Struktur der Kristalle

1. **Symmetriegruppen**
   1. Punktgruppen
   2. Raumgruppen
2. **Kristallsysteme**
   1. Translationsgitter
   2. 7 Kristallsysteme
   3. 14 Bravais-Gitter
3. **Einfache Kristallgitter**
   sc, bcc, fcc, hexagonal
   Beispiele
4. **Wigner-Seitz-Zelle**
5. **Millersche Indizes**
6. **Brillouin-Zone**
7. **Reziprokes-Gitter**

Keine flächendeckende Anordnung für 5-, 7-, oder 8-Ecke

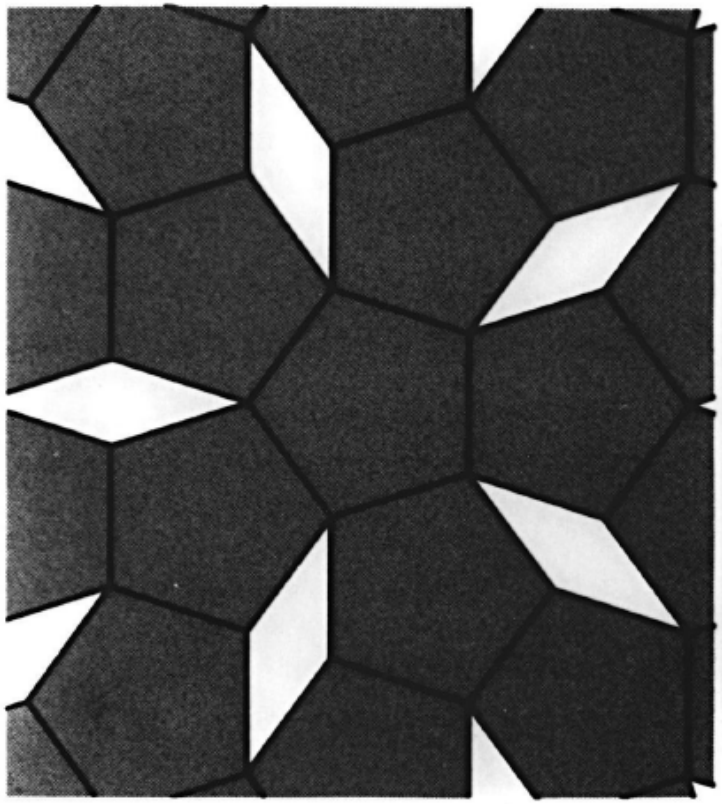


Figure 9a A five-fold axis of symmetry cannot exist in a lattice because it is not possible to fill all space with a connected array of pentagons. In Fig. 32 we give an example of regular pentagonal packing which does not have the translational invariance of a lattice.

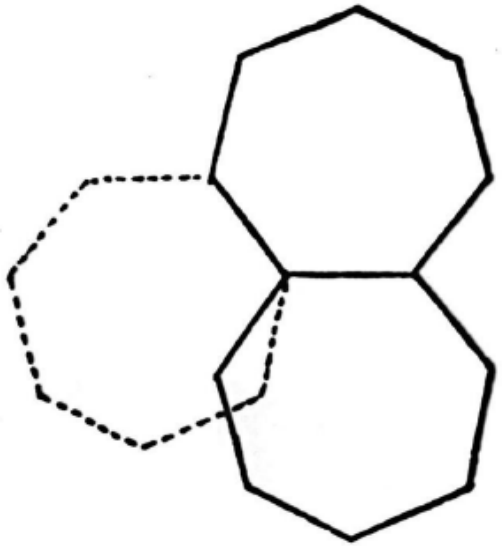
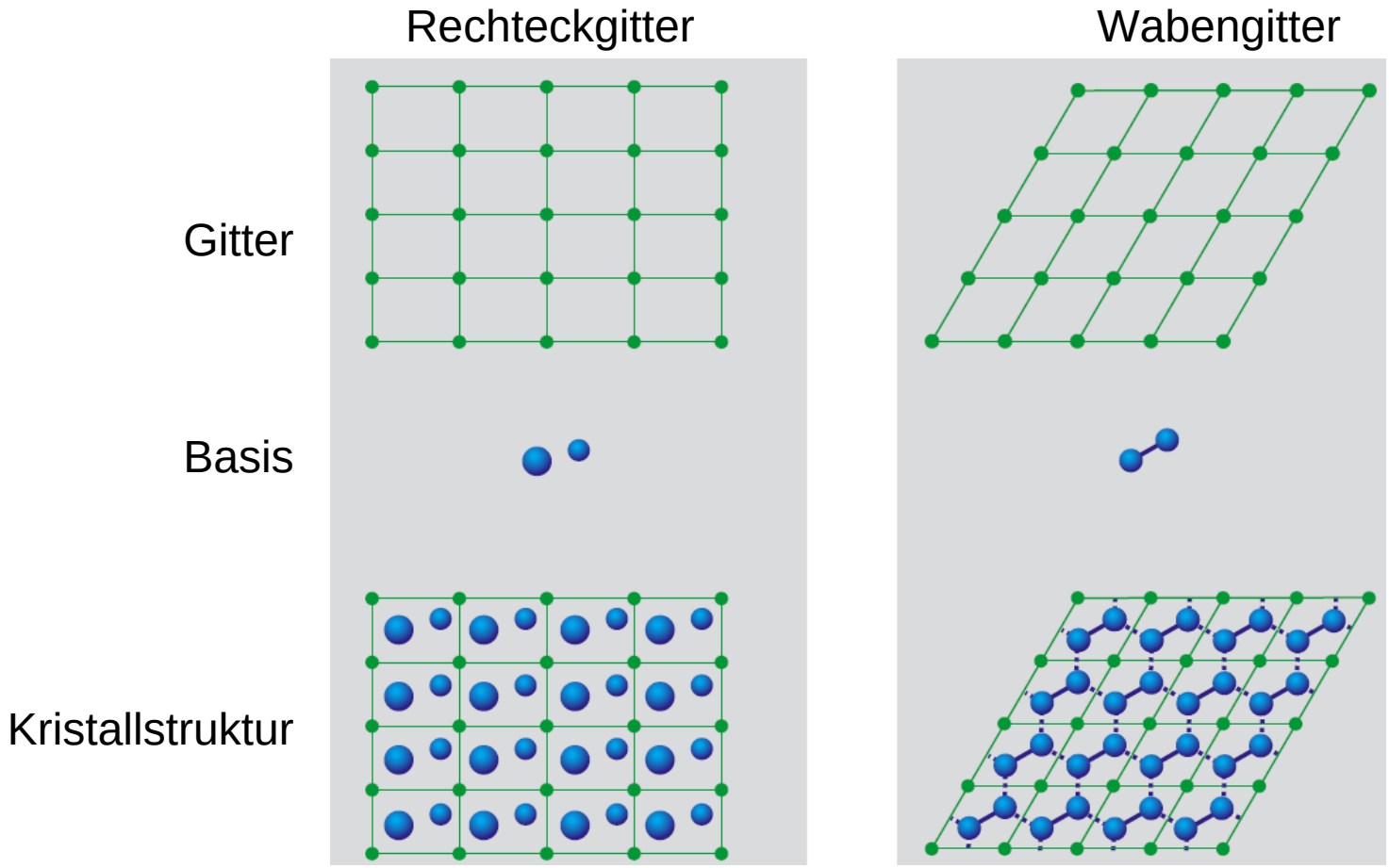


Figure 9b Kepler's demonstration (*Harmonice mundi*, 1619) that a seven-fold axis of symmetry cannot exist in a lattice. (*Gesammelte Werke*, Vol. 6, Beck, Munich, 1940.)

Kristallstruktur = Gitter + Basis



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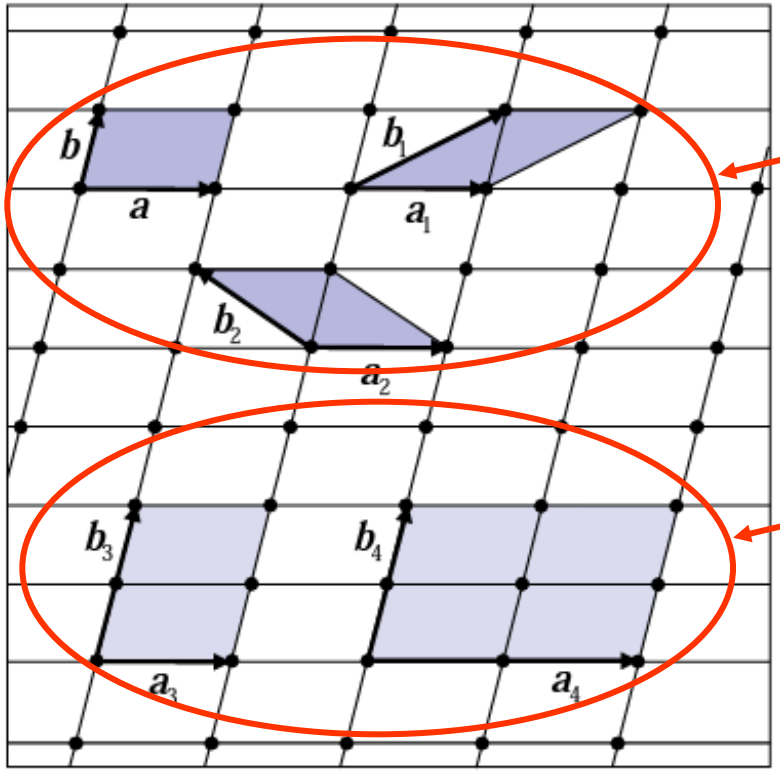
Primitive Elementarzelle

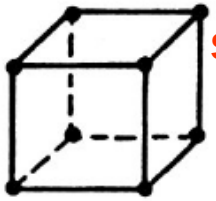


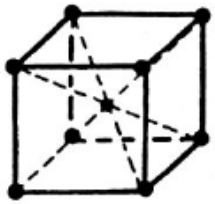
primitive Elementarzellen

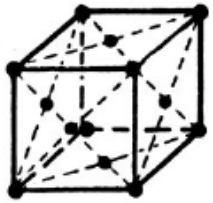
nicht-primitive Elementarzellen

Rechtwinklige Kristallsysteme

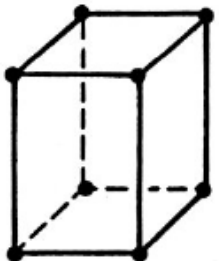
kubisch
$a=b=c$
$\alpha=\beta=\gamma=\pi/2$

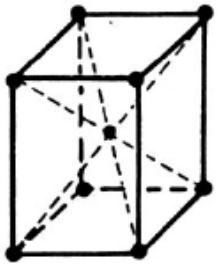

sc primitiv


bcc raumzentriert

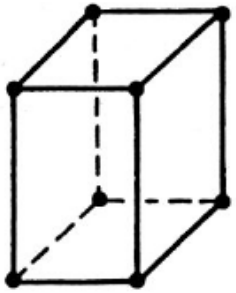

fcc flächenzentriert

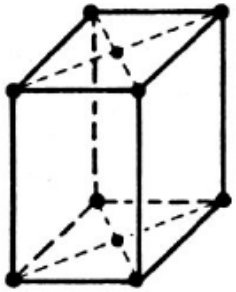
tetragonal
$a=b\neq c$
$\alpha=\beta=\gamma=\pi/2$

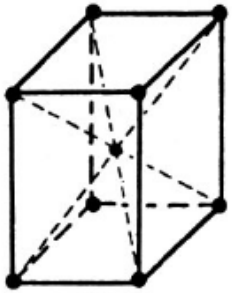

primitiv


raumzentriert

orthorhombisch
$a\neq b\neq c$
$\alpha=\beta=\gamma=\pi/2$


primitiv


basiszentriert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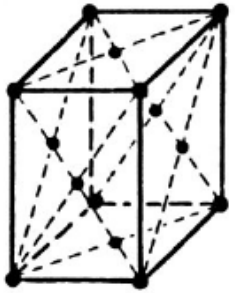
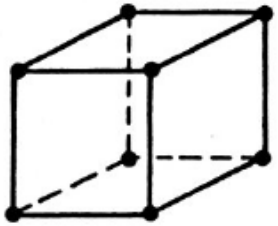
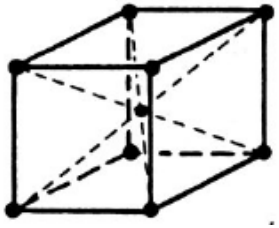

flächenzentriert

Schiefwinklige Kristallsysteme

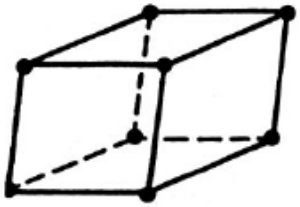
monoklin
$a \neq b \neq c$
$\alpha = \beta = \pi/2 \neq \gamma$



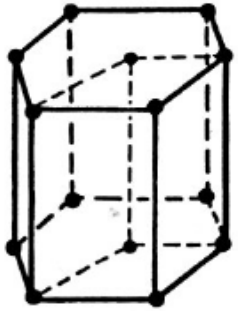
primitiv



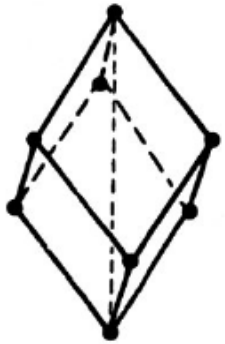
raumzentriert



triklin
$a \neq b \neq c$
$\alpha \neq \beta \neq \gamma \neq \pi/2$



hexagonal
$a = b \neq c$
$\alpha = \beta = \pi/2, \quad \gamma = 2\pi/3$

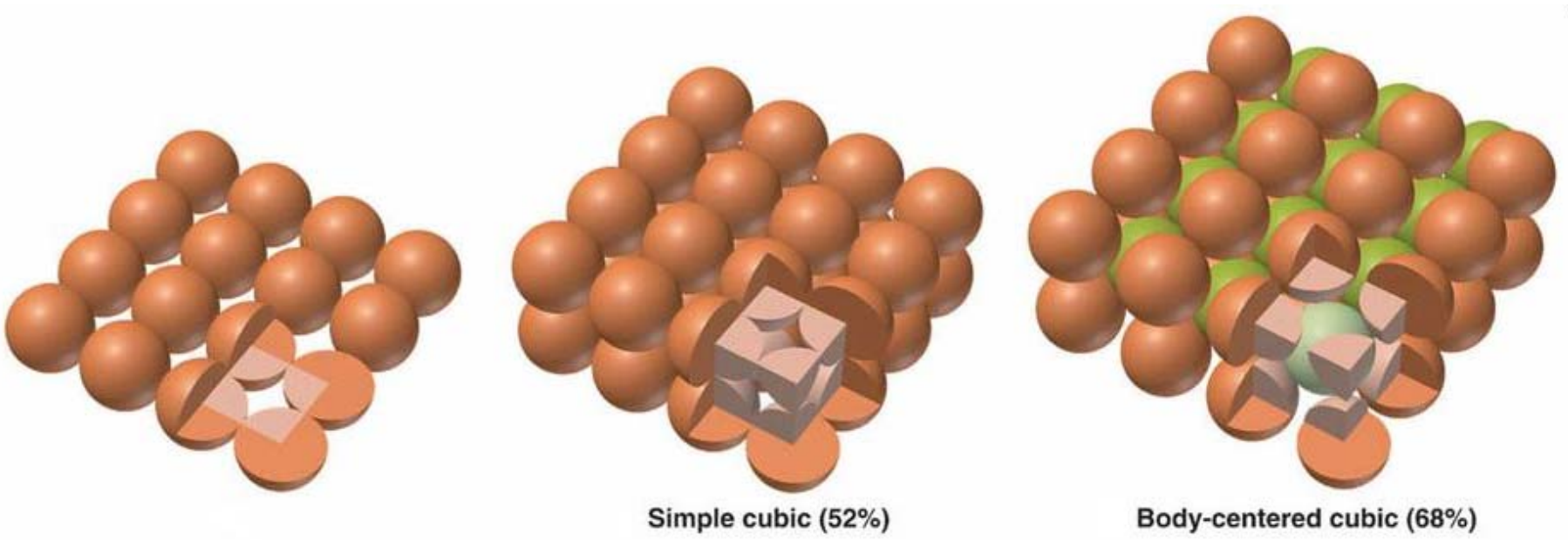


trigonal
$a = b = c$
$\alpha = \beta = \gamma \neq \pi/2$

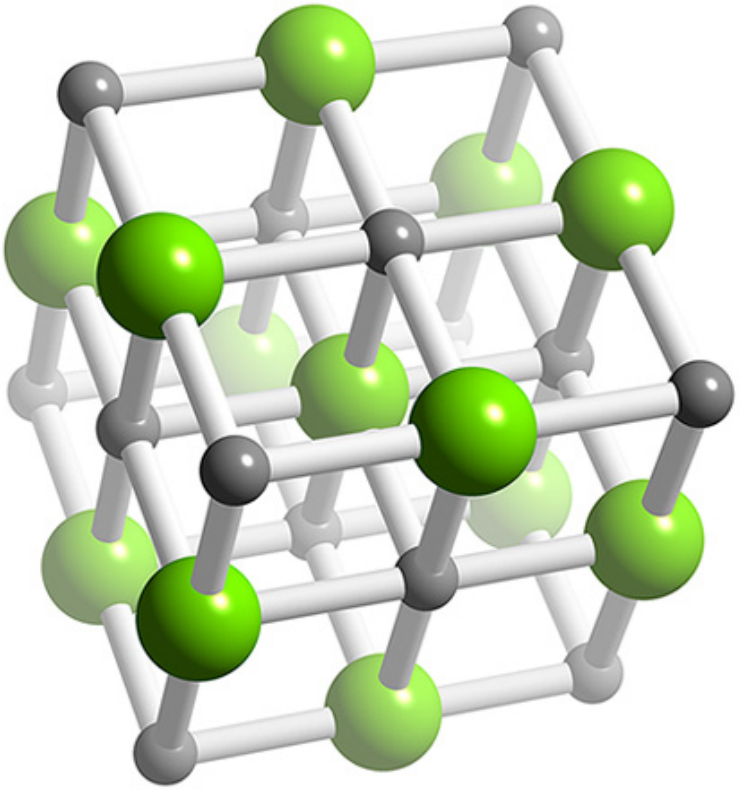
Kubische Kristalle
sc und bcc

sc

bcc

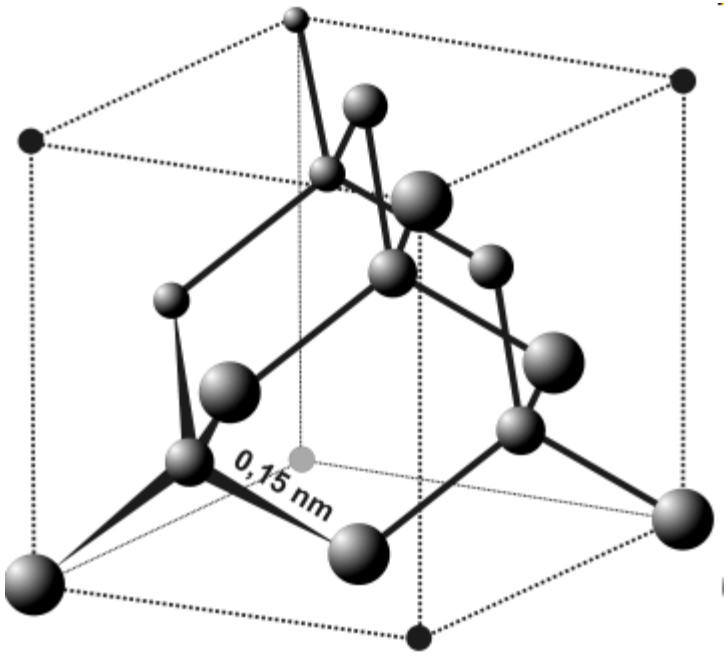


Natriumchlorid-Struktur
fcc

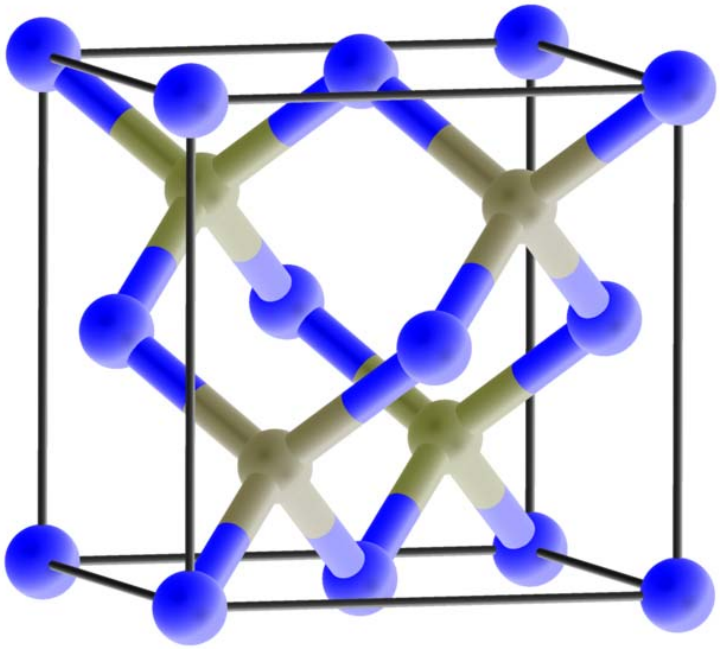


Diamant- und Zinkblende-Strukturen
fcc

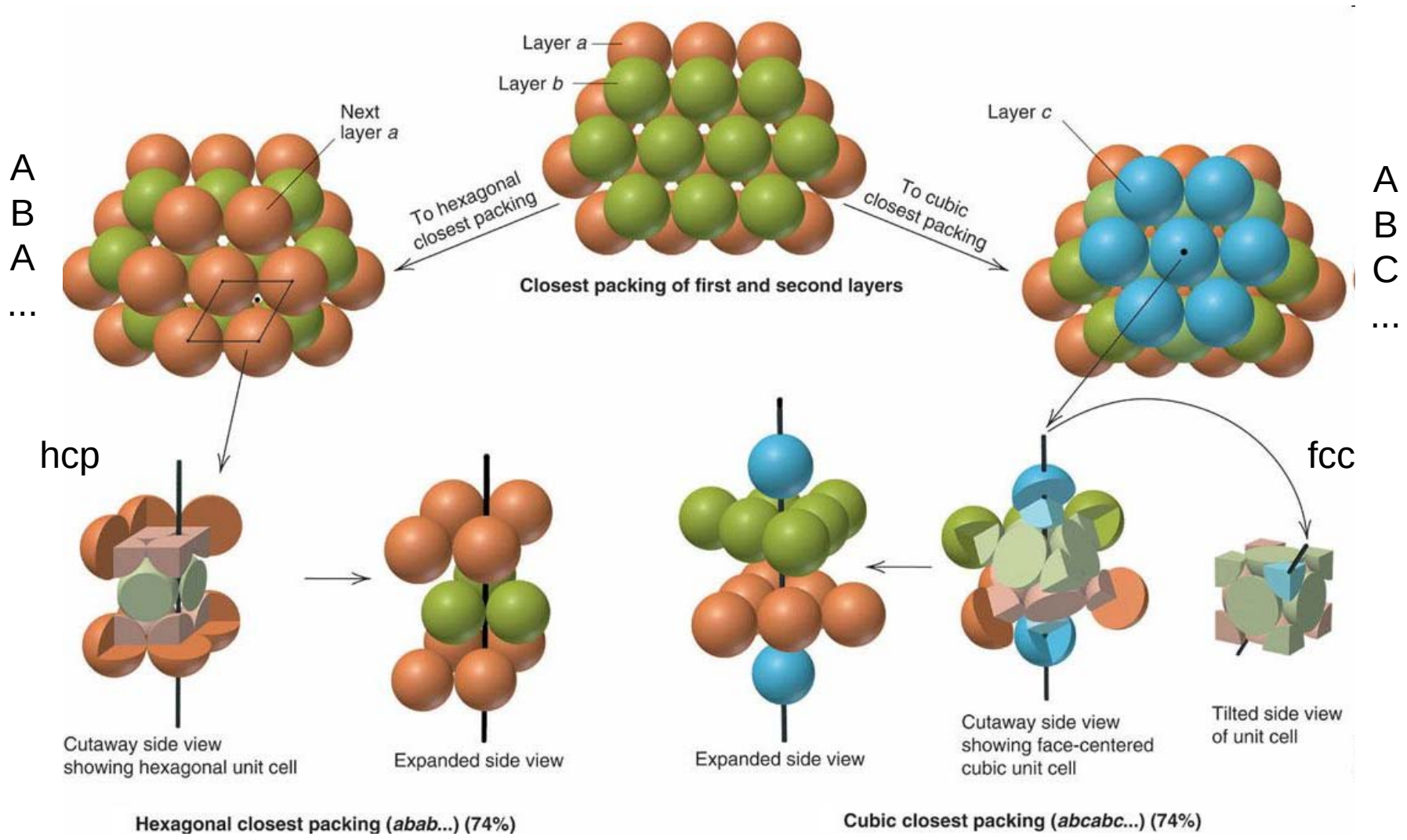
Diamant C



Zinkblende ZnS



Kugelpackung: hexagonal oder kubisch? hcp und fcc



Millersche Indizes