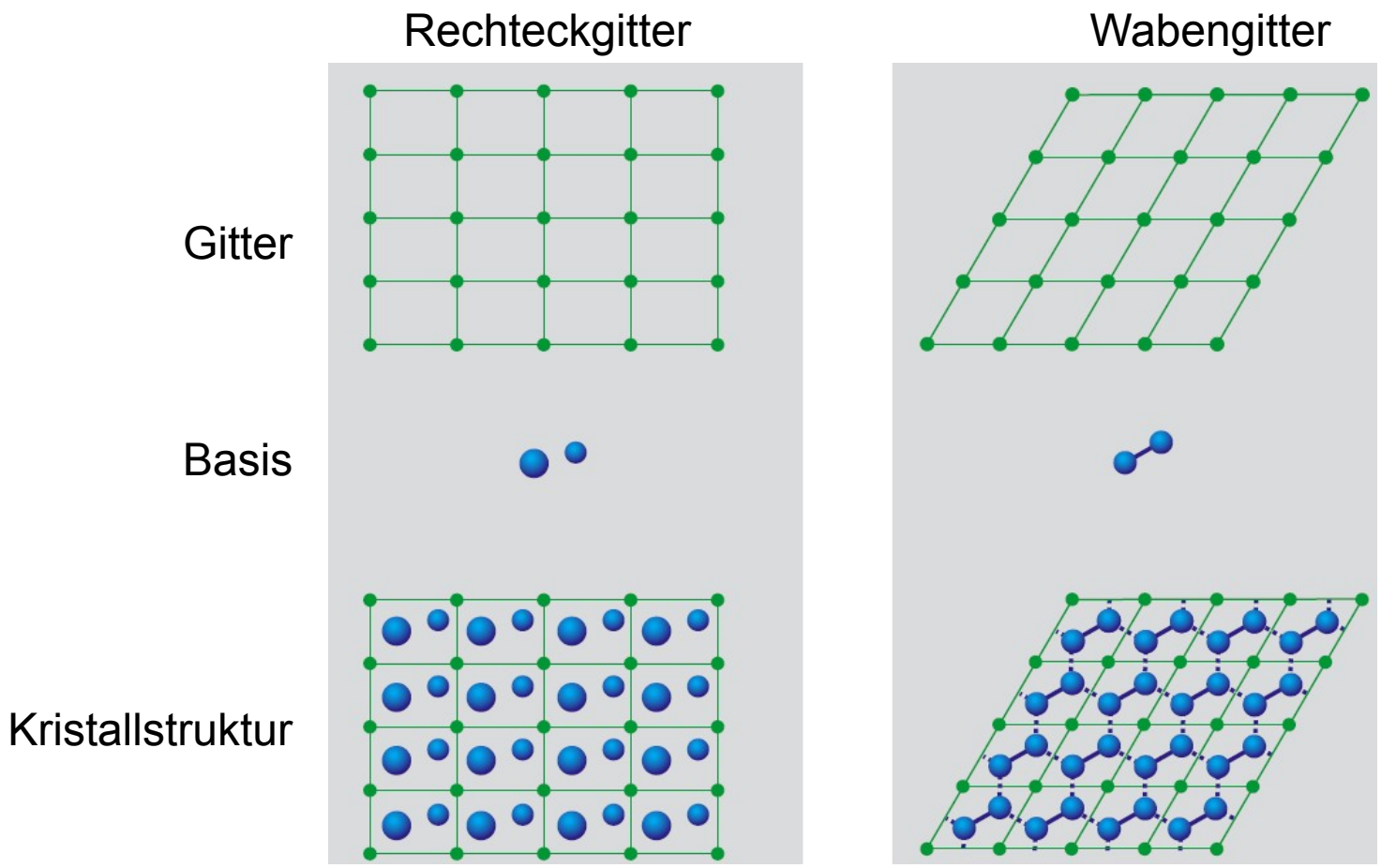
2. Die Kristallstruktur der Festkörper

Karlsruhe Institute of Technology

2.0 Vorbemerkungen

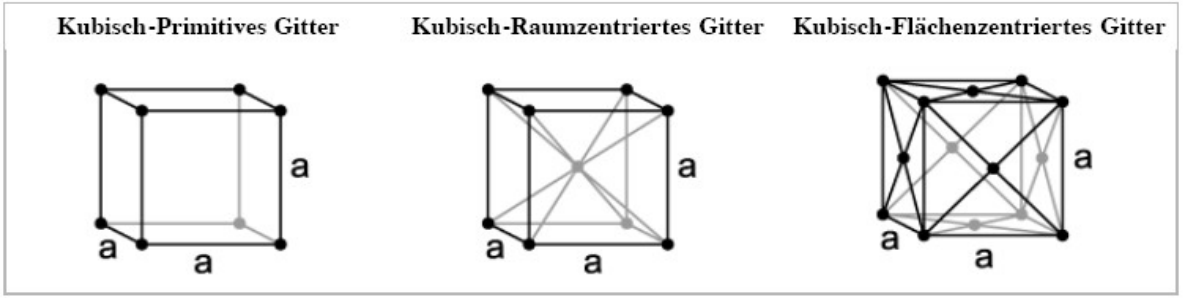
Kristall = Gitter x Basis

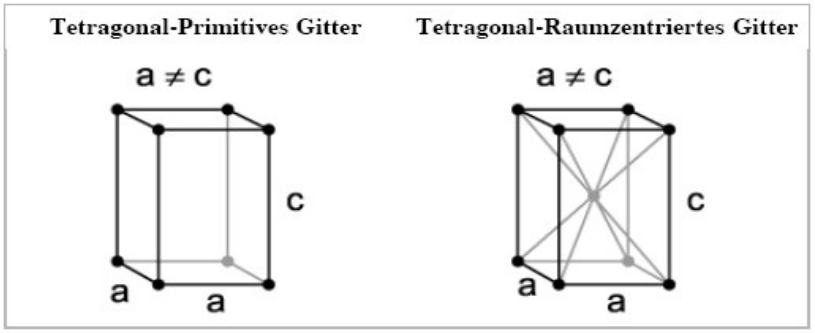


2.1 Die Bravias Gitter

Rechtwinklige Gitter

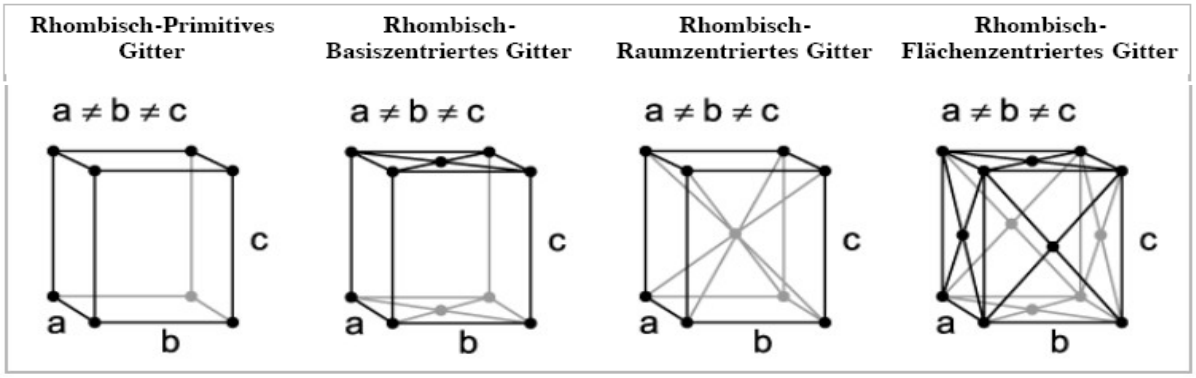
Kubisch:





:Tetragonal

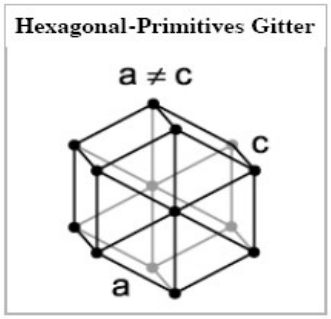
Rhombisch:

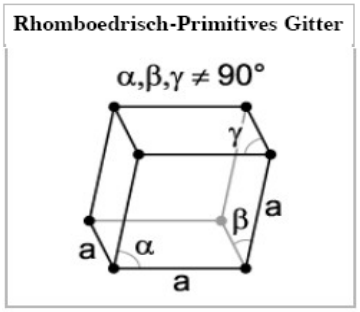


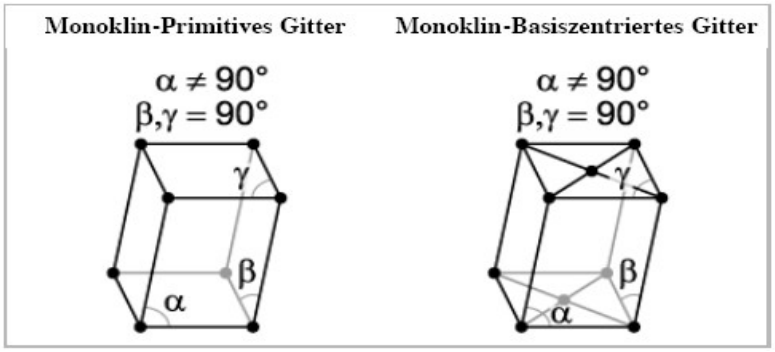
2.1 Die Bravias Gitter

Schiefwinklige Gitter

Gleichseitig:

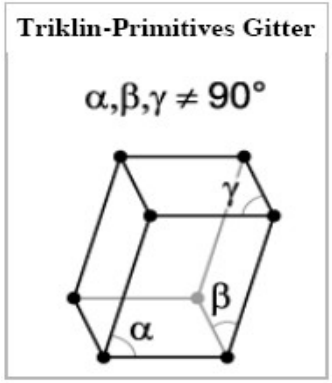






:Monoklin

Triklin:



2.2 Punktgruppen

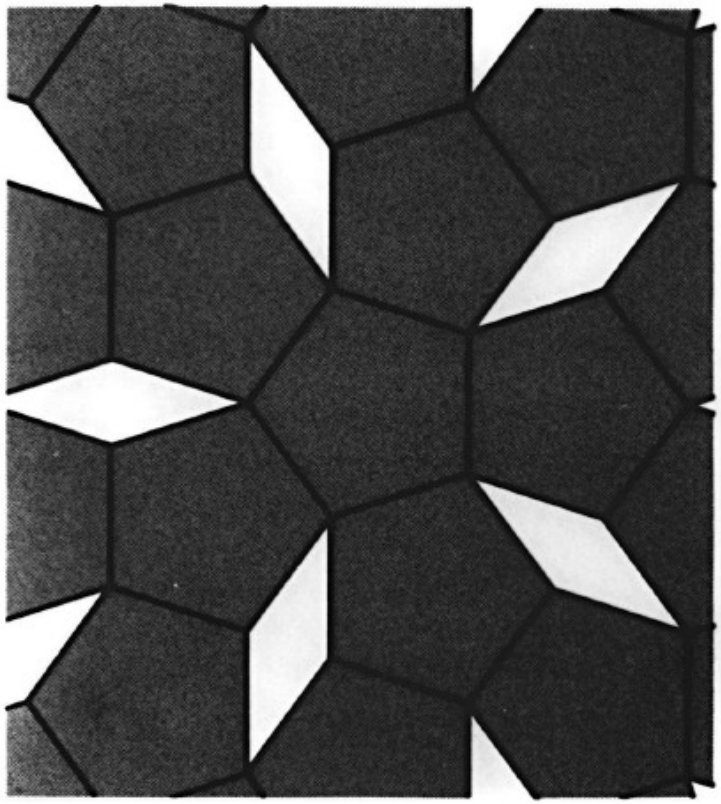


Figure 9a A five-fold axis of symmetry cannot exist in a lattice because it is not possible to fill all space with a connected array of pentagons. In Fig. 32 we give an example of regular pentagonal packing which does not have the translational invariance of a lattice.

5,7,8 etc. Eck füllen den Raum nicht ohne Lücken

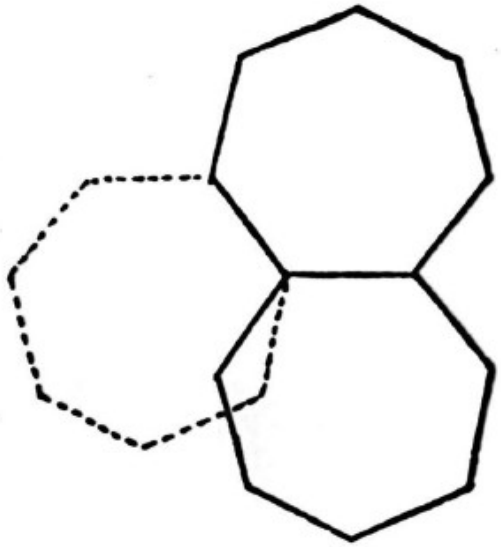
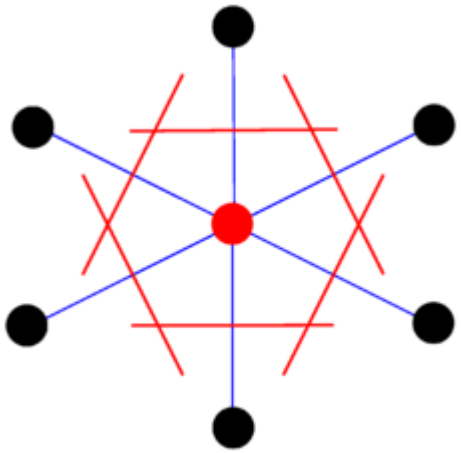
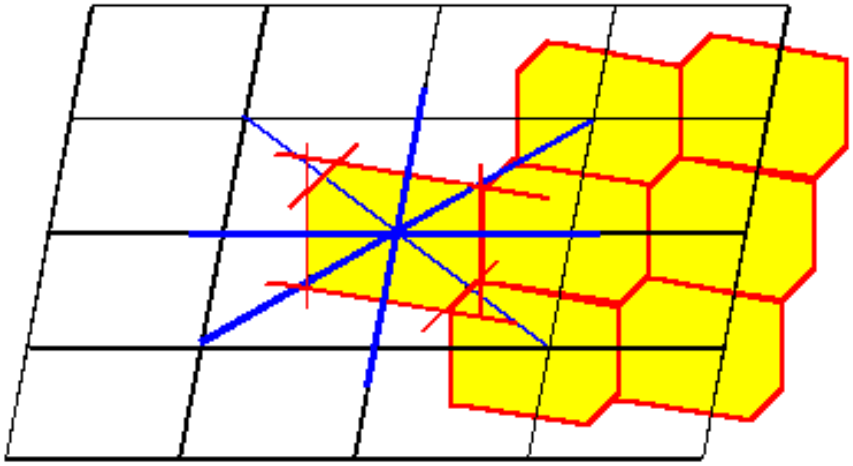


Figure 9b Kepler's demonstration (*Harmonice mundi*, 1619) that a seven-fold axis of symmetry cannot exist in a lattice. (*Gesammelte Werke*, Vol. 6, Beck, Munich, 1940.)

aus Kittel

2.4 Die Wigner-Seitz Zelle

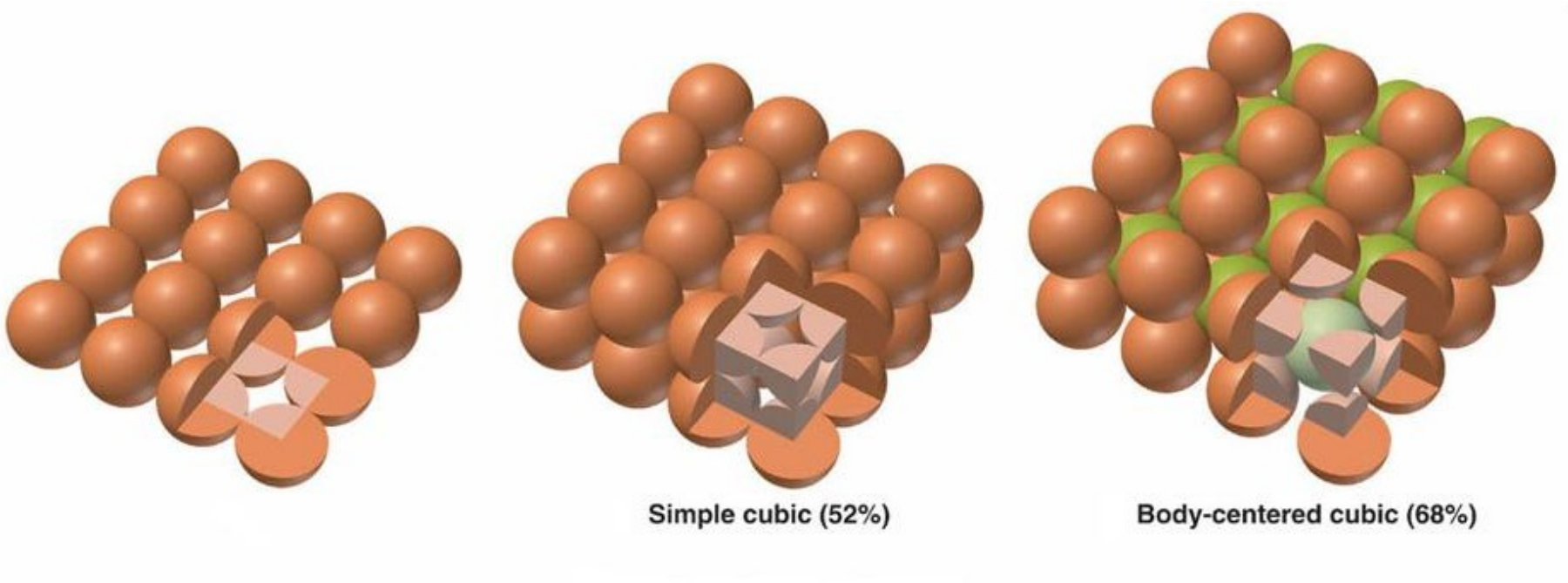




2.5 Einfache Kristallstrukturen

Kubisch primitiv (sc)
1 Gitterpunkt/EZ

Kubisch raumzentriert (bcc)
2 Gitterpunkte/EZ

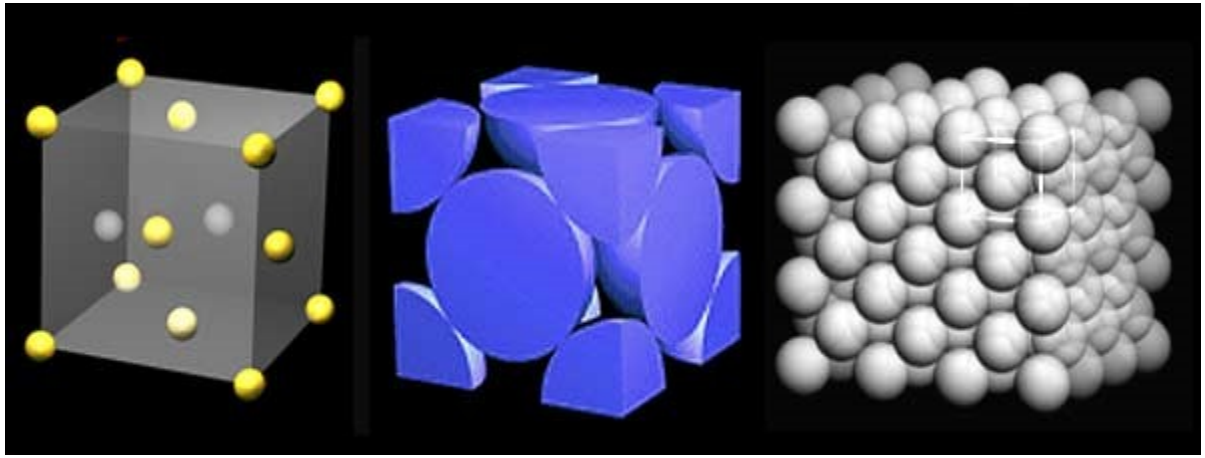


Kein Element
CsCl

Li, Na, K, …
V, Ni, Ta
Cr, Mo, W
Fe

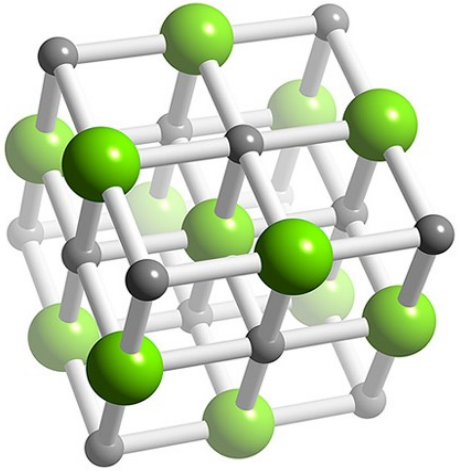
2.5 Einfache Kristallstrukturen

Kubisch flächenzentriert (fcc)
4 Gitterpunkte/EZ



Ne, Ar, Cr, Xe, …
Cu, Ag, Au, …
Ni, Pd, Pt, …
Rh, Ir, …

NaCl



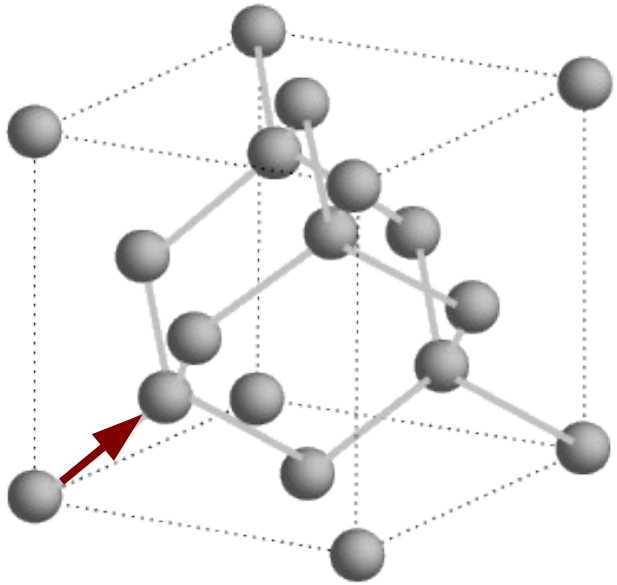
2.5 Einfache Kristallstrukturen

Diamantstruktur

Diamant

C,Si,Ge

elementare Halbleiter



Zinkblende

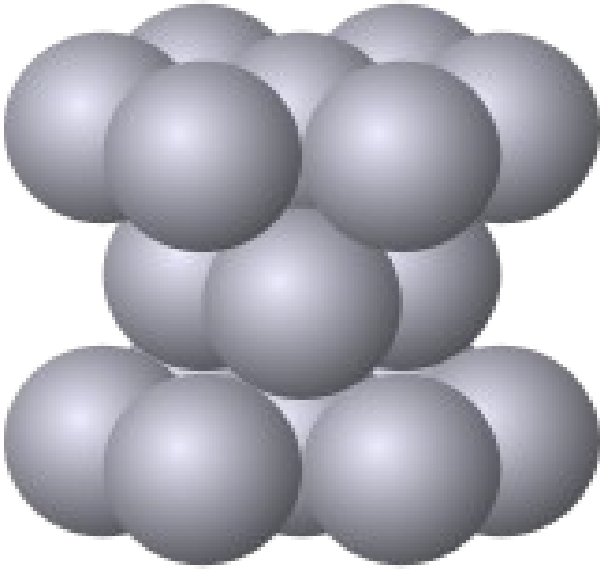
ZnS, GaAs, InP

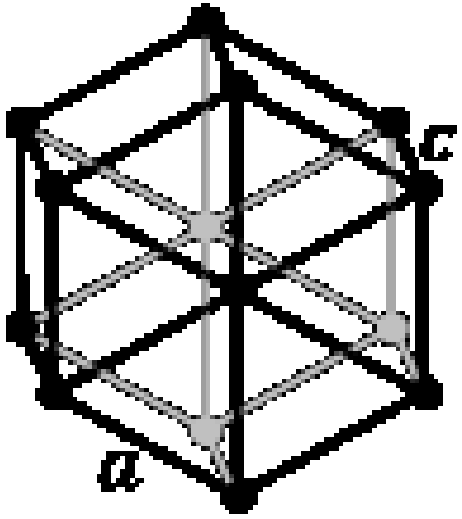
III-V Halbleiter

2 fcc Gitter um [1/4,1/4,1/4] gegeneinander verschoben.
Jedes Atom ist eingebettet in einen Tetraeder von nächsten Nachbarn.
Bindungsachsen entsprechen einer sp^3 Hybridisierung.
In der Zinkblende Struktur sind die Atome beider fcc Gitter unterschiedliche.

2.5 Einfache Kristallstrukturen

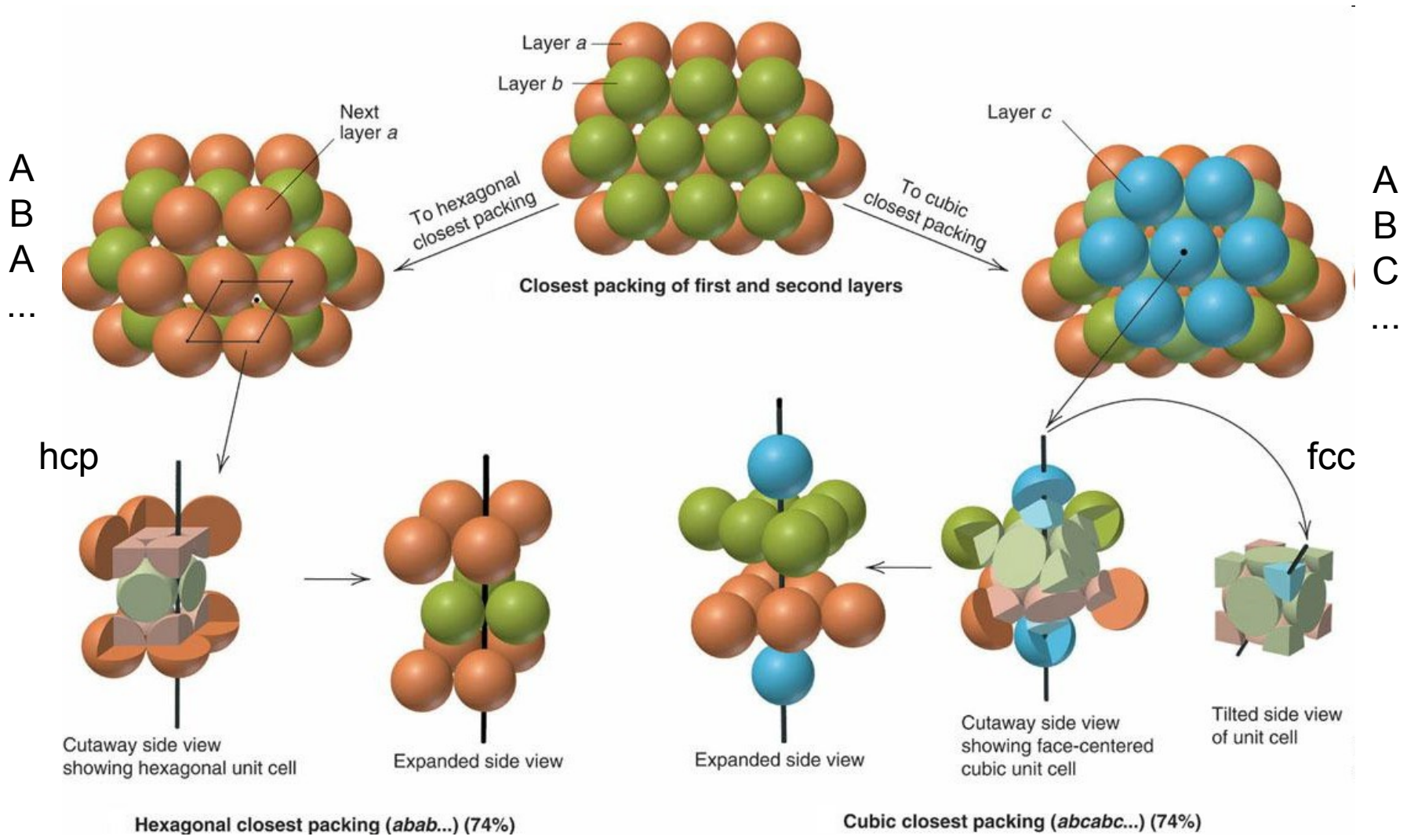
Hexagonal dichteste Packung (hcp)





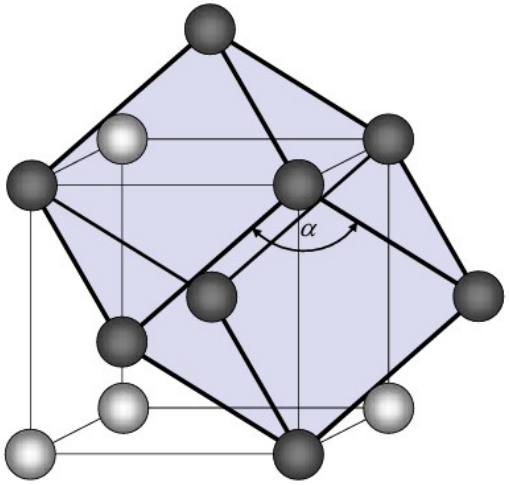
Ti, Zr, Hf, …
Be, Mg, Co

2.5 Einfache Kristallstrukturen



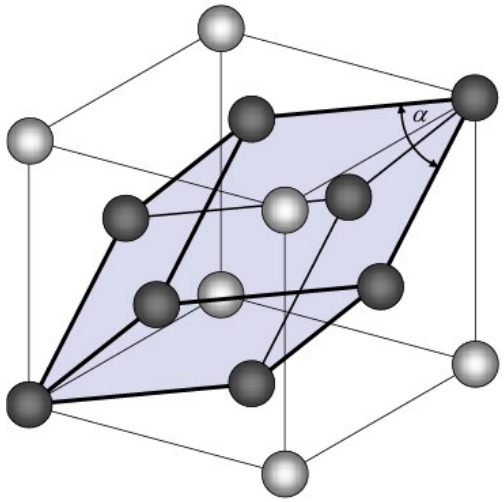
2.5 Einfache Kristallstrukturen

Die primitive Einheitszelle



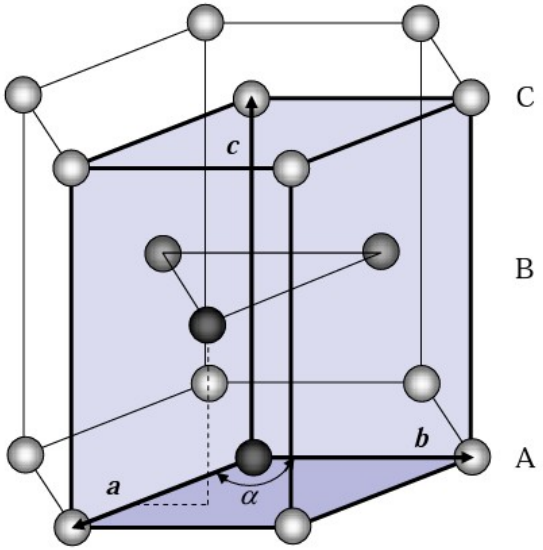
bcc

kubisch raumzentriertes Gitter



fcc

kubisch flächenzentriertes Gitter



hcp

hexagonal dichtesten Kugelpackung

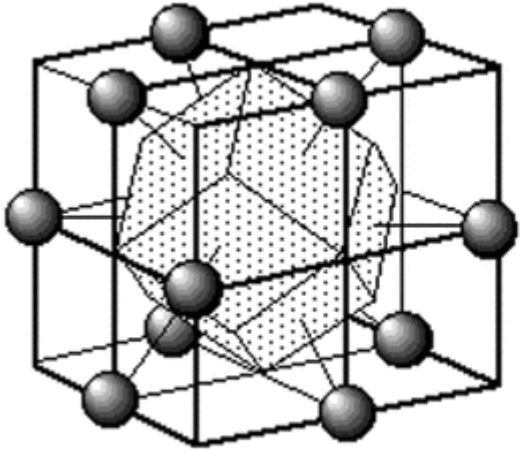
aus Hunklinger

2.5 Einfache Kristallstrukturen

Die Wigner-Seitz Zelle

fcc

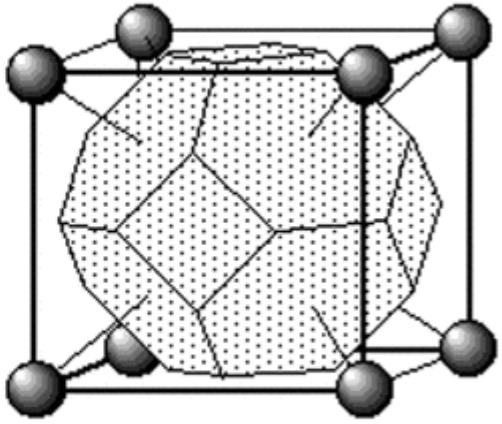
kubisch flächenzentriertes Gitter



rhombic dodecahedron

bcc

kubisch raumzentriertes Gitter



truncated octahedron