

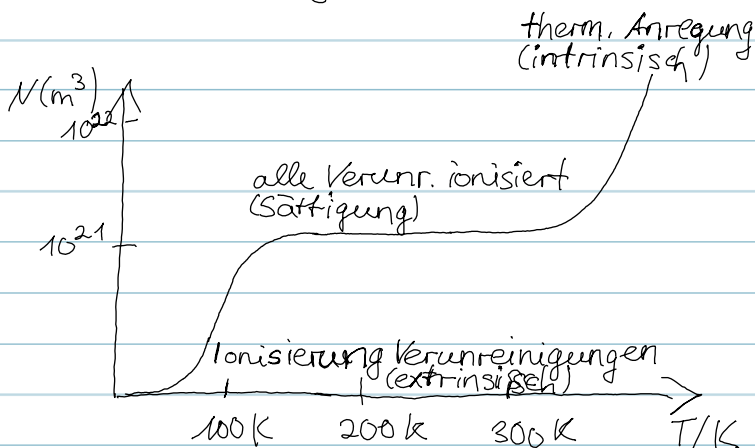
4.3 Halbleiter

6.6.12

perfekter Kristall, 0K → keine Leitfähigkeit!

Ursache Leitfähigkeit:

- thermische Anregung
- Verunreinigungen
- Gitterdefekte
- fehlende Stöchiometrie

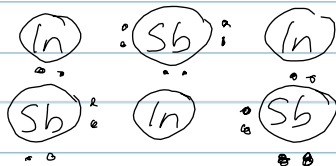


Intrinsische HL

z.B. Si, Ge → tetrah. Koord.

allg. $A^N B^{8-N}$

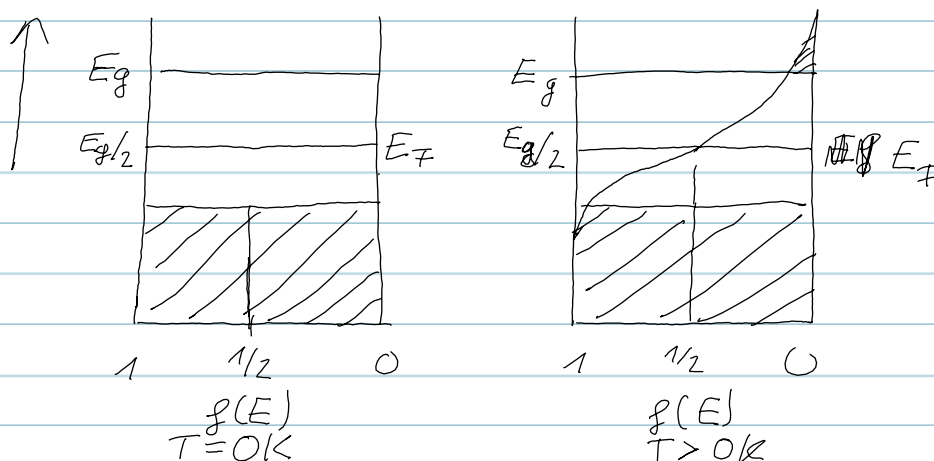
$N=3$: InSb, GaAs (III-V-HL)



$N=2$: ZnS, CdS (II-VI-HL)

4.3 Halbleiter

E_g -Bestimmung



$$\sigma = n_e e \mu_e + n_p p \mu_p$$

intrinsische Halbleiter: symm. $n_e = n_p$
 $\hookrightarrow \sigma \propto n_e$

$$n_e = \int_{E_f}^{\infty} f(E) D(E) dE$$

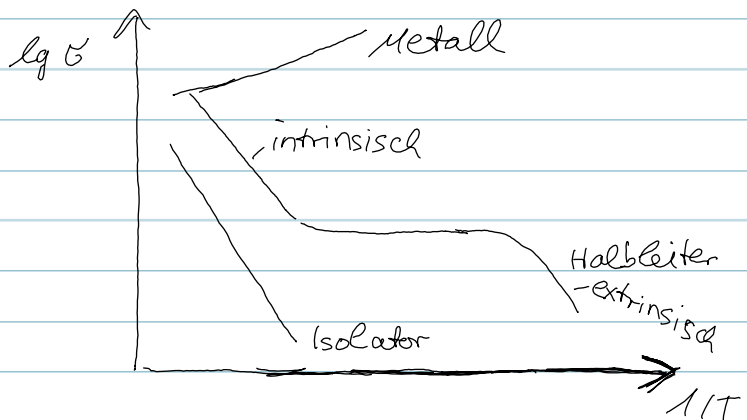
$$f(E) = \frac{1}{\exp[(E - E_f)/RT] + 1}$$

$$\approx \exp[-(E - E_f)/RT]$$

$$f(E_g) \approx \exp[-(E_g - E_f)/RT] \\ \approx \exp[-E_g/2RT]$$

$$E_f = \frac{1}{2} E_g$$

$\hookrightarrow \lg \sigma$ vs $1/T$



z.B. Ge: $< 300K$ extrinsisch
 $E_g \approx 0,7 eV$