Homework 9
Due 18 November 2003

1. **Assume you have a target of $Si_{50}Ge_{50}$ sputtered by 50keV Ar ions with a preferential sputtering yield of Si twice that of Ge. Assume a projected range of 50nm.**

   What is the initial sputter yield ratio Y_{Si}/Y_{Ge}?
   What is the steady state yield ratio Y_{Si}/Y_{Ge}?
   What is the surface concentration ratio of Si to Ge at steady state?
   What thickness of SiGe must be removed to acheive steady state?

2. **The maximum value of nuclear energy loss occurs at a reduced energy value of $\varepsilon = 0.3$ for the Thomas-Fermi potential.**

   For $\varepsilon = 0.3$, what value of energy, in keV, does this correspond to for Ne, Ar, and Xe incident on Ni?
   Do these values seem reasonable when compared with the data in Figure 9.3?
   For $\varepsilon = 0.3$, what value, in keV, does this correspond to for Ar incident on Si?
   Compare you answer with the data in Figure 9.2.

3. **Calculate the minimum and maximum energy values for replacement collisions in a Be latttice irradiated with Li, B, Cu, and Au ions, assuming a displacement energy of 25 eV. Determine the velocity of the recoil Be atoms for these examples.**

4. **The projected range for Ti in Ni is 400nm and the sputter yield is 5. What dose of Ti atoms would be required to achieve a steady-state concentration (i.e. Maximum retained dose) and how many Ni atoms/cm^2 would be removed? If the ion beam were at 45^0 incident angle, what dose would be required to achieve a steady state concentration?**