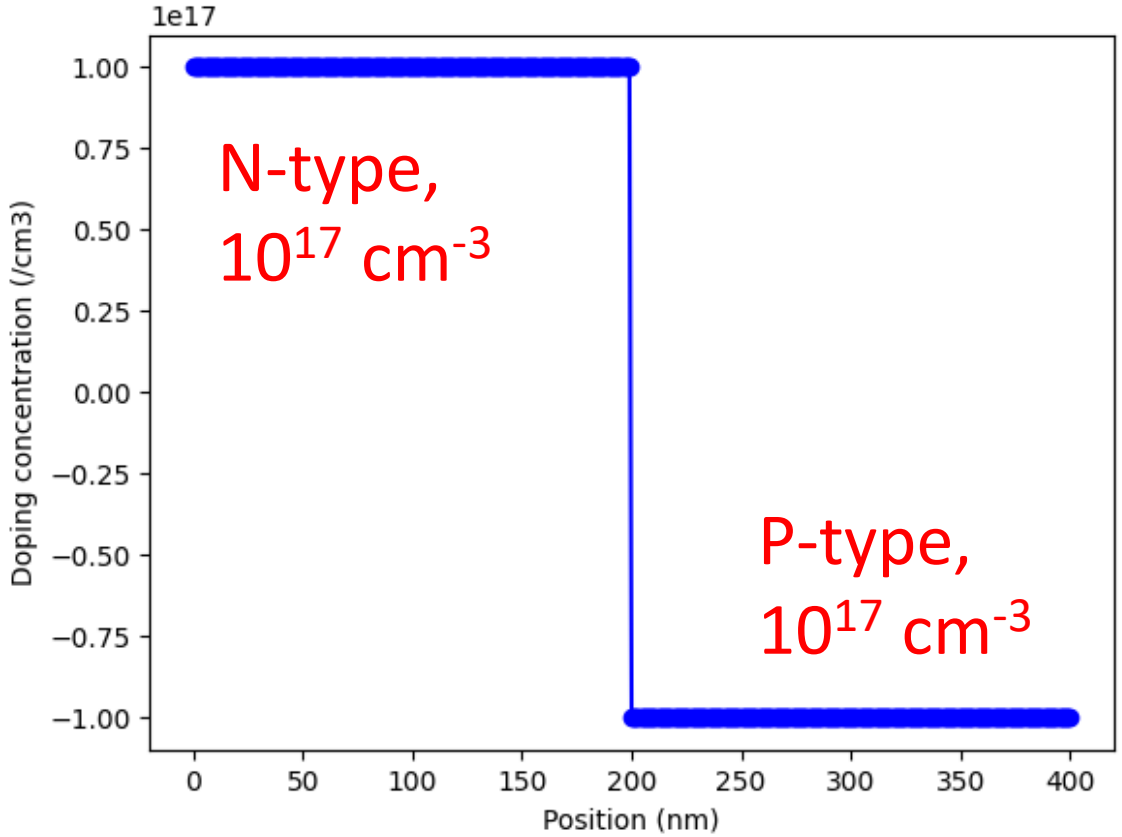
Nonlinear Poisson Equation

Abrupt PN junction

- Consider a 400-nm-long structure.
  - The metallurgical junction is located at 200 nm.
  - Assume that $N_D \geq N_A \geq 10^{17}$ cm^{-3}.



Boundary condition

- Ohmic contacts at both sides
  - Assume the local charge neutrality at those contacts.

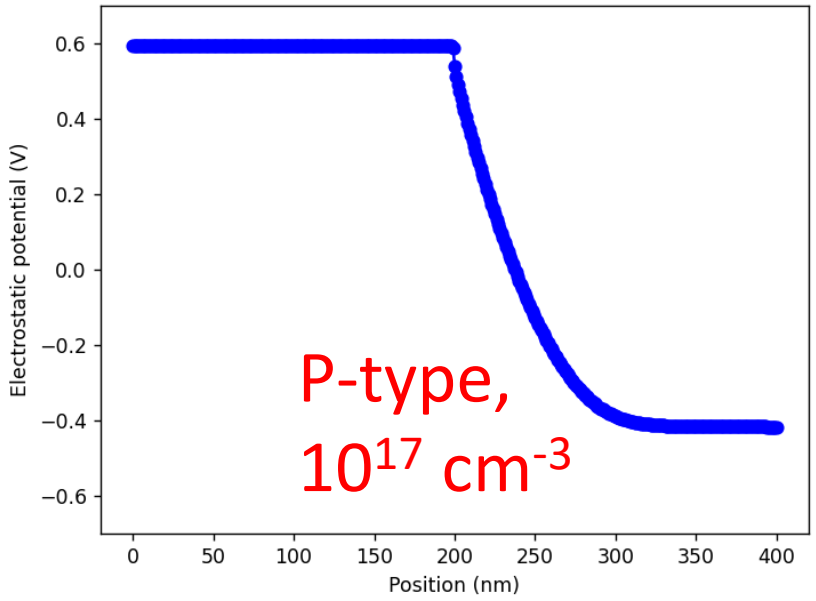
$$\phi_0 = V_T \operatorname{asinh} \frac{N_D - N_A}{2n_{int}}$$

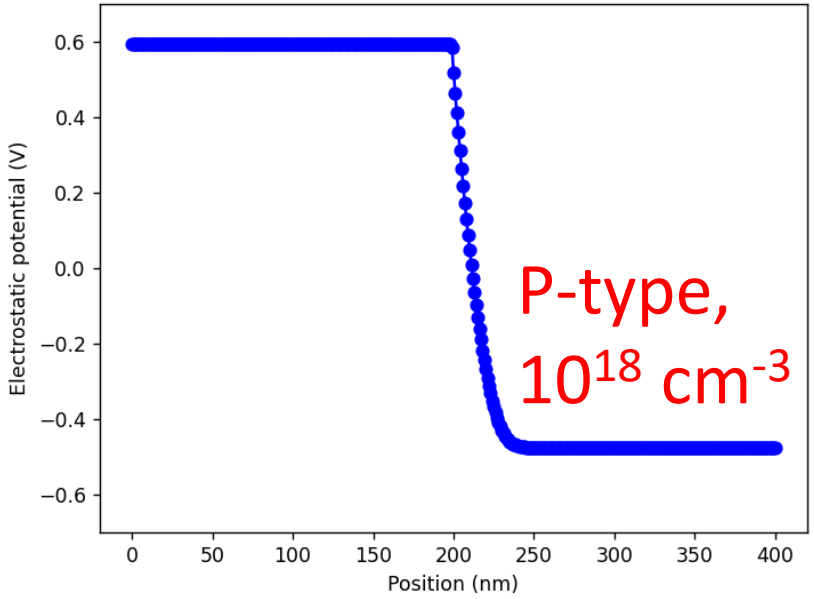
  - Then, the electrostatic potential is fixed at a contact.

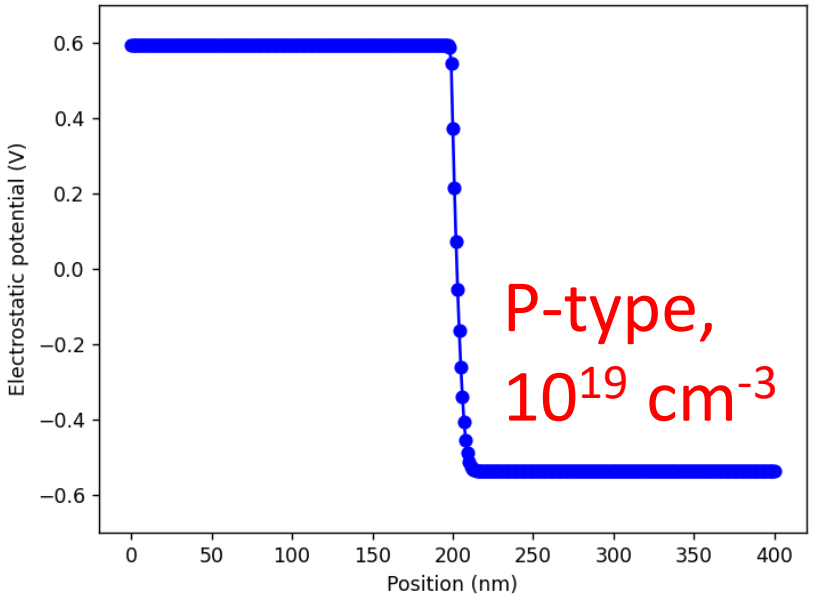
$$\phi - \phi_0 = 0$$

N^+P junction

- When N_D = 10^{20} cm^{-3}, try various N_A values.
  - With a higher acceptor density, the depletion width is reduced.
  - Check your results.







HW#13

- Due: AM08:00, November 6
- Problem#1
  - Reproduce the graph shown in Slice 8, Lecture 14.
- Problem#2
  - Reproduce the graph shown in Slice 5, Lecture 15 (This lecture).

Term project

- It is now time to start the term project!
  - Theme: Your own choice
  - Due: AM08:00, December 18, 2023 (Send a recorded video.)

  - Watch the previous term projects in 2022:
    https://youtu.be/CIh75LwePOs?si=vXRnLCFXWnAc31pF
    https://youtu.be/xr6NoV-Xxqw?si=gm_UMh1x7SzlFw9n
    https://youtu.be/V-wDRYQCIsY?si=d5HtwItEnlWa5WBP

HW#13

- Problem#3
  - Write down your plan for the final term project.

Thank you!