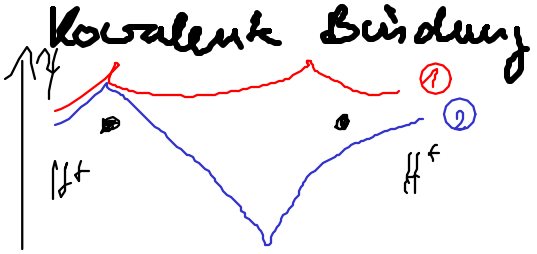
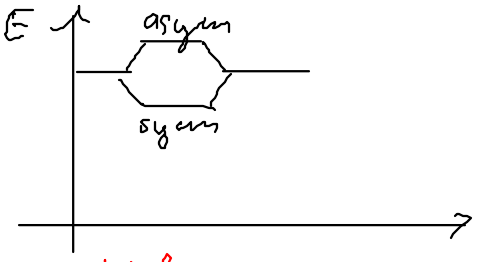
Bindungstypen

- Van-der-Waals Bindung
- Ionen Bindung
- Kovalente Bindung
- metallische Bindung

Kovalente Bindung



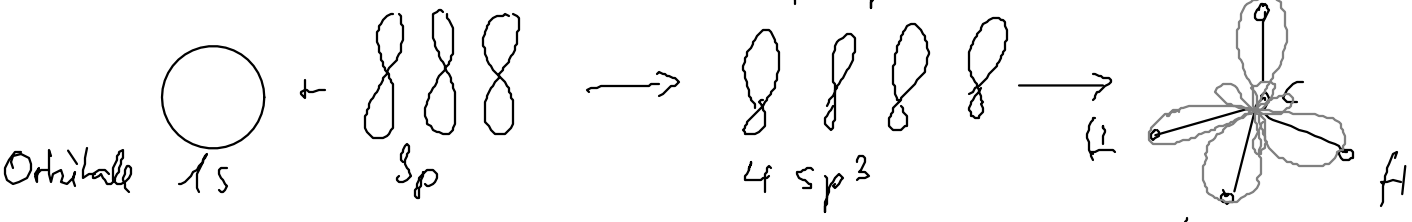


Wahrscheinlichkeit des Elektrons symmetrisch

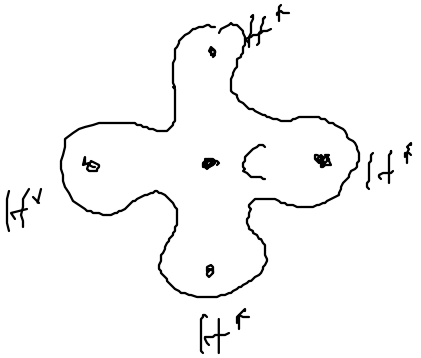
asymmetrisch

$1s^2\ 2s^2\ 2p^1$ —Hybridisierung→ $1s^2\ 2s\ 2p_x\ 2p_y\ 2p_z$ (Hybridorbitale) oder $2p_z + 3 \cdot sp^2$

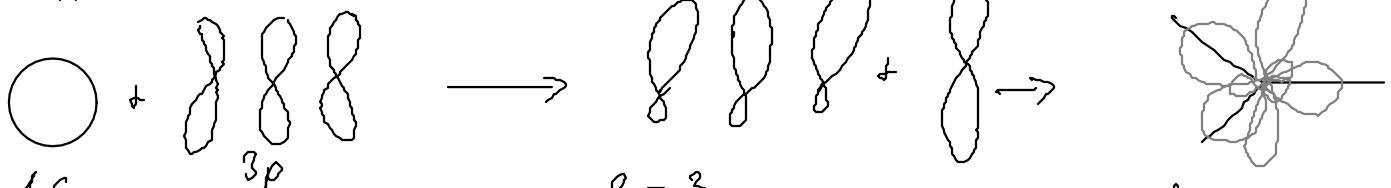
$2s\ 2p_x\ 2p_y\ 2p_z$ = $4 \cdot sp^3$



Tetragonal



oder



Trigonal

Kristalle: C (Diamant), Si, Ge

$A^{III} B^{V}$ ⟶ InSb; GaAs

Kohlenstoff Materiale

Graphit	Graphene	Nanoröhre	Fullerene	
3D	2D	1D	0D	Dimension
	2004	1991	1985	Entdeckung
			C_{60}, C_{20}	Beispiele
			⇓	
			⌀ 7,1 Å	

Metallische Bindung

Valenzelektronen sind delokalisiert ⇒ Elektronengas

Li-Ionen: $r_i \sim 0{,}6$ Å

Li-Kristall: $R_0 \sim 3$ Å

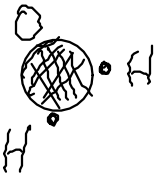
Cu: $\frac{R_0}{r_i} \approx 1{,}33$

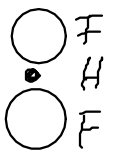
Au: $\frac{R_0}{r_i} \approx 1{,}05$

Wasserstoffbrückenbindung

Ionisierungsenergie H: $U_i \approx 13{,}6$ eV Na: $U_i \sim 5{,}1$ eV

H ⟶ kovalente Bindung nur mit einem Nachbarn

H_2O 

HF_2^- 

Struktur der Kristalle

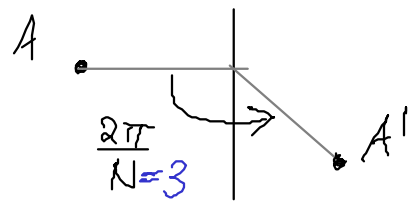
1. Symmetriegruppen
   1. Punktgruppe
   2. Raumgruppe
2. Kristallsysteme
   1. Translationsgitter
   2. 7 Kristallsysteme
   3. 14 Bravais Gitter
3. Einfache Kristallgitter
   1. SC, bcc, fcc hexagonal
   2. Beispiele
4. Wigner-Seitz-Zelle
5. Millersche Indizes
6. Brillouin Zone
7. Reziprokes-Gitter

Struktur der Kristalle

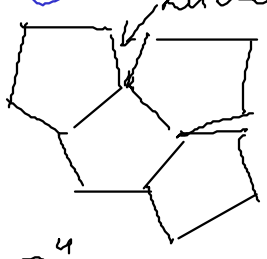
- Symmetrie & Transformationen unter denen Syst. „unverändert" erscheinen
  Natur ⟶ Gruppentheorie

Punktgruppen sind, 1 Punkt ist fest (blau: Bezeichnung)

- Drehung um 1 Achse 3 Lücken es gibt 7 Gruppen



N = 1, 2, 3, 4, 5, 6

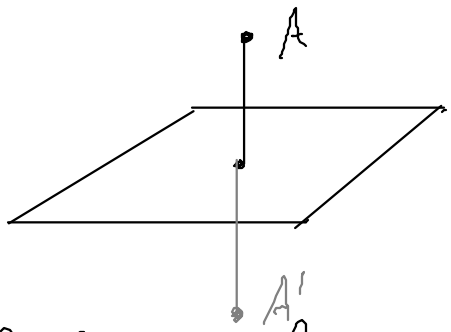


4 Fünfeck

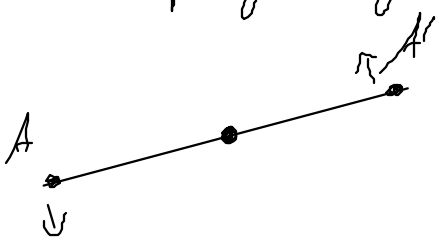
6-Eck ⇒ ohne Lücken

7-Eck ⇒ überlapp

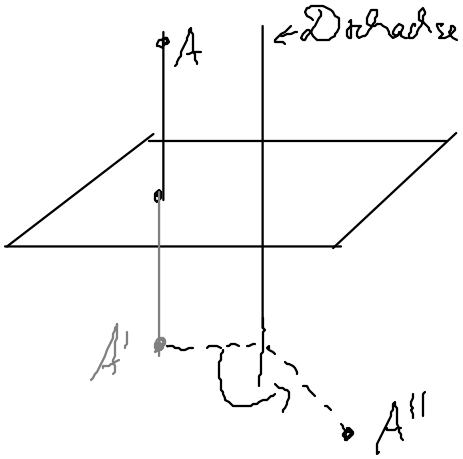
- Spiegelung an einer Spiegelachse m



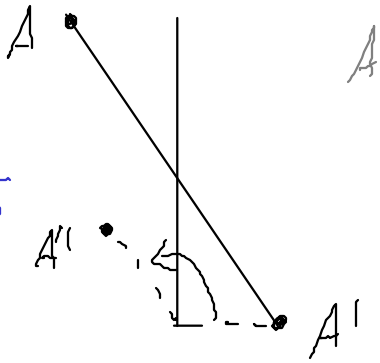
- Punktspiegelung $\overline{1}$



- Spiegelung und Drehung $\frac{3}{m}$



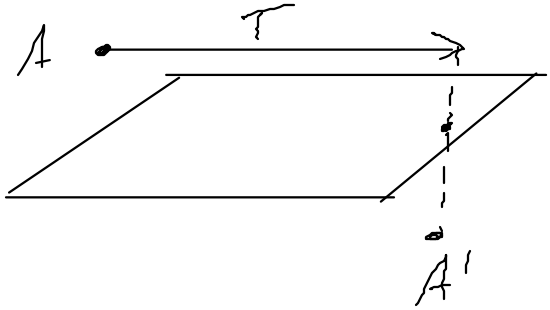
- Drehinversion $\overline{3}$



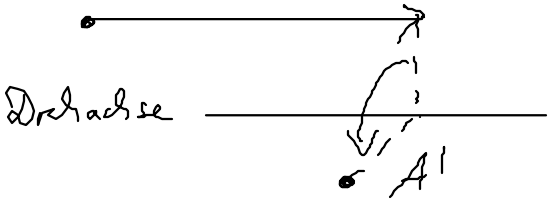
Raumgruppen translative Symmetrieoperationen

es gibt 230 Gruppen

- Gleitspiegelebene

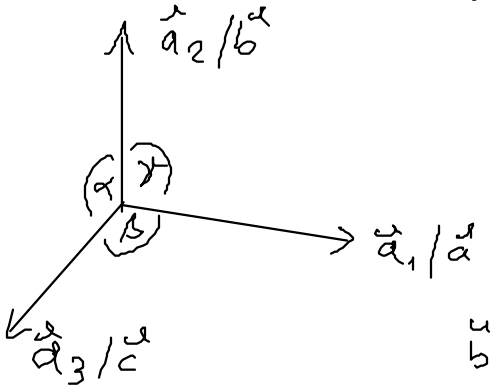


- Schraubung



Kristallsysteme

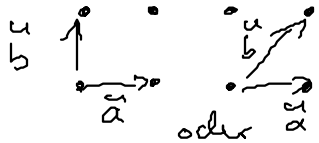
- Kristallstruktur = Gitter + Basis

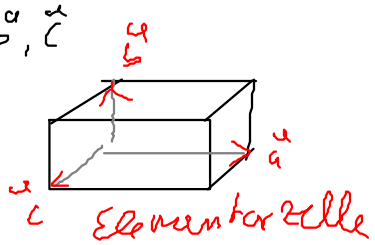


Umgebung $U(\vec{r}) = U(\vec{r} + \vec{R})$

$\vec{R} = n_1 \vec{a} + n_2 \vec{b} + n_3 \vec{c}$

Basisvektoren $\vec{a}, \vec{b}, \vec{c}$





- primitive Elementarzelle = kleinst mögliche Elementarzelle

3D	Bravais-Gitter Basisobjekt kugelsym	Kristallstruktur beliebige Sym
Punktgruppen Anzahl Kristallsyst	7	32
Raumgruppen	14	230
2D (Punktgr.)	5	17

Basis $\hat{=}$ Anzahl und welche Atome in 1 Elementarzelle

7 Kristallsysteme

kubisch

tetragonal

orthorhombisch

monoklin

triklin

hexagonal

trigonal