









Material Science And Metallurgy By Phaneesh Pdf 11

1. Crystal Structure

## Chapter 1

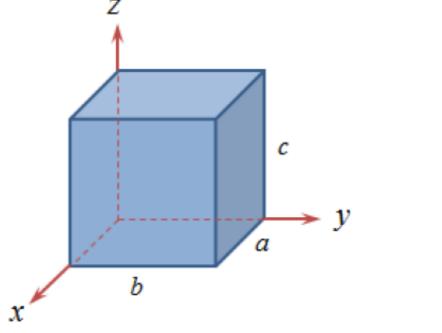
## CRYSTAL STRUCTURE

- Metallic crystal structures; BCC, FCC and HCP
- Coordination number and Atomic Packing Factor (APF)
- Crystal imperfections: point, line and surface imperfections
- Atomic Diffusion: Phenomenon, Fick's laws, factors affecting diffusion.

## 1.1 INTRODUCTION

The engineering materials (either metallic or non-metallic) can be identified as *crystalline* or *amorphous* structured. But most of the metals assume crystalline form with a systematic and regular arrangement of atoms as compared to amorphous structure that lacks regular atomic arrangement.

A crystalline material is thus comprised of group of atoms with a specific atomic arrangement which repeats in a 3D pattern; the small group of atoms that repeats over a 3D array is termed as a *unit cell*. The geometry and the atomic positions of a unit cell define the crystal structure.



βα

Figure 1.1: Unit cell lattice parameters

Based on unit call geometry for different possible combinations of a, b, c and  $\alpha$ ,  $\beta$ ,  $\gamma$  seven crystal systems were identified. Further, considering atomic arrangement within a crystal system A. Bravais showed that the seven crystal systems could be arranged in 14 independent ways to obtain the 14 Bravais lattices.

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