

CHE323/384 Chemical Processes for Micro- and Nanofabrication
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Homework #4

1. Suppose we perform a solid solubility-limited predeposition from a doped glass source which introduces a total of Q impurities per square cm.
 - a. If this predeposition was performed for a total of t minutes, how long would it take (total time) to predeposit a total of $3Q$ impurities into a wafer if the predeposition temperature remained constant?
 - b. Derive a simple expression for the $(Dt)_{\text{drive-in}}$ which would be required to drive the initial predeposition of Q impurities sufficiently deep so that the final surface concentration is equal to 1% of the solid solubility concentration. This can be expressed in terms of $(Dt)_{\text{predep}}$ and the solid solubility concentration C_s .
2. A diffused region is formed by an ultra-shallow implant followed by a drive-in. The final profile is Gaussian.
 - a. Derive an expression for the junction depth (x_j) given a background dopant concentration (of the opposite type) of C_B .
 - b. Derive a simple expression for the sensitivity of x_j to the implant dose Q . Is x_j more sensitive to Q at high or low doses?
3. Campbell textbook, Chapter 3, problem 7.