



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

FRESHMAN ENGINEERING DEPARTMENT

Assignment

UNIT II Crystallography & X-Ray diffraction

1	Define space lattice, basis, unit cell, lattice parameters and crystal structure.
2	Draw the seven crystal systems with lattice parameters and Bravias lattices
3	Show that FCC is more closely packed than BCC & SCC
4	What are Miller indices? How they are obtained.
5	Derive an equation for the interplanar spacing between successive planes of cubic and orthorhombic lattice.
6	State and explain Bragg's law.
7	Illustrate Bragg's spectrometer to determine lattice constant and interplanar spacing.
8	Describe the construction and working of a powder method to determine the interplanar distance.
9	Draw the planes (100), (110), (111) in a cubic lattice.
10	Define atomic radius, coordination number, and packing fraction with example.

Problems

1	Find the maximum radius of the interstitial sphere that can fit into the void at $(1/2, 1/2, 1/2)$ between the atoms in the body centred cubic lattice.
2	Metallic iron changes from BCC to FCC form at 910°C and corresponding the atomic radii vary from 1.258 \AA to 1.292 \AA . Calculate the percentage of volume change during this structural change.
3	Show that the maximum radius of the sphere that can just fit into the void at the body centre of the FCC structure coordinated by the facial atoms is $0.414r$, where r is the radius of the atom.

4	X-rays of wavelength are diffracted by (111) planes in a crystal at an angle of 30° in the second order. Estimate the interatomic spacing.
5	Estimate the value of d-spacing for (111) planes in a rock salt crystal of $a = 2.8149 \text{ \AA}$
6	Calculate the interplaner distance for the (321) & (101) planes in a SCC lattice with interatomic spacing equal to 4.12 \AA .
7	Copper crystalline in the FCC structure. The density and atomic weight of copper is 8960 kg/m^3 and 63.54 respectively. Estimate the lattice constant.
8	GaAs has its principle planes separated at 5.6534 \AA . The first order reflection is located at 14° . Calculate the wavelength and angle in the second order diffraction.
9	A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm . Estimate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of 9° . Also calculate the maximum order of diffraction possible.
10	X-rays of wavelength 1.5418 \AA are diffracted by (111) planes in a crystal at an angle of 30° in the first order. Find the interplanar spacing.
11	Lattice constant of copper is 0.38 nm . Calculate the distance between (111) planes.
12	Show that in a simple lattice the separation between the successive lattice planes (100), (110) and (111) are in the ratio of $1:0.71:0.58$.
13	Obtain the Miller indices of a plane which intercepts at $(a, b/2, 3c)$ in a simple cubic unit cell. Draw a neat diagram showing the plane.