ECE6450 Homework #4 Solutions Dr. Alan Doolittle

1.) The key to this problem is recognizing that only half the power radiated by the susceptor is absorbed by the wafer (only the power from the wafer side of the susceptor is absorbed by the wafer, the rest is radiated back toward the lights). In steady state, the temperature is constant. The power absorbed must equal the power radiated. Thus, from equation 6.4,

$$Power_{absorbed\ by\ wafer} = 0.5\ Power_{radiated\ by\ susceptor} = Power_{radiated\ by\ wafer}$$

$$0.5\ (\epsilon_{susceptor})\ \sigma\ (T_{susceptor})^4 = (\epsilon_{wafer})\ \sigma\ (T_{wafer})^4$$

$$T_{wafer} = \left(\frac{\epsilon_{susceptor}}{2\ \epsilon_{wafer}} \right)^{1/4} T_{susceptor}$$

$$T_{wafer} = \left(\frac{0.9}{2(0.7)} \right)^{1/4} (1000 + 273) = 1140\ K\ or\ 867\ C$$

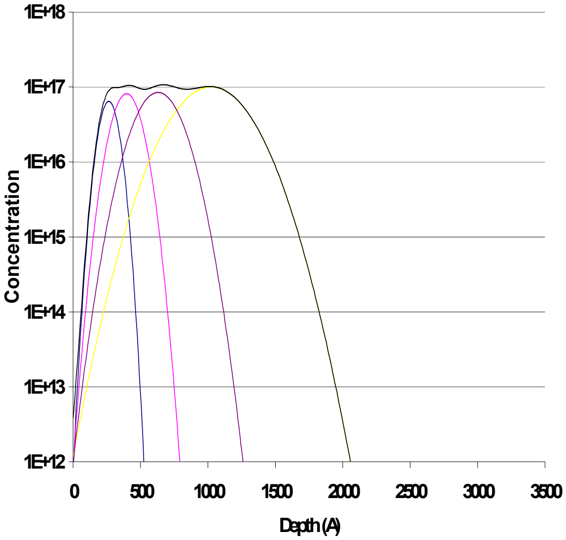
2.) My results were obtained in a simple spreadsheet.

	Peak concentration cm^{-3}	Energy KeV
Implant 1	6.4e16	51.6
Implant 2	8.1e16	77.4
Implant 3	8.5e16	123
Implant 4	1.0e17	200

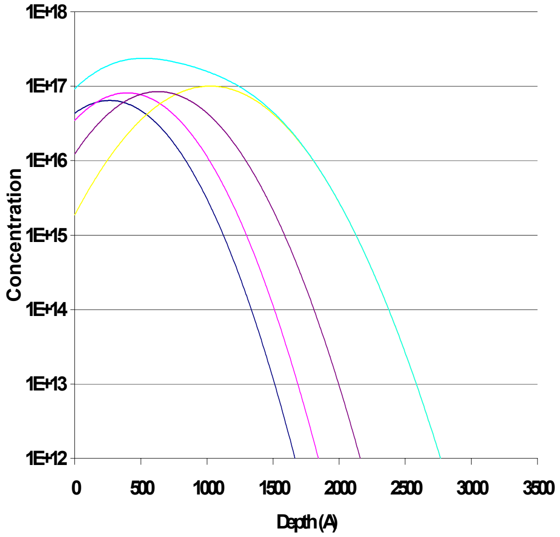
The profiles are plotted on the next page.

3.) A and B) The profiles are plotted on the next page.
C.) Since for the RTP process, the concentration drops by over two orders of magnitude, the assumption is probably okay. For the furnace anneal the concentration drops by a facto of only ~2. Thus, it is probably not a good assumption for this process.

Problem 2: As Implanted profile



Problem 3A: Furnace anneal Profile



Problem 3A: RTP anneal Profile