Háskóli Íslands
Raunvisindadeild
Eðlisfræðiskor

Haust 2000

Rafeindatækni fastra efna

Dæmablað 2

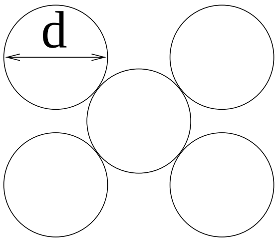
Skilafrestur til 14. september 2000 kl. 9:30

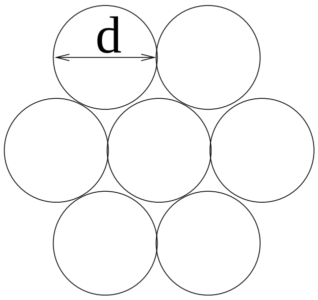
1. **Pökkun í kristalli**

   (10) Myndin að neðan sýnir þétt pökkuð plön tveggja teningsgrinda sem hafa sömu fjarlægð milli næstu granna d.

   (a) Hverjir eru Miller vísar plananna og í hvaða grindum finnast þau.

   (b) Hver er frumeindaþéttleikinn (frumeind/einingarflatarmál) í hvoru plani fyrir sig.





2. **Crystal growth**

   (10) The seed crystal used in Czochralski growth is "necked down" to ~3 mm, to help produce a dislocation free state in the pulled ingot. Using the yield strength of silicon (2×10^6 g/cm^2), calculate the maximum length of a 200 mm ingot that can be supported by this neck. How many wafers can be produced by this ingot ? (200 mm wafers are 1 mm thick. Approximately 50 % of silicon is lost due to cutting and polishing of the wafers.

3. **Photon scattering**

(10) An X-ray photon of wavelength 1.0×10^{-12} m is incident on stationary electron. Calculate the wavelength of the scattered photon if it is detected at an angle of (a) $60°$, (b) $90°$, and (c) $120°$ to the incident of radiation.

4. **Diffraction**

(10) Electrons of energy 100 eV are incident on a crystal containing planes of atoms whose seperation is 5×10^{-10} m. For what values of the Bragg angle will diffraction from these planes occur ? What happens if the electron is replaced by neutrons of the same energy ?

5. **Silicon lattice**

(10) At 300 K the lattice constant for silicon is 5.43 Å. Find the number of atoms per square centimeter for silicon in the (111) plane. Sketch a view down a $<110>$ direction of a silicon lattice.