

Skript zur Vorlesung Allgemeine Chemie I

Educational Material

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Publication date:

2001

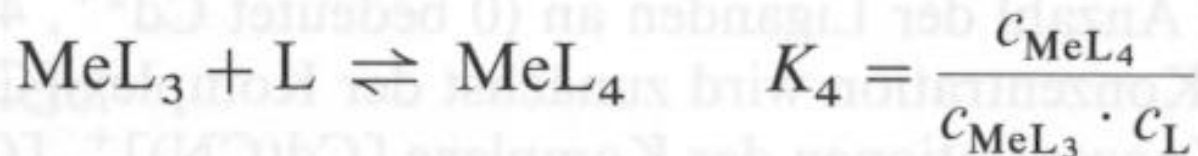
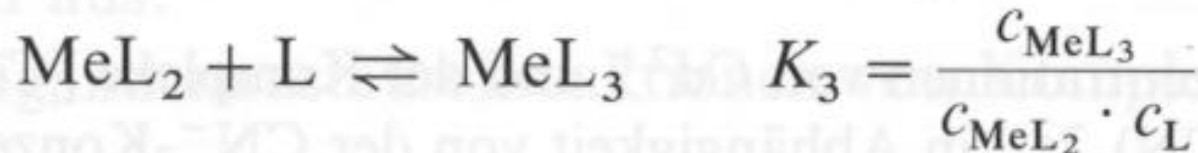
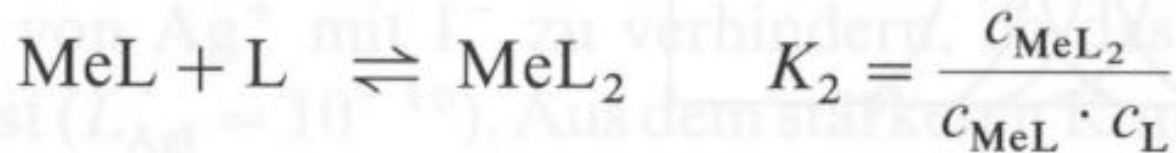
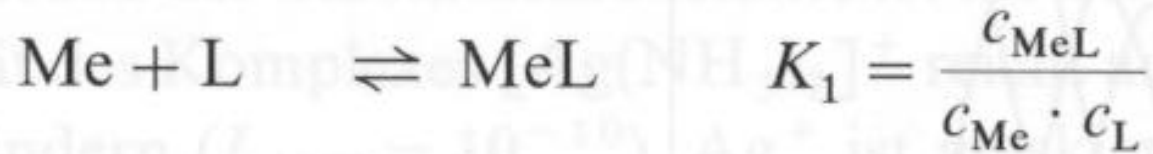
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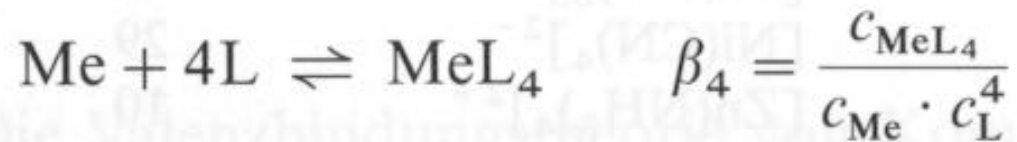
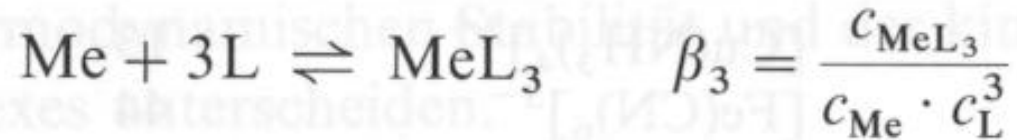
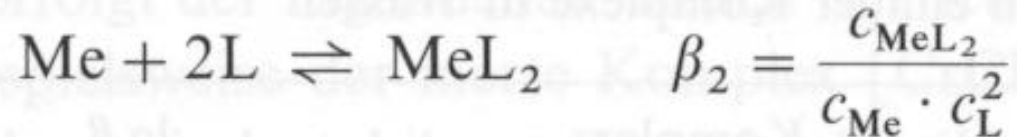
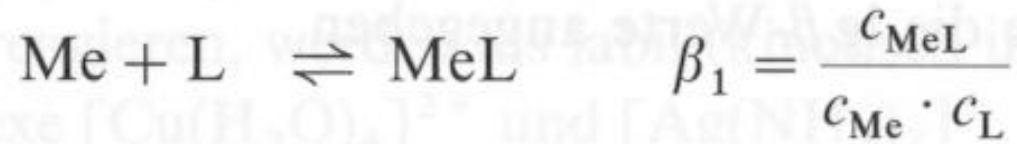
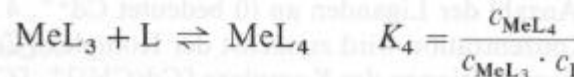
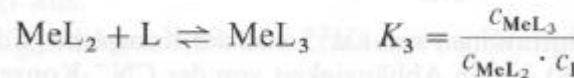
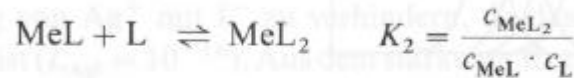
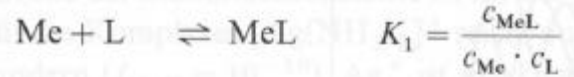
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Gleichgewichte- Komplexbildungskonstanten



$$K_1 > K_2 > K_3 \dots > K_n$$

Brutto-Komplexbildungskonstanten



$$\beta_n = K_1 \cdot K_2 \cdot \dots \cdot K_n$$

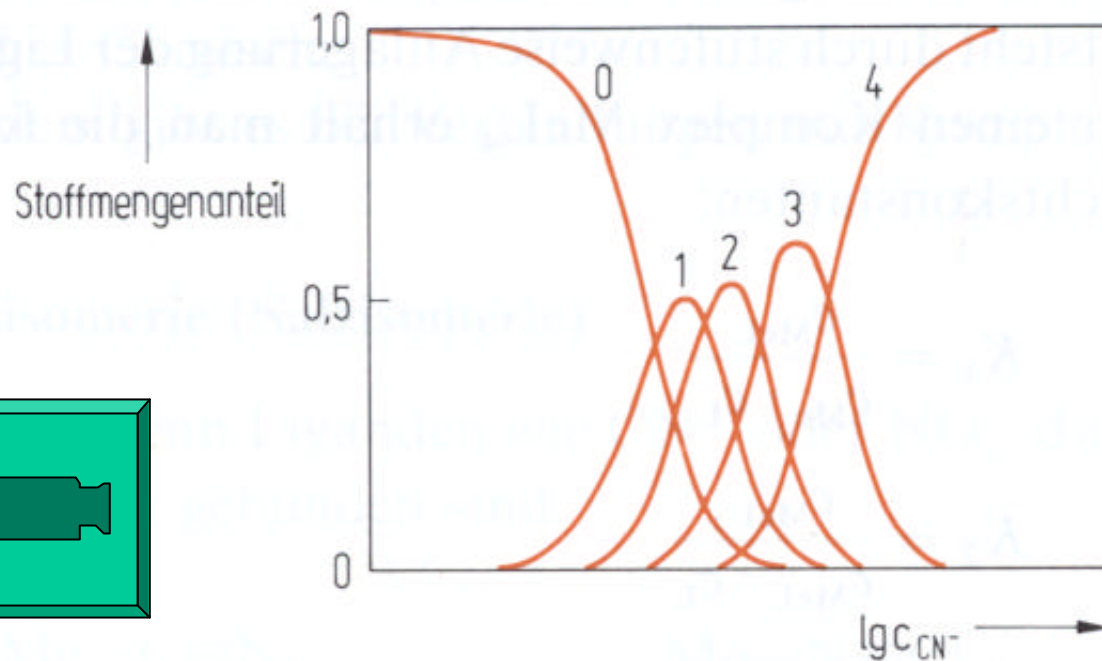
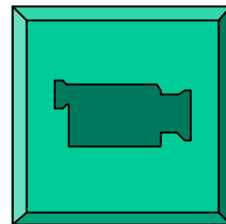
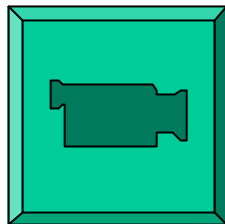
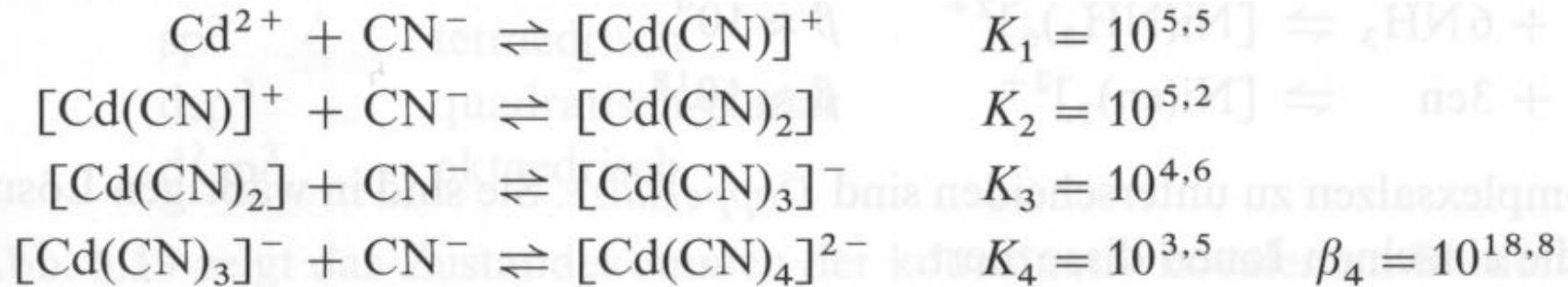
$$\beta_4 = K_1 \cdot K_2 \cdot K_3 \cdot K_4$$

Brutto-Komplexbildungskonstanten

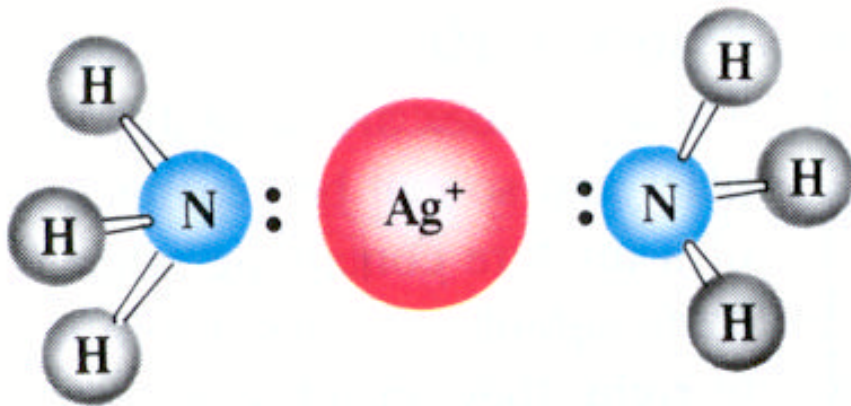
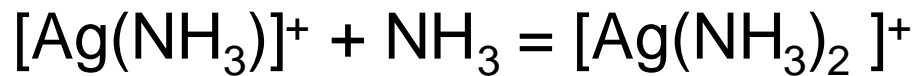
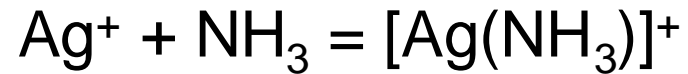
Komplex	$\lg \beta$	Komplex	$\lg \beta$
$[\text{Ag}(\text{NH}_3)_2]^+$	7	$[\text{Cu}(\text{NH}_3)_4]^{2+}$	13
$[\text{Ag}(\text{S}_2\text{O}_3)_2]^{3-}$	13	$[\text{Fe}(\text{CN})_6]^{3-}$	44
$[\text{Ag}(\text{CN})_2]^-$	21	$[\text{Fe}(\text{CN})_6]^{4-}$	35
$[\text{Au}(\text{CN})_2]^-$	37	$[\text{Ni}(\text{CN})_4]^{2-}$	29
$[\text{Co}(\text{NH}_3)_6]^{2+}$	5	$[\text{Zn}(\text{NH}_3)_4]^{2+}$	10
$[\text{Co}(\text{NH}_3)_6]^{3+}$	35	$[\text{Cu}(\text{CN})_4]^-$	27

(In der Literatur sind z. Teil sehr unterschiedliche Werte angegeben)

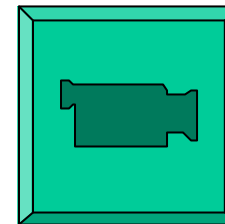
Brutto-Komplexbildungskonstanten



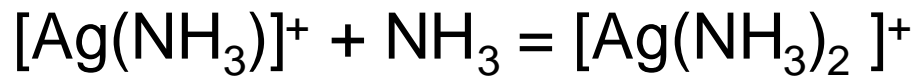
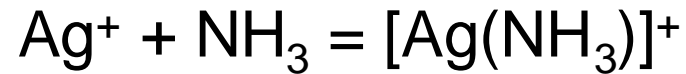
Silber-Amminokomplexe



$$K_1 = \frac{[\text{AgNH}_3^+]}{[\text{Ag}^+][\text{NH}_3]}$$
$$K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{AgNH}_3^+][\text{NH}_3]}$$



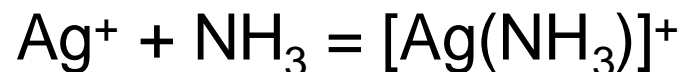
Silber-Amminokomplexe



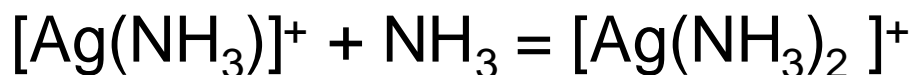
$$K_1 = \frac{[\text{AgNH}_3^+]}{[\text{Ag}^+][\text{NH}_3]}$$
$$K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{AgNH}_3^+][\text{NH}_3]}$$

$$[\text{NH}_3] K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{AgNH}_3^+]}$$

Silber-Amminokomplexe



$$[\text{NH}_3] K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{AgNH}_3^+]}$$



$$[\text{NH}_3] = 1/K_2$$

$$[\text{Ag}(\text{NH}_3)_2^+] = [\text{AgNH}_3^+]$$

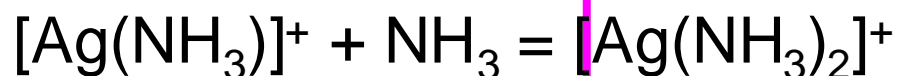
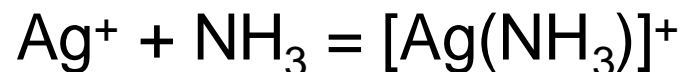
$$[\text{NH}_3] > 1/K_2$$

$$[\text{Ag}(\text{NH}_3)_2^+] > [\text{AgNH}_3^+]$$

$$[\text{NH}_3] < 1/K_2$$

$$[\text{Ag}(\text{NH}_3)_2^+] < [\text{AgNH}_3^+]$$

Silber-Amminokomplexe



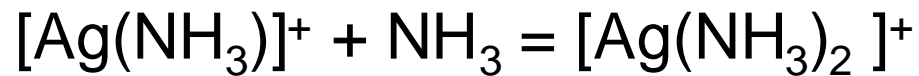
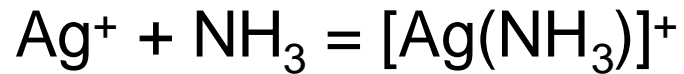
$$K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{NH}_3]([\text{Ag}^+]_0 - [\text{Ag}(\text{NH}_3)_2^+]}$$

Anteil $[\text{Ag}(\text{NH}_3)_2]^+ = x$

$$x = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{Ag}(\text{NH}_3)_2^+] + [\text{Ag}(\text{NH}_3)]^+} = \frac{[\text{NH}_3]}{1/K_2 + [\text{NH}_3]}$$

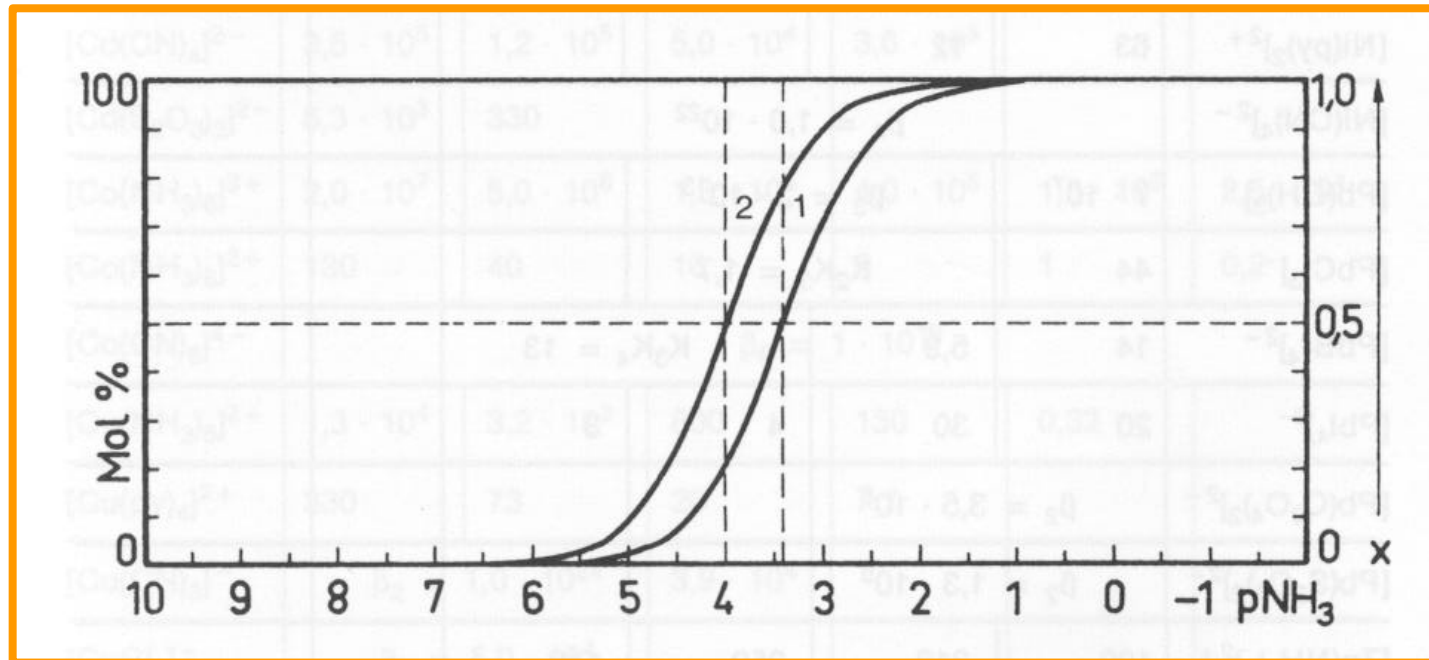
$$x = \frac{1}{10^{\rho K_2 + \rho \text{NH}_3} + 1}$$

Silber-Amminokomplexe

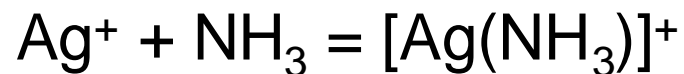


$$K_1 = \frac{[\text{AgNH}_3^+]}{[\text{Ag}^+][\text{NH}_3]} = 2.5 \times 10^3$$

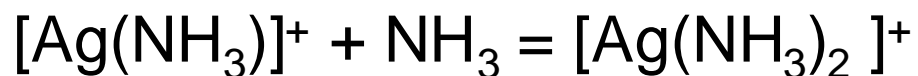
$$K_2 = \frac{[\text{Ag}(\text{NH}_3)_2^+]}{[\text{AgNH}_3^+][\text{NH}_3]} = 10^4$$



Silber-Amminokomplexe



$$[\text{NH}_3] K_1 = \frac{[\text{Ag}(\text{NH}_3)^+]}{[\text{Ag}^+]}$$



$$[\text{NH}_3] = 1/K_1$$

$$[\text{Ag}(\text{NH}_3)^+] = [\text{Ag}^+]$$

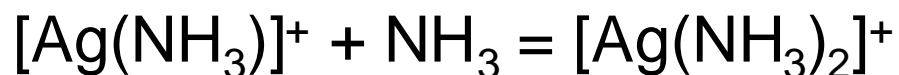
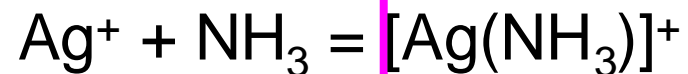
$$[\text{NH}_3] > 1/K_1$$

$$[\text{Ag}(\text{NH}_3)^+] > [\text{Ag}^+]$$

$$[\text{NH}_3] < 1/K_1$$

$$[\text{Ag}(\text{NH}_3)^+] < [\text{Ag}^+]$$

Silber-Amminkomplexe



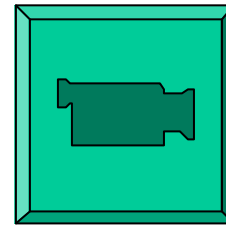
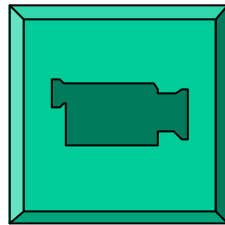
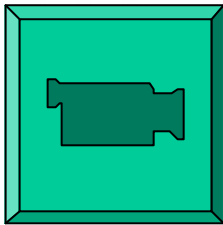
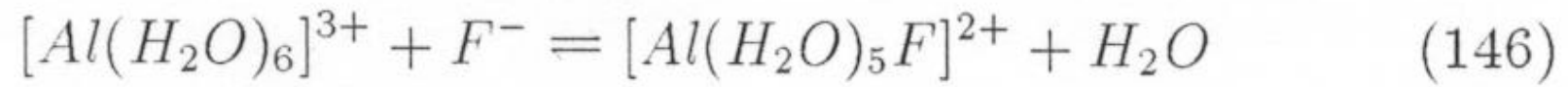
$$K_1 = \frac{[\text{Ag}(\text{NH}_3)^+]}{[\text{NH}_3]([\text{Ag}^+]_0 - [\text{Ag}(\text{NH}_3)^+])}$$

Anteil $[\text{Ag}(\text{NH}_3)]^+ = x$

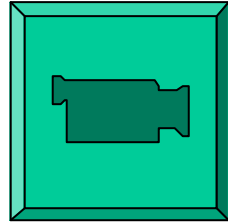
$$x = \frac{[\text{Ag}(\text{NH}_3)^+]}{[\text{Ag}(\text{NH}_3)^+] + [\text{Ag}^+]} = \frac{[\text{NH}_3]}{1/K_1 + [\text{NH}_3]}$$

$$x = \frac{1}{10^{pK_1 + p\text{NH}_3} + 1}$$

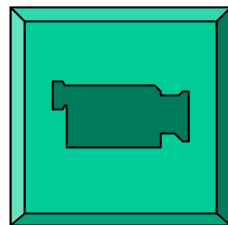
Komplexere Komplexe



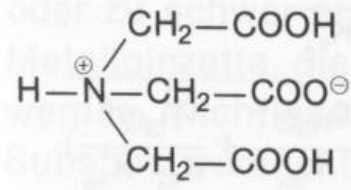
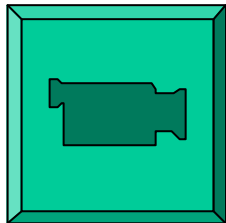
Austauschreaktion als f(T)



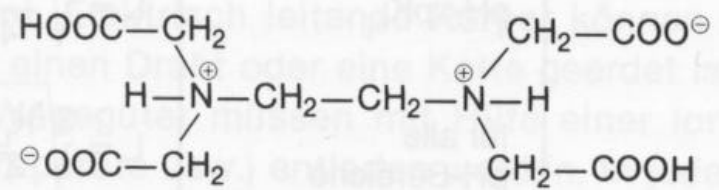
Ligandenfeldänderung als f(P)



Komplexone

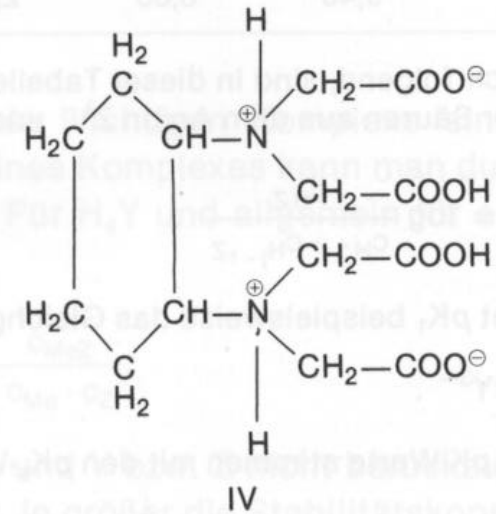


I oder H₃X

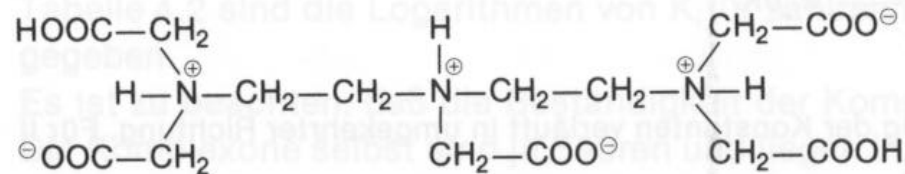


II oder H₄Y

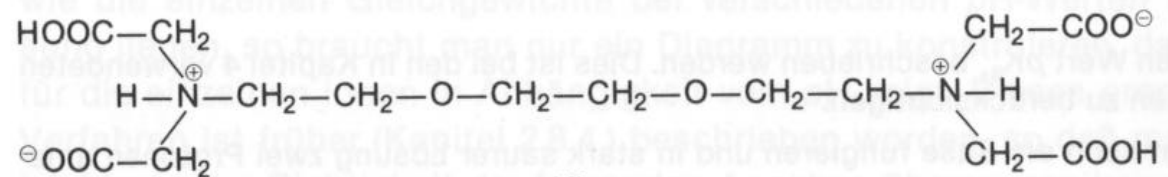
Na₂H₂Y · 2H₂O
III



IV



V

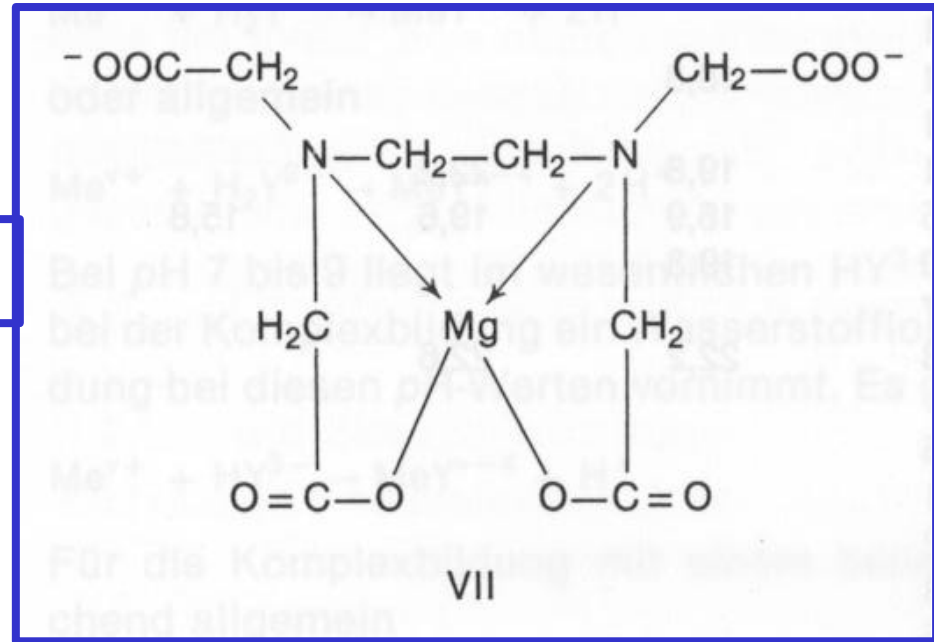


VI

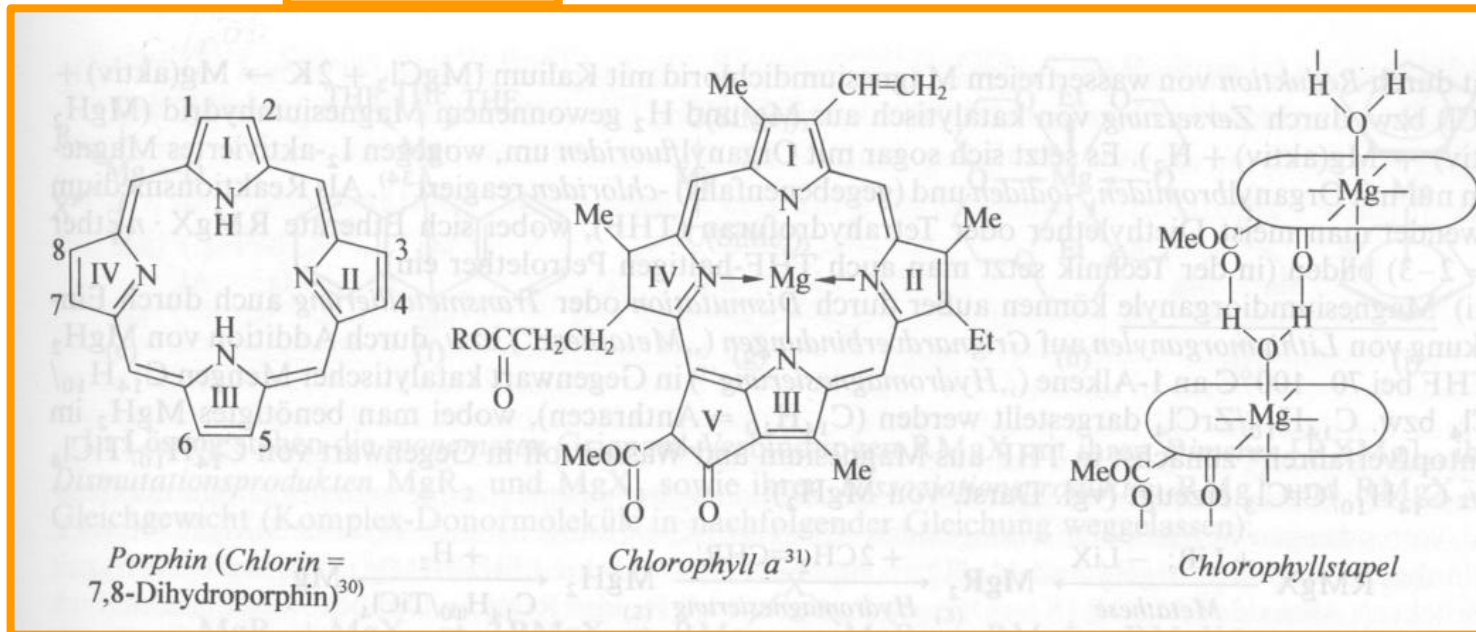
Allgemeine

Komplexone

EDTA



Porphin



Enzyme

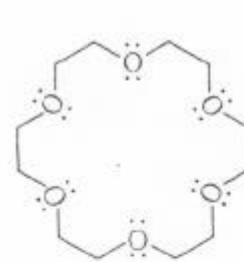
Carboxypeptidase



bestehend aus 307 Aminosäuren. Der Zn-Gehalt beträgt 0,19 %. Das Zn^{2+} -Ion ist mit zwei N-Atomen aus Histidin (69 und 196), einem O-Atom aus Glutaminsäure 72 und einem O-Atom eines H_2O -Moleküls koordiniert.

Kronenether

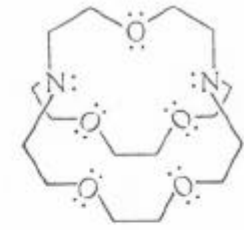
Enthärtung von Wasser



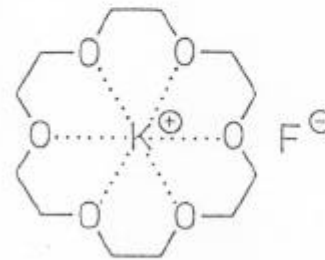
18-Krone-6



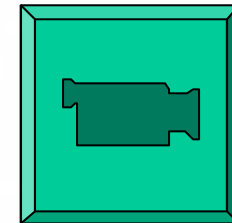
C222



C221



$[\text{Kronenether-K}]^{\oplus} + \text{F}^{\ominus}$
(Dieses Salz ist in CHCl_3 löslich)



Schichtsilicate
wie Muskovit

