

SSP Exercise 2

To be handed in by 4pm, Thursday 26 January.

For a simple cubic lattice the reflections with the following Miller indices are possible: (100), (110), (111), (200), (210), (211), (220), (etc.). An x-ray diffraction experiment with the wavelength of $\lambda = 1\text{\AA}$ reveals a set of peaks recorded at the following angles θ (deg.):

5.74
8.13
9.98
11.54
12.93
14.19
16.44

- a. Show that this x-ray diffraction picture corresponds to a simple cubic lattice. **Hint**, note that the sequence n formed by $n = h^2 + k^2 + l^2$ for a simple cubic lattice is 1,2,3,4,5,6,8. Rewrite the Bragg law in the form

$$\sin^2 \theta = \frac{\lambda^2}{4d^2} \quad \text{Eq. 1}$$

and express d via a and h, k, l . Can you obtain the sequence n above from the recorded peaks using Eq. 1? **[10]**

- b. Calculate the value of the lattice constant a . **[5]**