23 lecture

B.Sc (Chemistry Hons) – III

Date 07/05/2020
Page 01

Solid State

Prof. Ashok
Dept. of Chemistry
S.N.S.R.K.S. College
Saharsa

Formation of Lattice

Formation of unit cells takes place in seven forms namely:—

1) Cubic Lattice (2) Tetragonal lattice
3) Orthorhombic Lattice (4) Monoclinic Lattice
5) Hexagonal lattice (6) Rhombohedral Lattice
7) Triclinic lattice.

1) Cubic Lattice:— Cubic lattice is formed into three geometries of unit cells; primitive, body centred and face centred unit cells. In a cubic lattice all the edges are equal and the angle between their face is 90° that is mutually perpendicular.

2) Tetragonal lattice:— The formation of tetragonal lattice takes place in two geometries of unit cells; Primitive and body centred unit cells. In a tetragonal lattice only one edge has different length and angle

between respective edges is 90° that is mutually perpendicular.

(3) Orthorhombic Lattice:— There are four types of orthorhombic lattice mainly Primitive, end centred, body centred and face centred. In orthorhombic lattice, the edge lengths are unequal in nature and the angle between respective edges is 90° that is mutually perpendicular.

(4) Monoclinic Lattice:— Monoclinic Lattice is formed from two types of unit cell namely; primitive and end centred. Monoclinic lattice has unequal sides and two angles between the faces of the lattice are 90°.

(5) Hexagonal lattice :→ Hexagonal lattice is formed from only one type of unit cell that is primitive. In hexagonal lattice only one side and two angles are 90° and one angle is 120°.

(6) Rhombohedral lattice:— Rhombohedral lattice is also formed from one

Date 07/05/2022
Page 03

type of unit cell that is primitive. In Rhombohedral lattice all the sides are equal and two angles between the faces of the rhombohedral lattice are less than 90°.

(7) Triclinic lattice :- The formation of triclinic lattice also takes place for from one type of unit cell that is primitive. In triclinic lattice all the sides are unequal and none of the angles between the faces of of the triclinic lattice are 90°

The table show the summarise type of Lattice formation :-

Lattice	Types	Edge Length	Angles between faces	Examples
Cubic	Primitive, Body Centred, Face Centred	$a=b=c$	$\alpha=\beta=\gamma=90$	NaCl, Copper & Zns
Tetragonal	Primitive body Centred	$a=b\neq c$	$\alpha=\beta=\gamma=90$	White tin, SnO_2, TiO_2 Casor

Date 07/05/2020
Page 24

Lattice	Types	Edge Length	Angles between faces	examples
Ortho-rhombic	Primitive, body centred, face centred, end centred	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90$	Rhombic Sulphur, $BaSO_4$, KNO_3
Hexagonal	Primitive	$a = b \neq c$	$\alpha = \beta = 90°$ and $\gamma = 120°$	Graphite, ZnO, CdS
Rhombohedral	Primitive	$a = b = c$	$\alpha = \beta = \gamma \neq 90°$	$CaCO_3$, HgS
Monoclinic	Primitive, End-centred	$a \neq b \neq c$	$\alpha = \beta = 90$ $\beta \neq 90°$	Sulphur
Triclinic	Primitive	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90°$	H_3PO_3, $CuSO_4 \cdot 5H_2O$