MATERIALS ENGINEERING

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Mechanical Engineering Discipline

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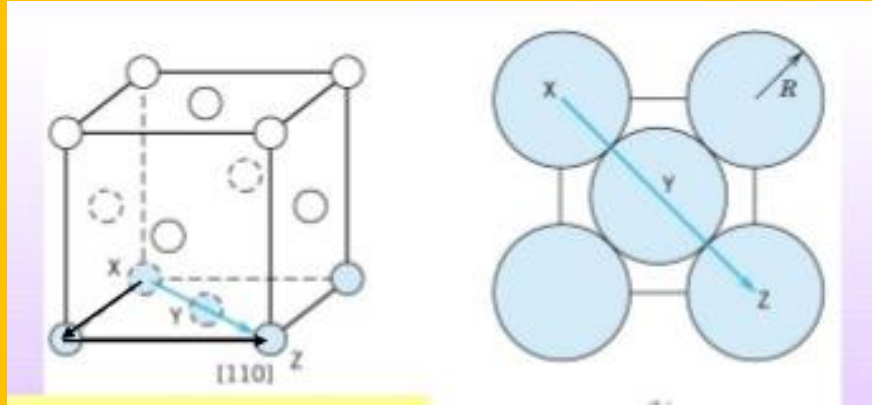Veer Bahadur Singh Purvanchal University,Jaunpur,India

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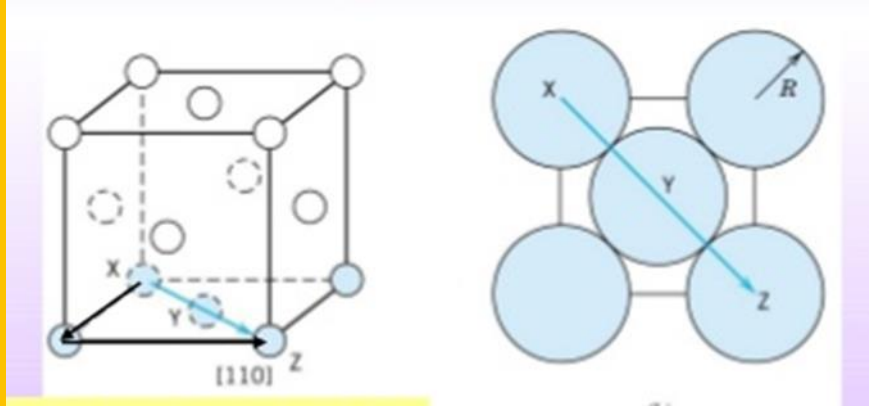
Linear and Planar Density

Linear Density

$$LD = \frac{\text{Number of atoms centered on a direction vector}}{\text{Length of the direction vector}}$$

$$\text{LD } \frac{2}{a\sqrt{2}}$$

Question: Lattice constant of a copper unit cell is 2.61 A. Compute the density of atoms per unit length along the directions [110].Find for [111] also

LD= $2/(a\sqrt{2})$

LD= $\{2/(3.61*10^{-10})\sqrt{2}\}=3.91*10^9$ *atoms per meter*

Planar Density

$$PD = \frac{\text{Number of atoms centered on a given plane}}{\text{Area of the plane}}$$
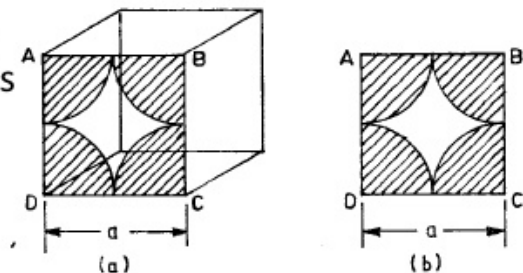
Planar density on (100) plane in a Simple Cubic Structure:

- Number of atoms on (100) plane is 1
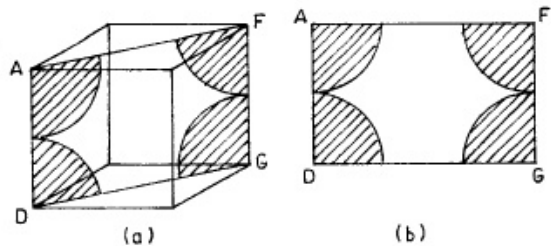- Area of (100) plane (square section) is
  $a \times a = a^2$

  PD = 1 atom / a^2 =
  = $1 / a^2$

Planar density on (110) plane in a Simple Cubic Structure:

- Number of atoms on (110) plane is 1
- Area of (110) plane (rectangular section) is $\sqrt{2}a^2$

  PD = 1 atom / $\sqrt{2} a^2$ =
  = $1 / \sqrt{2} a^2$

References

- Callister - Fundamentals of Materials Science and Engineering 5e
- William D. Callister - Materials Science and Engineering. An Introduction-Wiley (2006)
- https://www.slideshare.net/RakeshSingh125/f-crystalstructure
- https://www.quora.com/How-is-FCC-used-in-chemistry
- https://www.slideshare.net/djk239/mt-201-b-material-science-new

Thank You