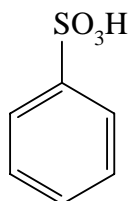


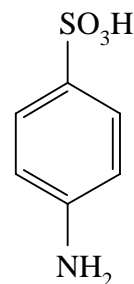
**Einfluß von Substituenten am Benzol auf Geschwindigkeit
und Richtung der elektrophilen Substitution**

	Substituenten	Geschwindigkeit (Reaktivität)	Richtung (Regioselektivität)	Interpretation
1.	-NH ₂ , -OH, -OCH ₃ , -CH ₃	beschleunigen	<i>ortho</i> und <i>para</i>	+ M (- I) + I
2.	-F, -Cl, -Br, -I	verzögern	<i>ortho</i> und <i>para</i>	+ M / - I
3.	-CHO, -COR, -CO ₂ H, -CN, -NO ₂ , -SO ₃ H	verzögern stark	<i>meta</i>	- M / - I

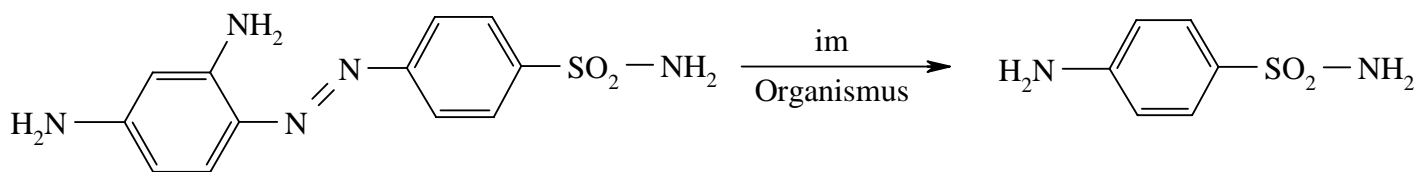
Aromatische Sulfonsäuren und Derivate



Benzolsulfonsäure
(Benzensulfonsäure)

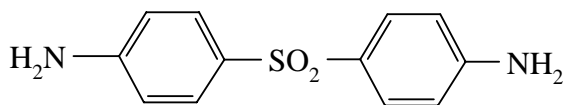


4-Aminobenzolsulfonsäure
(Sulfanilsäure)



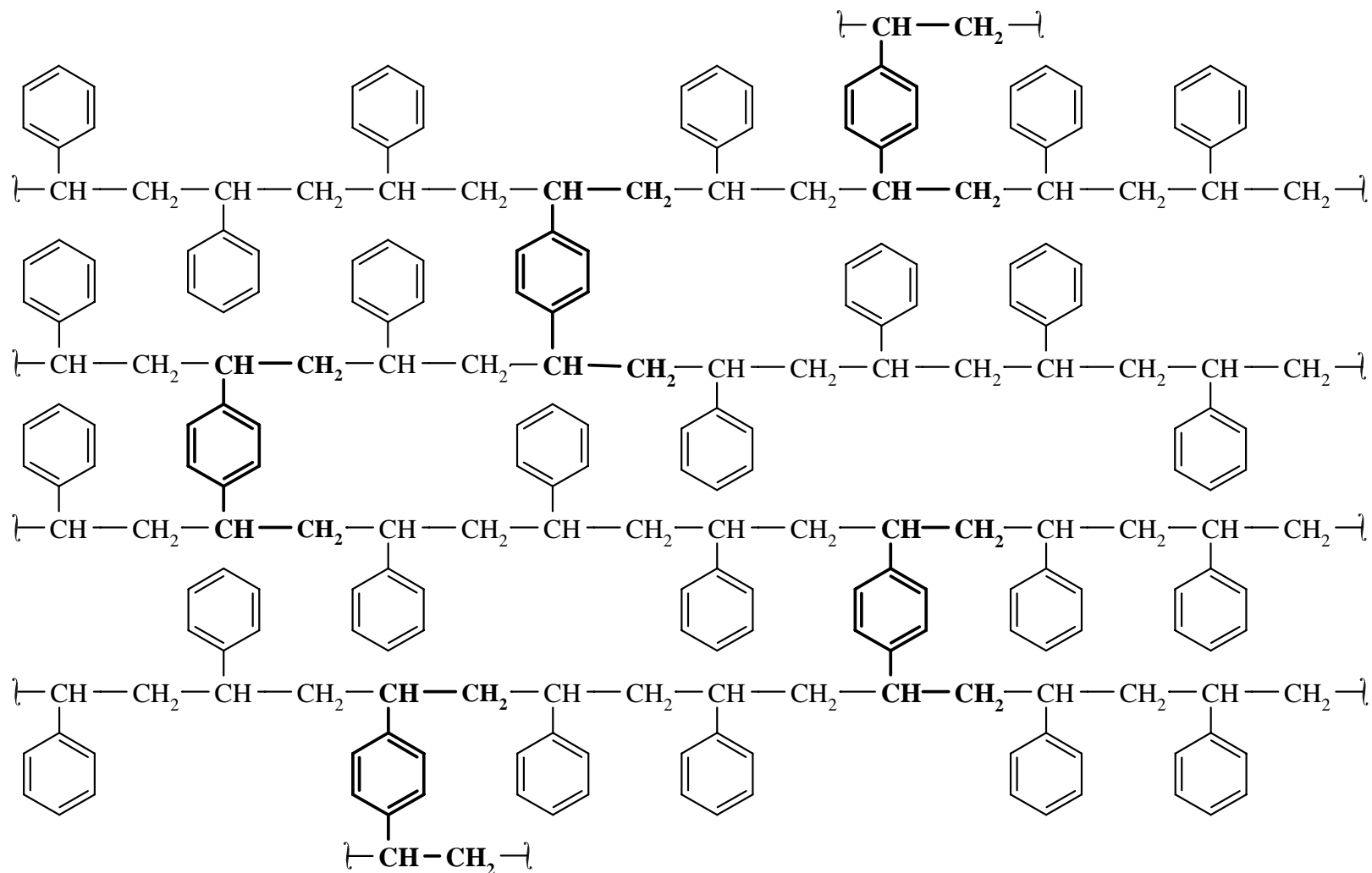
Sulfamidochrysoidin
Prontosil (1. Sulfonamid)
(Domagk, Medizin-Nobelpreis 1939)

4-Aminobenzolsulfonsäureamid
(Sulfanilamid)
(eigentlicher Wirkstoff)

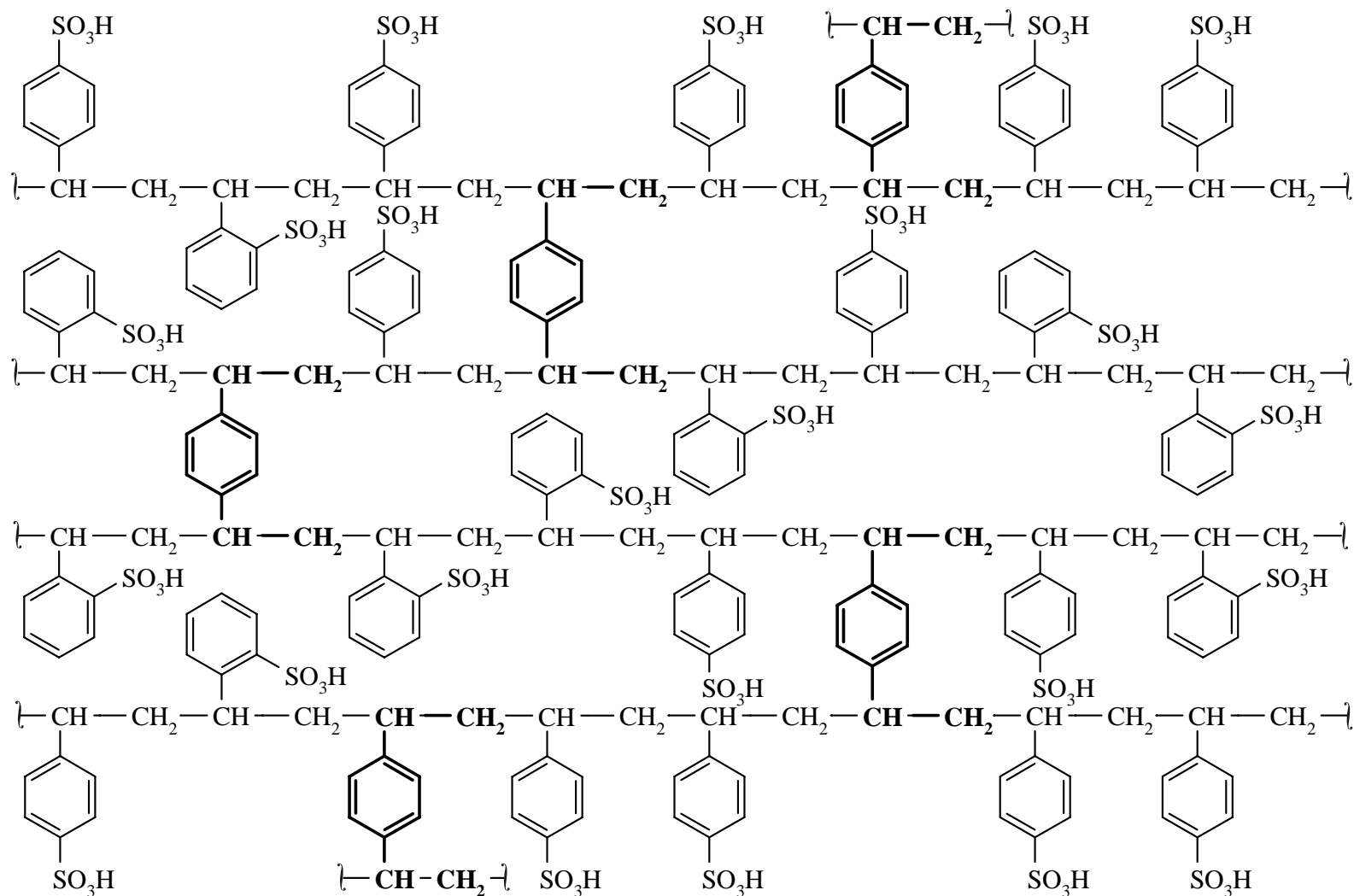


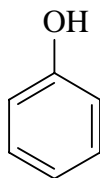
4,4'-Diaminodiphenylsulfon
(Dapson)
gegen Dermatosen und Lepra

Vernetztes Polystyrol aus Styrol und 1,4-Divinylbenzol (5:1)

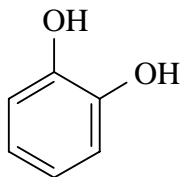
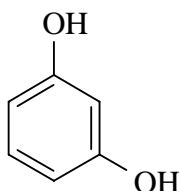
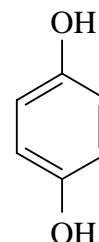
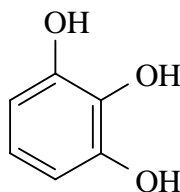
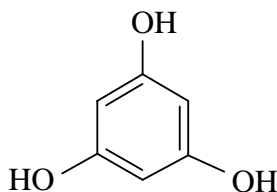
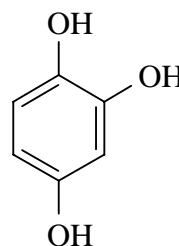
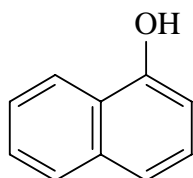


Kationenaustauscher auf Polystyrolbasis

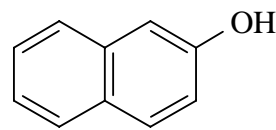


Phenole

Phenol

1,2-Dihydroxybenzol
(Brenzkatechin)1,3-Dihydroxybenzol
(Resorcin)1,4-Dihydroxybenzol
(Hydrochinon)1,2,3-Trihydroxybenzol
(Pyrogallol)1,3,5-Trihydroxybenzol
(Phloroglucin)1,2,4-Trihydroxybenzol
(2-Hydroxyhydrochinon)

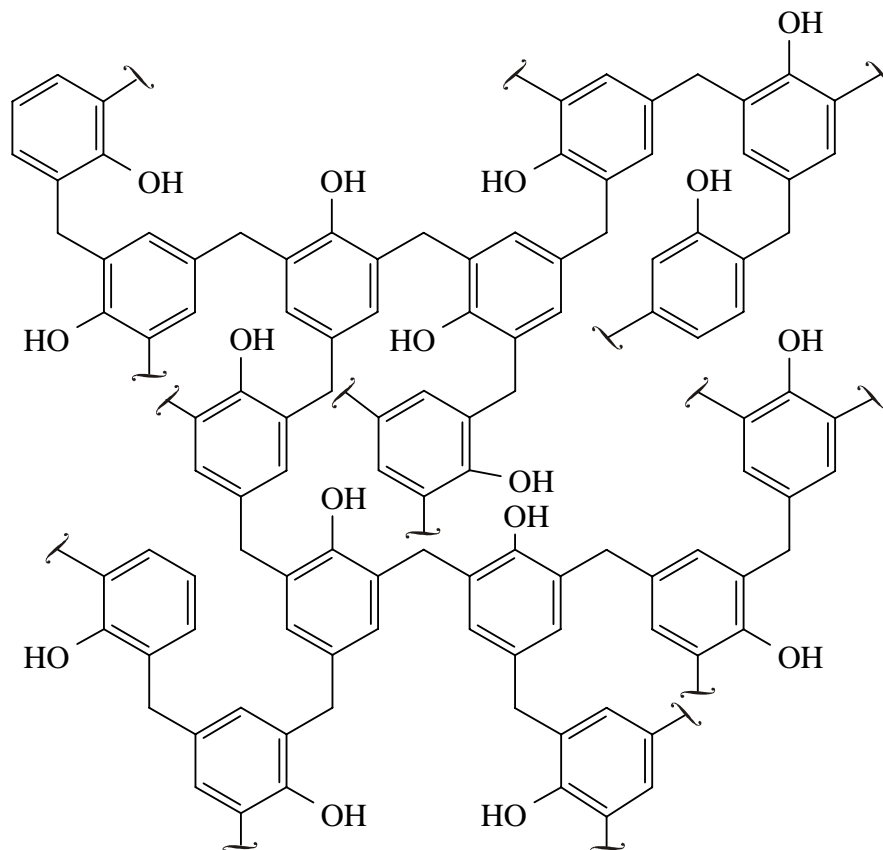
1-Naphthol



2-Naphthol

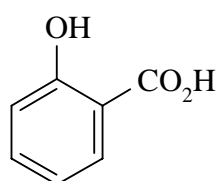
14.06

Struktur von Phenol-Formaldehyd-Duroplasten

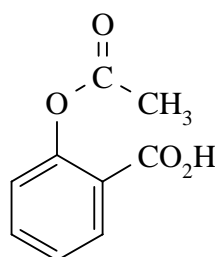


14.07

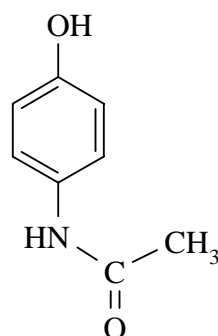
Phenole mit weiteren funktionellen Gruppen



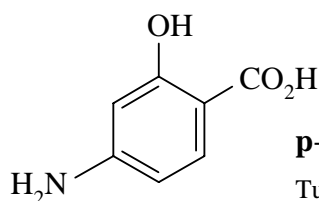
Salicylsäure
(aus Weiden)



Acetylsalicylsäure
(Aspirin)
Analgetikum
Antipyretikum

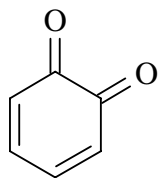


Paracetamol
Analgetikum
Antipyretikum

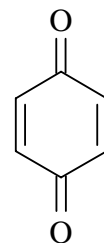


p-Aminosalicylsäure (PAS)
Tuberkulostatikum

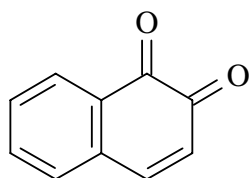
Chinone



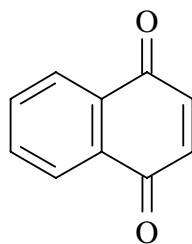
1,2-Benzochinon

 $(E_0 = + 0.78 \text{ V})$ 

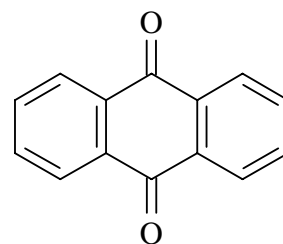
1,4-Benzochinon

 $(E_0 = + 0.70 \text{ V})$ 

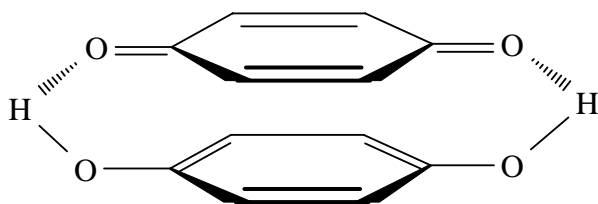
1,2-Naphthochinon

 $(E_0 = + 0.56 \text{ V})$ 

1,4-Naphthochinon

 $(E_0 = + 0.48 \text{ V})$ 

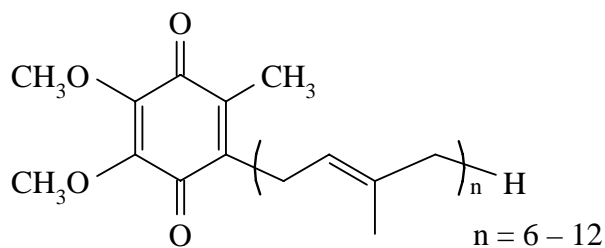
9,10-Anthrachinon

 $(E_0 = + 0.15 \text{ V})$ 

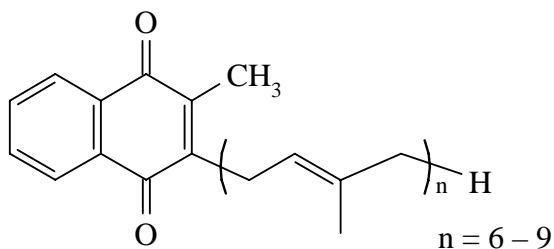
1:1 Komplex aus Chinon
und Hydrochinon = Chinhydron

Natürlich vorkommende Chinone

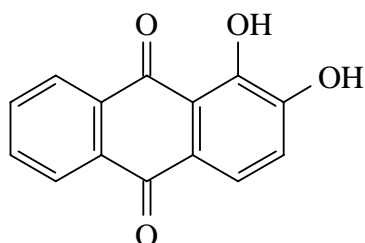
Ubichinone
(Atmungskette)



Vitamin K
(Blutgerinnung)

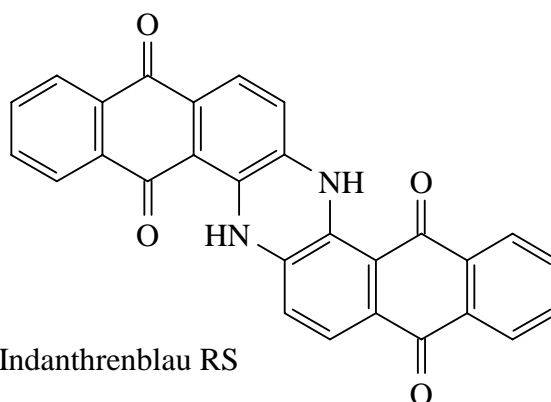


Anthrachinon-Farbstoffe



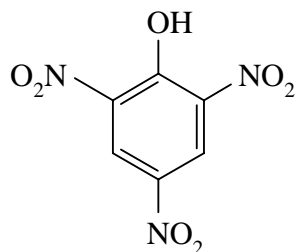
Alizarin

(Wurzel der Färberröte, Krappwurzel)
Komplex = Farblack
mit
Al³⁺ karminrot
Sn²⁺ scharlachrot
Cr³⁺ braun
Fe³⁺ violett

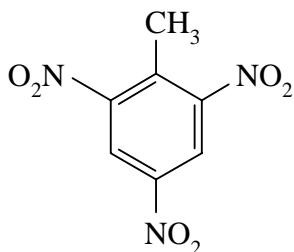


Indanthrenblau RS

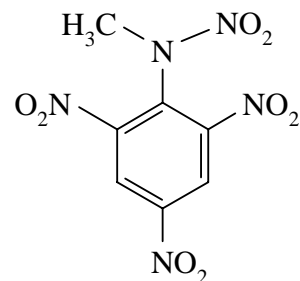
14.10

Aromatische Polynitroverbindungen sind Explosivstoffe

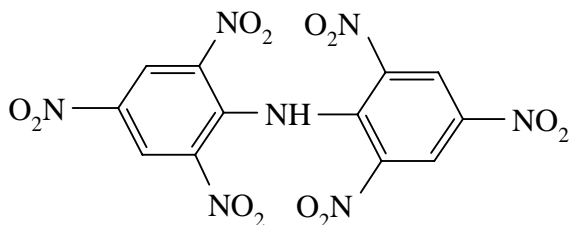
2,4,6-Trinitrophenol
(Pikrinsäure)



2,4,6-Trinitrotoluol
(TNT)

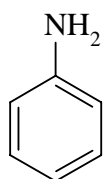


N,2,4,6-Tetranitro-N-methylanilin
(Tetryl)



Hexanitrodiphenylamin
(Hexyl)

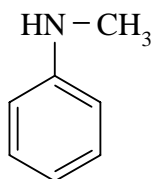
14.11

Aromatische Amine

Anilin

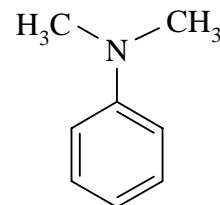
Siedepunkt [°C]

184



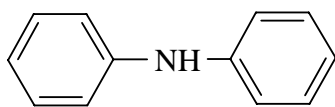
N-Methylanilin

196



N,N-Dimethylanilin

194



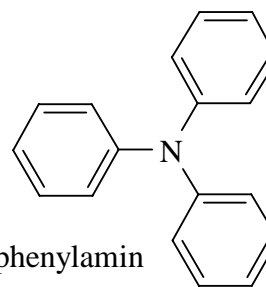
Diphenylamin

Siedepunkt [°C]

302

Schmp. [°C]

54 -55

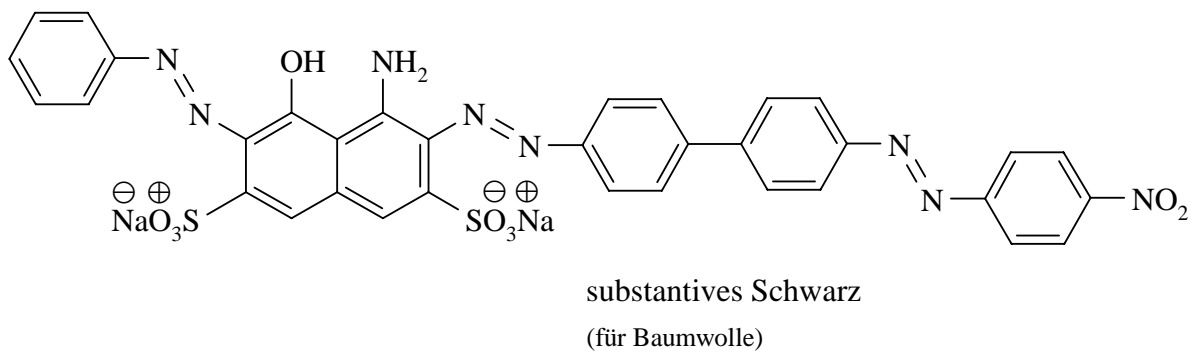
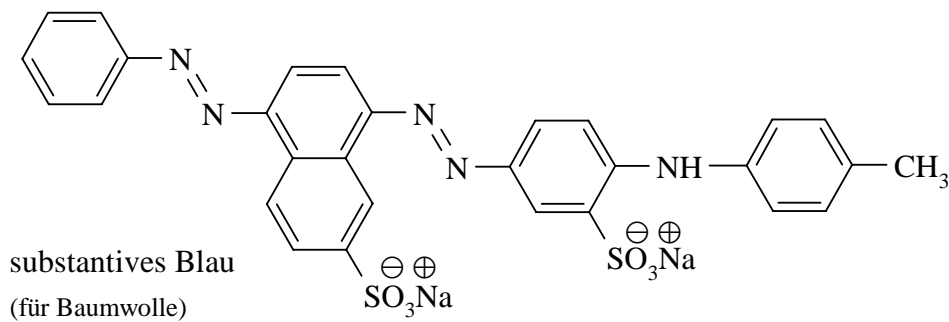
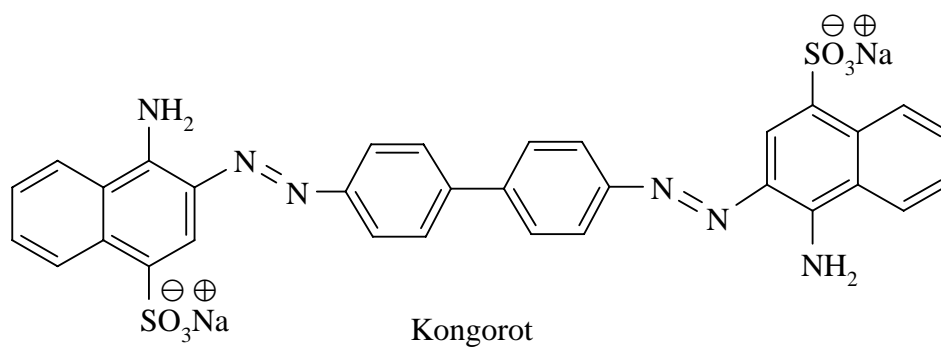
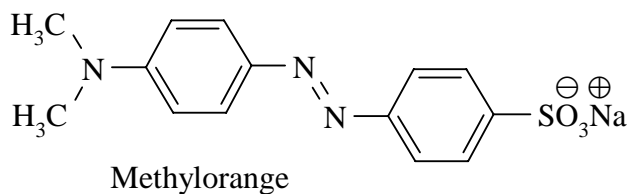


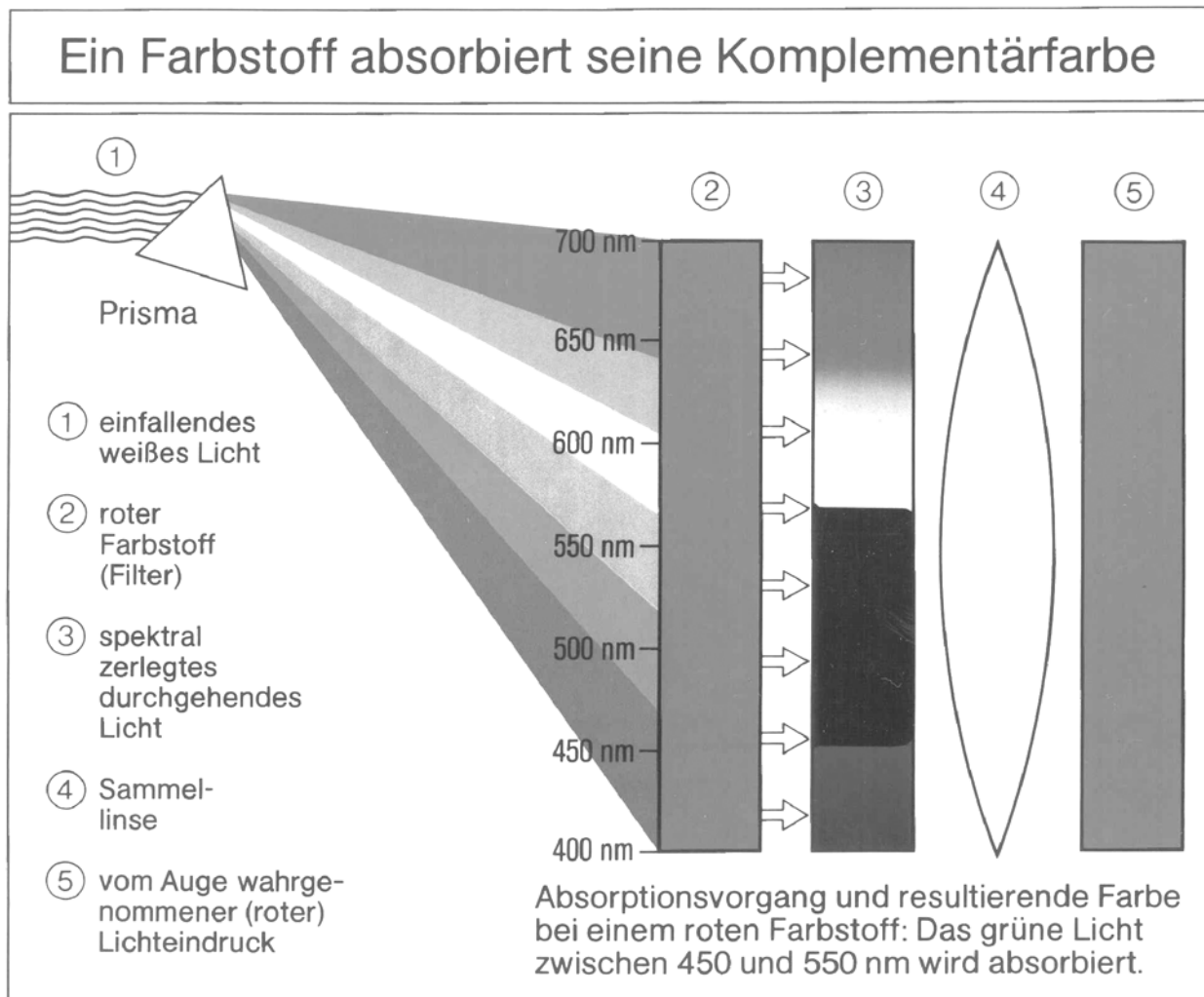
Triphenylamin

365

127

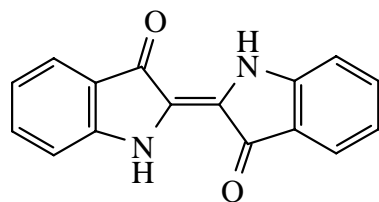
Azo-Farbstoffe





absorbiertes Licht		sichtbare Farbe
Wellenlänge [nm]	Farbe	
< 400	(ultraviolett)	(unsichtbar)
400 – 440	violett	gelbgrün
440 – 480	blau	gelb
480 – 490	grünblau	orange
490 – 500	blaugrün	rot
500 – 560	grün	purpur
560 – 580	gelbgrün	violett
580 – 595	gelb	blau
595 – 605	orange	grünblau
605 – 750	rot	blaugrün
750 – 800	purpur	grün
> 800	(ultrarot, infrarot)	(unsichtbar)

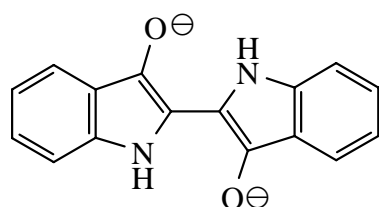
Küpen-Farbstoff Indigo



Indigo

(blau, unlöslich in Wasser)

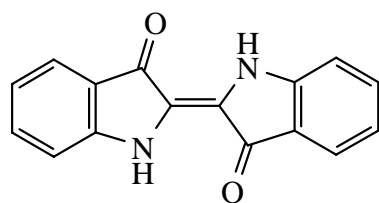
Reduktion



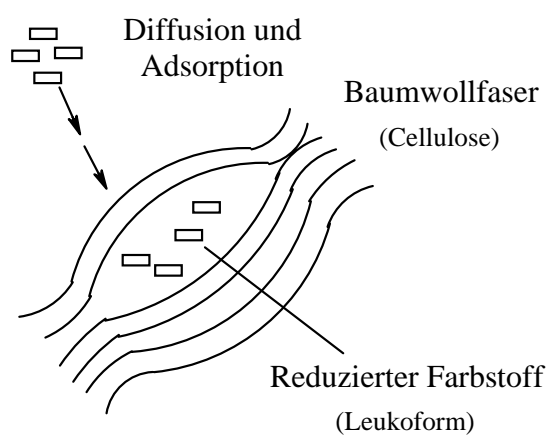
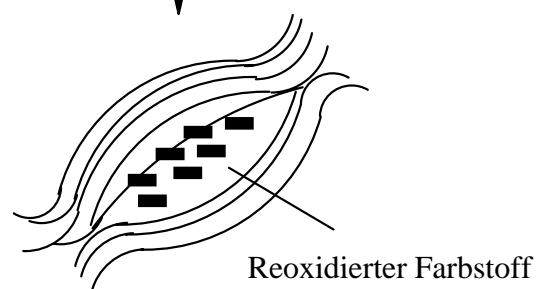
Leukoindigo

(Indigweiß)

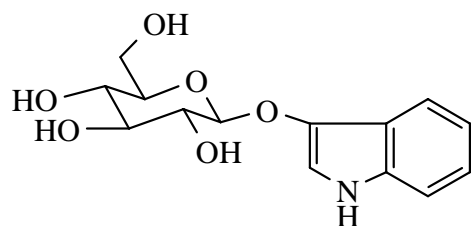
(farblos, löslich in Wasser)

Oxidation
durch Luft

Indigo

O₂

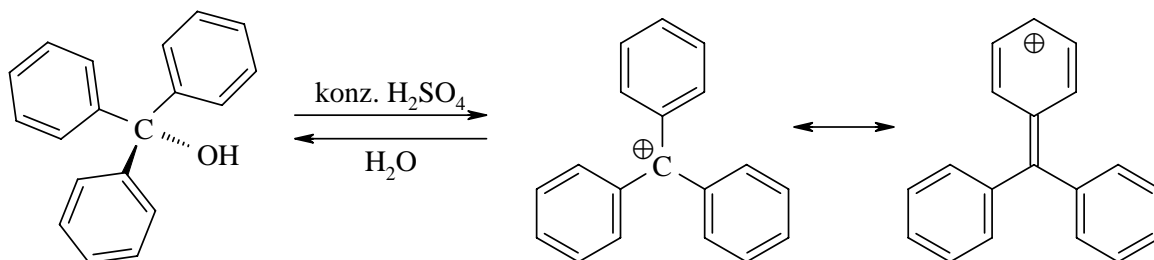
Vorstufe in der Indigopflanze:



Indican

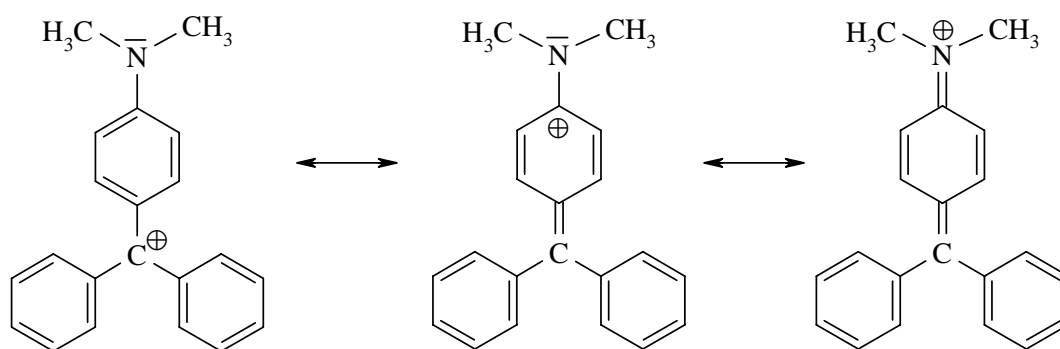
(Färberwaid, Indigopflanze)

Kationische Triphenylmethan-Farbstoffe

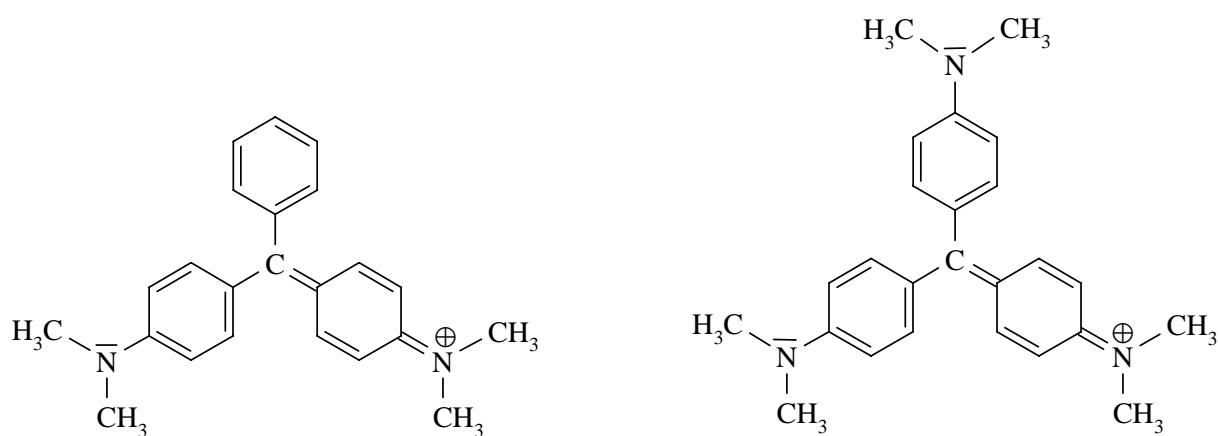


Triphenylmethanol
(farblos)

Triphenylmethylcarbenium-Ion
(blaßgelb, λ_{max} : 405, 428 nm)



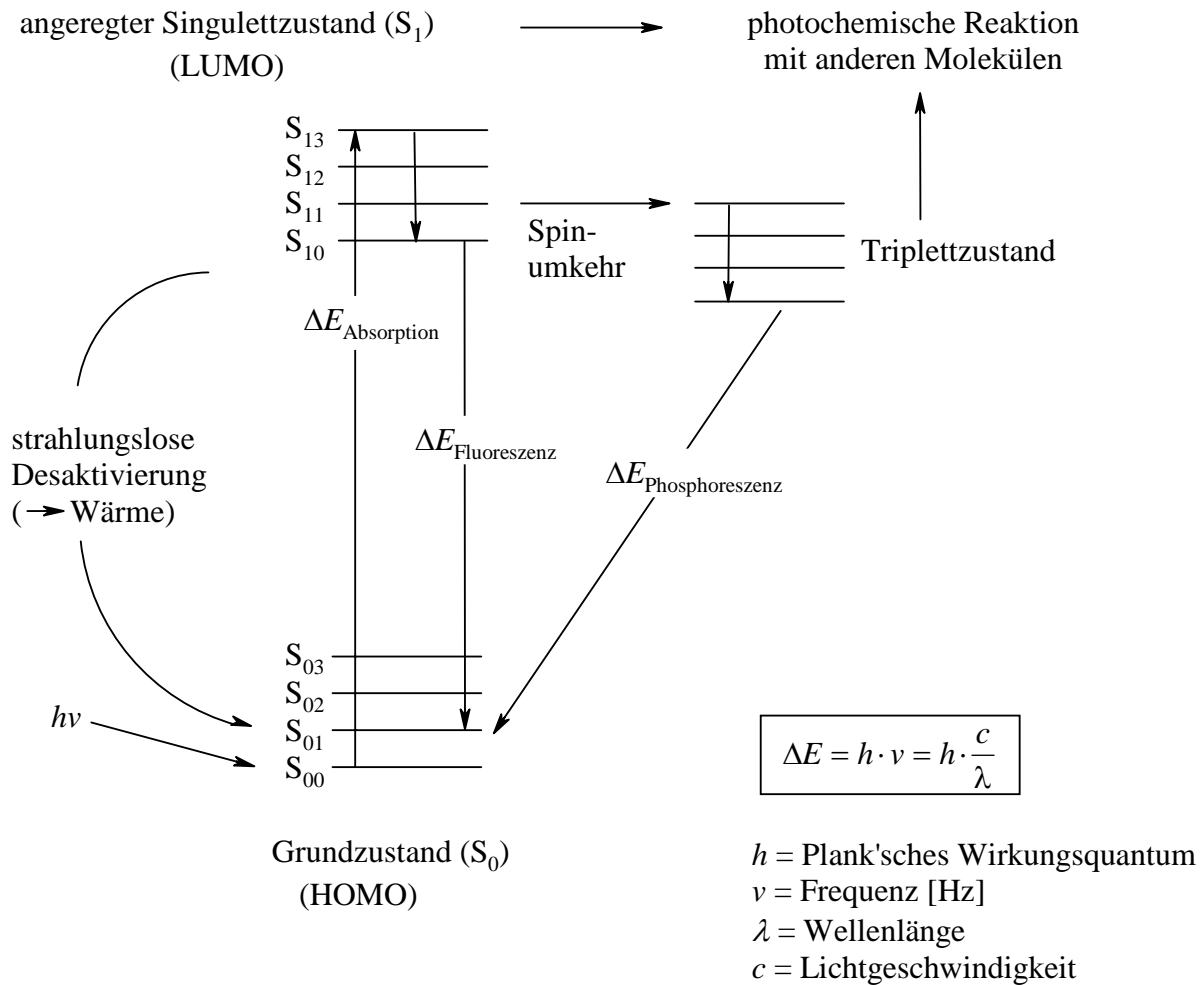
(4-Dimethylaminophenyl)diphenylmethylcarbenium-Ion
(orange gelb, λ_{max} : 455 nm)



Malachitgrün-Kation
(λ_{max} : 617, 425 nm)

Kristallviolett-Kation
(λ_{max} : 589 nm)

**Energieschema der Lichtabsorption,
Fluoreszenz und Phosphoreszenz
(mit Schwingungs-Energieniveaus)**



Absorptions- und Fluoreszenzspektrum eines Fluoreszenzfarbstoffes (Optischer Aufheller)

