# Tutorial VI (2011- 2012 Sem II) Prof A K Ganguli : Course Coordinator
Powder X-ray Diffraction

1. Using diffraction from a set of planes deduce Bragg's Law

2. Explain the difference between a filter and a primary monochromator

3. Explain how the d – values are calculated from the Debye-scherer film.

4. The d-spacing for the 110 planes of a metal crystallizing in the cubic structure is equal to 2.952 A. Calculate the d- spacing corresponding to the 111 and 311 planes.

5. Calculate the cell parameters of a tetragonal cell which shows the following d – values; d_{110} = 2.828; d_{020} = 2.000; d_{201} =1.897Å

6. Given the powder x-ray diffraction pattern, index the reflections on a cubic cell and calculate the lattice parameters. (d-values given).
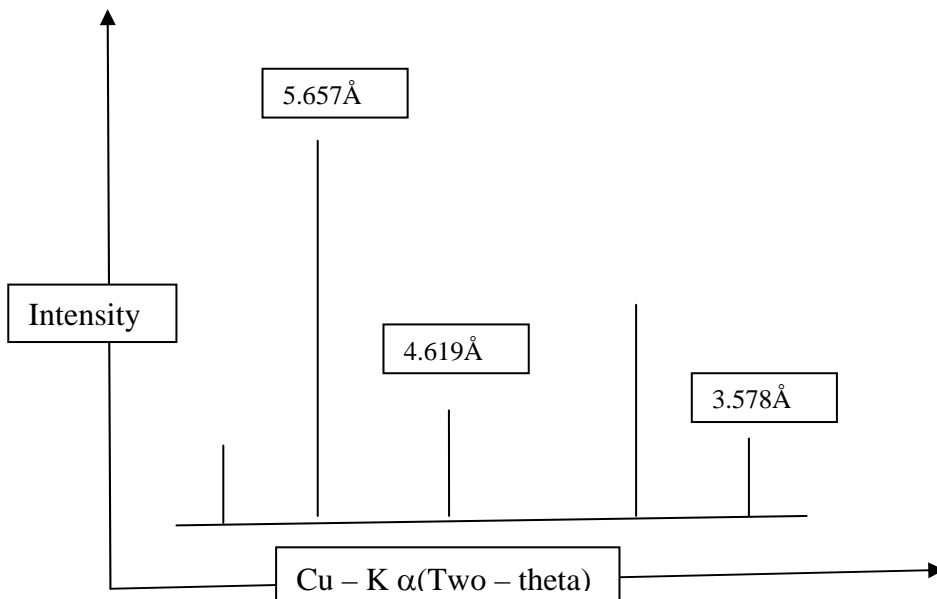

7. Give the important parts of a powder diffractometer.

8. Write brief notes on a) scintillation detector and 2) CCD detector

9. What is the difference between a theta-theta and theta-2theta goniometer.

10. In what type of crystalline materials would you see preferred orientation effects in the diffraction patterns?

11. How do you obtain the crystallite size of particles usig X-ray diffraction?

12. The powder x-ray diffraction pattern **(a)**of a sample was collected on a diffractometer**A** at room temperature. The sample gave a diffraction pattern **(b)** when it was heated to high temperature and the data was collected using the same diffractometer **A**. The initial sample when recorded on a different diffractometer**B** gave the pattern **(c)** at room temperature. What are the possible reasons for the differences among **(a), (b) and (c)** ?
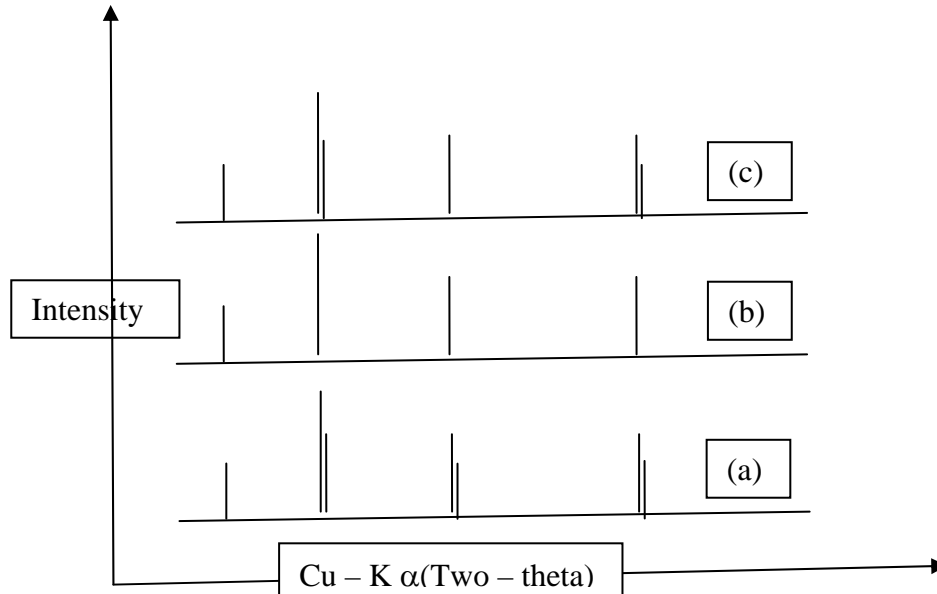
13. Given the following electron diffraction photographs of an oxide sample at 373K and 1273K.
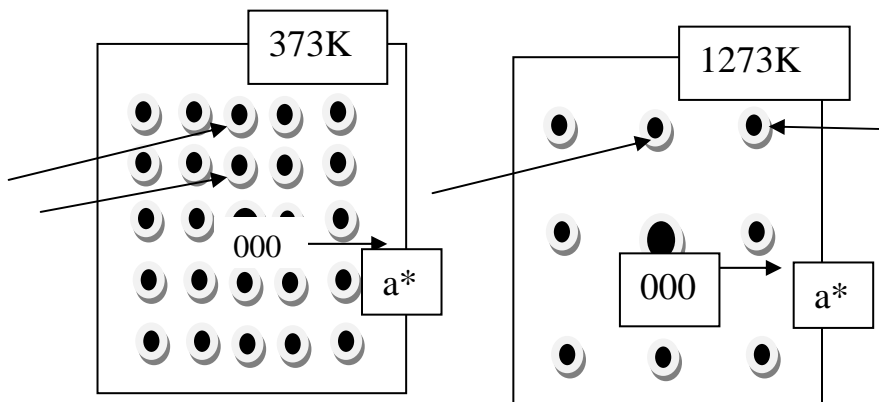
(a) what are the hkl values for the spots marked with an arrow?
(b) Given **a** = 4A at 373K what is the value of **a** and **a*** at 1273K

14. What information you can derive from powder diffraction patterns of a solid sample? Sketch the diffractograms of a glass, layered aluminosilicate like mica, and NaCl. Give the possible indices of the peaks wherever possible.