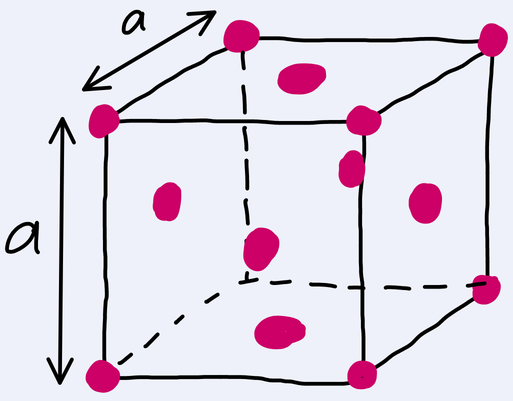
crystallines

24 Kasım 2024 Pazar 20:15

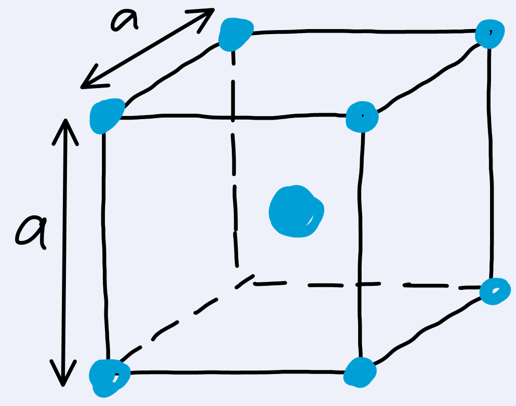


FCC
4 atoms
$a = 2R\sqrt{2}$

APF = 0.74
coord #: 12

$V_u = a^3 = (2R\sqrt{2})^3$

$V_a = 4 \cdot \frac{4}{3}\pi R^3$

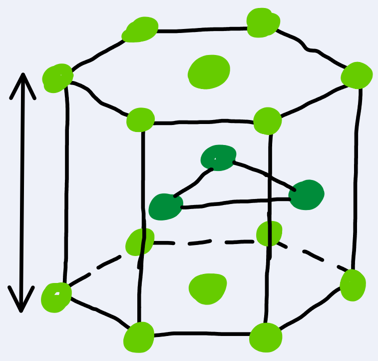


BCC
2 atoms
$a = \frac{4R}{\sqrt{3}}$

APF = 0.68
coord #: 8

$V_u = a^3 = \left(\frac{4R}{\sqrt{3}}\right)^3$

$V_a = 2 \cdot \frac{4}{3}\pi R^3$



HCP
6 atoms

APF = 0.74
coord #: 12

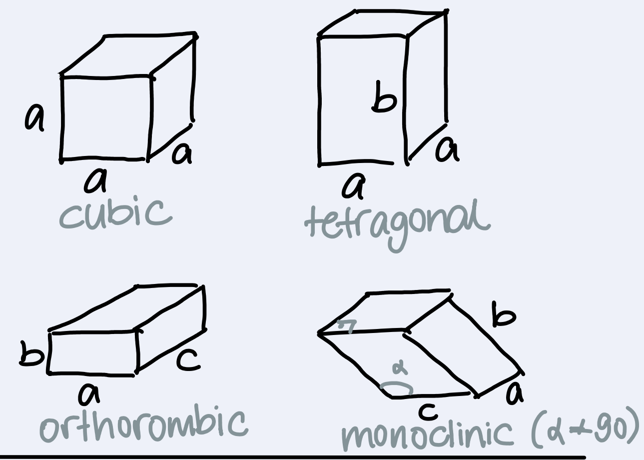
touching atom = coordination

$APF = \frac{\text{volume of atoms}}{\text{volume of unit cell}}$ ← V_a / ← V_c

$\text{Volume of sphere} = \frac{4}{3}\pi R^3$

$\rho = \frac{nA}{V_u \cdot N_A}$ (n: # atoms, A: atomic weight, N_A: avogadro, V_u: volume of unit cell)

$N_A = 6.023 \times 10^{23}$



1nm = 10^{-7}cm

$\rho = \frac{n \cdot A}{V_u \cdot N_A}$ ⇝ for BCC ⇒ 2.14 g/mol

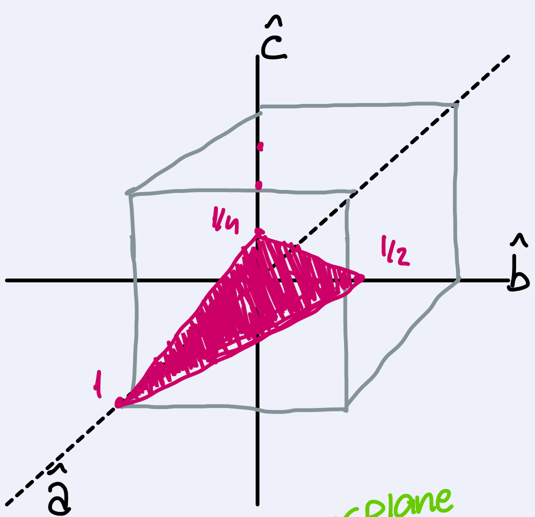
$V_c =$ 0.35nm → 0.35×10^{-7}cm
3.5×10^{-8}cm

000 → point coordinates

[uvw] → vector/directions

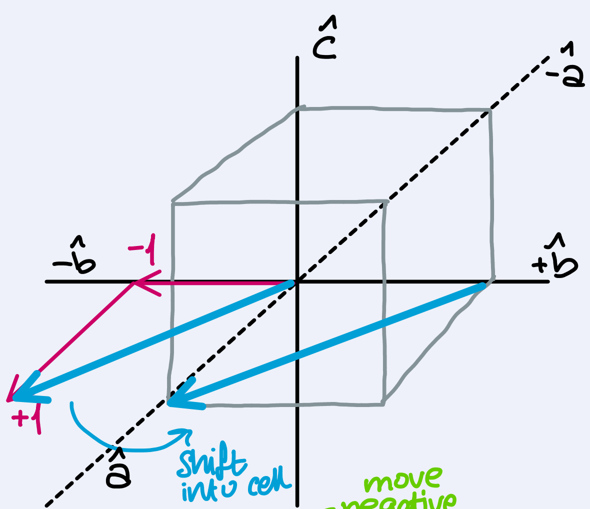
⟨100⟩ → family ⇝ 001, 010 etc. equivalent

(hkl) → plane coordinates



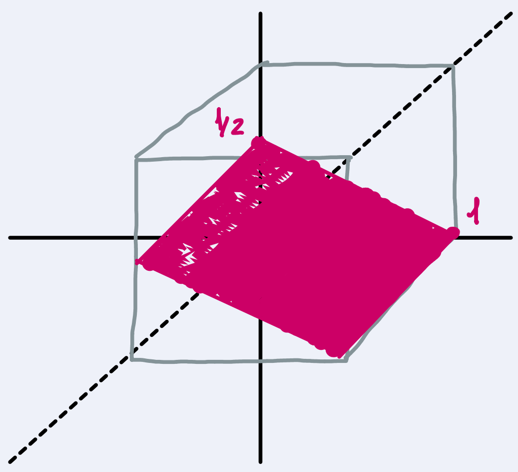
(1 2 4) ← plane

take reciprocal → $(1\ \frac{1}{2}\ \frac{1}{4})$
point the dots,
connect the dots,
fill in.



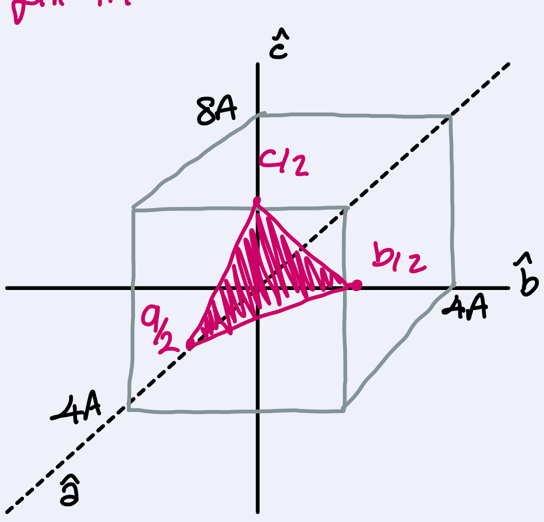
$[1\bar{1}0]$ ← move negative

draw the negative one,
shift it into the unit cell.

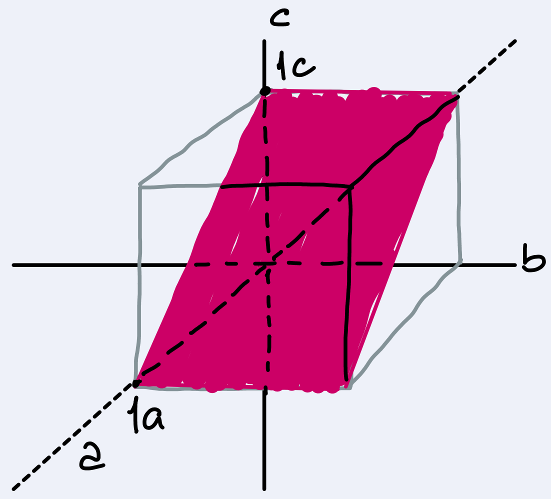


(0 1 2)

$(\infty\ 1\ \frac{1}{2})$ → means plane is parallel to the axis ∞ is in.

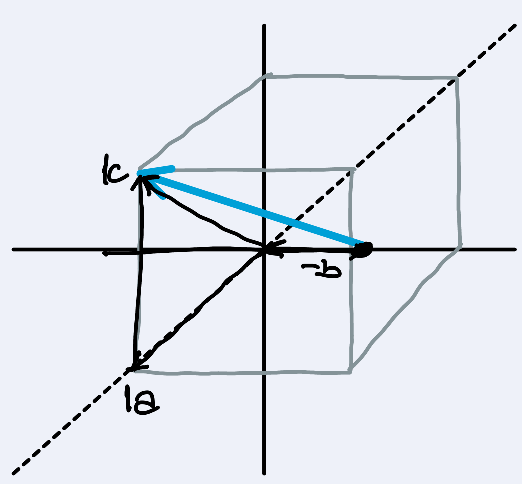


recip. $(\frac{1}{2}\ \frac{1}{2}\ \frac{1}{2})$ → (2 2 2) ✓



parallel to b

(1 0 1) → $(1\ \infty\ 1)$



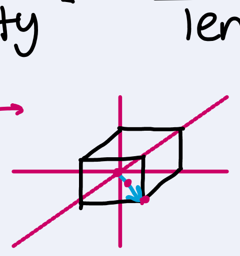
$[1\ \bar{\frac{1}{2}}\ 1]$

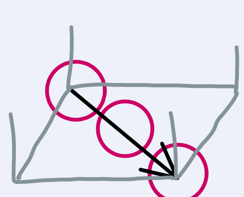
$[1\ \bar{2}\ 1]$

$\text{linear density} = \frac{\#\text{atom along the vector}}{\text{length of vector}}$

$\text{planar density} = \frac{\#\text{atom on the plane}}{\text{area of plane}}$

LD_{110} → for FCC





$\frac{2\text{ atoms}}{4R}$