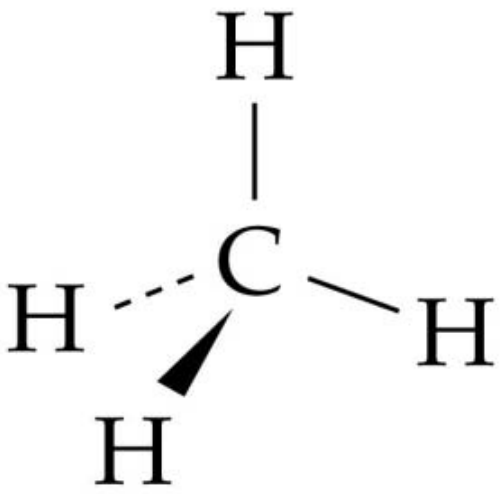
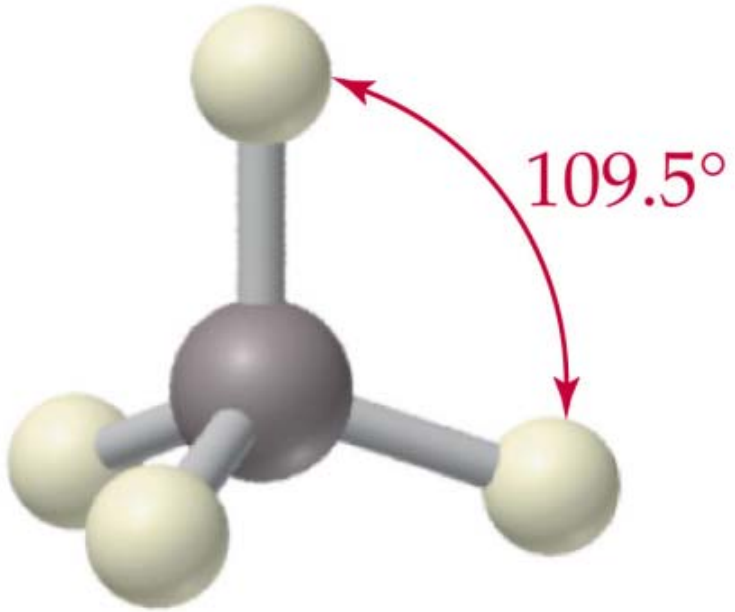
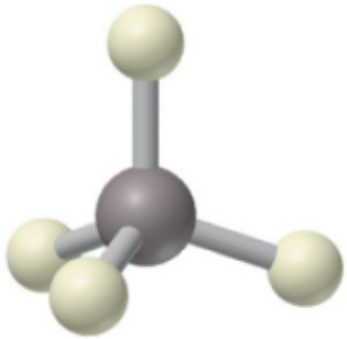
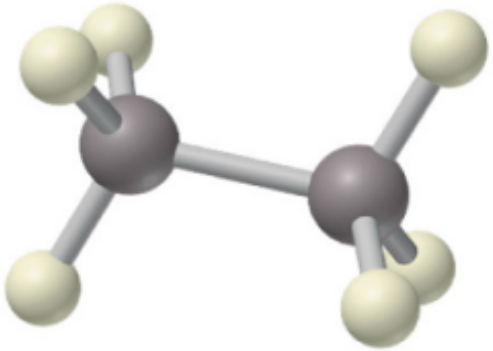
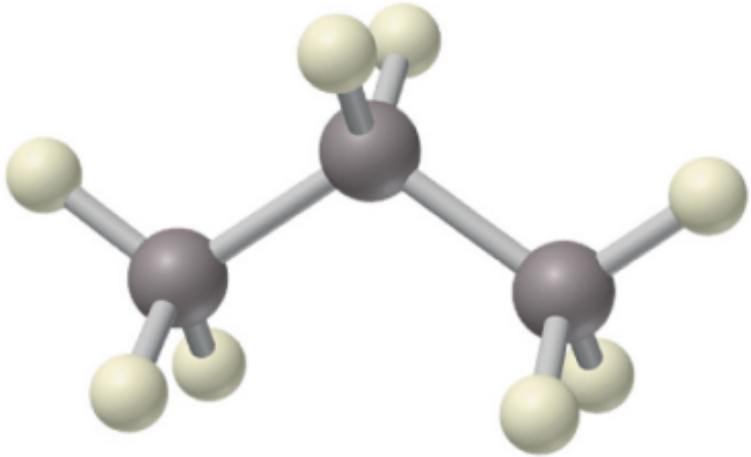
Methan: Strukturformel und Bindungswinkel

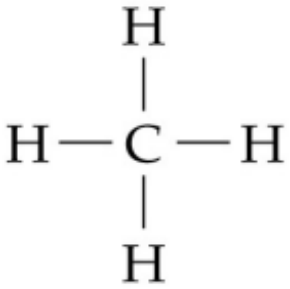




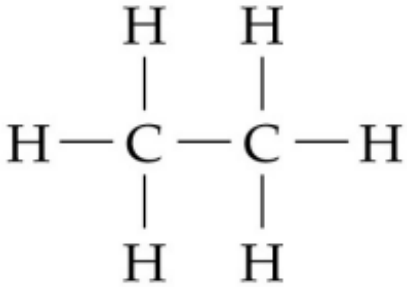




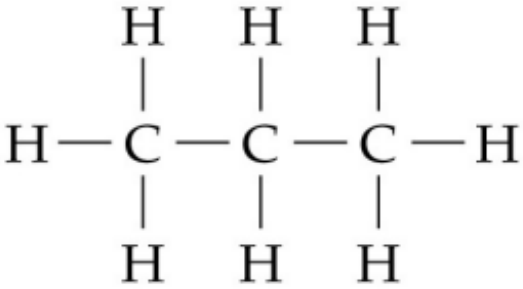




Methane, CH_4



Ethane, C_2H_6



Propane, C_3H_8

Nomenklatur gesättigter aliphatischer Kohlenwasserstoffe

Alkane C_nH_{2n+2}	**Alkyl C_nH_{2n+1}-**
CH_4 Methan	methyl CH_3-
C_2H_6 Ethan	ethyl C_2H_5-
C_3H_8 Propan	propyl C_3H_7-
C_4H_{10} Butan	butyl C_4H_9-
C_5H_{12} Pentan	pentyl C_5H_{11}-
C_6H_{14} Hexan	hexyl C_6H_{13}-
C_7H_{16} Heptan	heptyl C_7H_{15}-
C_6H_{18} Octan	octyl C_8H_{16}-
C_9H_{20} Nonan	nonyl C_9H_{19}-
$C_{10}H_{22}$ Decan	decyl $C_{10}H_{21}$-

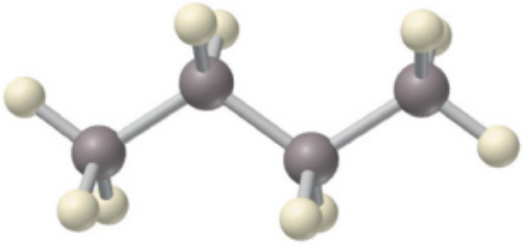
Einige physikalisch-chemische Eigenschaften von n-Alkanen

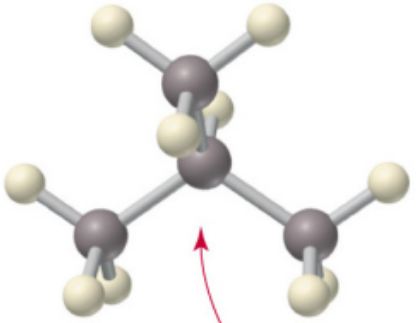
Name	Formel	Smp. [°C]	Sdp. [°C]	Dichte der Flüssigkeit* [g /cm^3]	Anzahl der Konstitutionsisomeren
Methan	CH_4	-182	-161	0,42	1
Ethan	C_2H_6	-183	-89	0,55	1
Propan	C_3H_8	-188	-42	0,58	1
Butan	C_4H_{10}	-138	-0,5	0,60	2
Pentan	C_5H_{12}	-130	+36	0,63	3
Hexan	C_6H_{14}	-95	69	0,66	5
Heptan	C_7H_{16}	-91	98	0,68	9
Octan	C_8H_{18}	-57	126	0,70	18
Nonan	C_9H_{20}	-54	151	0,72	35
Decan	$C_{10}H_{22}$	-30	174	0,73	75
Dodecan	$C_{12}H_{26}$	-10	216	0,75	355
Hexadecan	$C_{16}H_{34}$	+18	287	0,77	10359
Heptadecan	$C_{17}H_{36}$	+22	302	0,78	24894

Erdölfraktionen

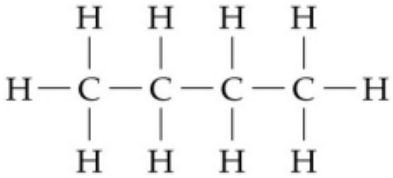
Fraktion	Siedebereich [°C]	Zahl der C-Atome	Verwendung der Bestandteile
Gas	< 20	C_1 - C_4	Brennstoff; ehem. Synthesegas
Petrolether	20 - 90	C_5 - C_7	Lösungsmittel
Ligroin	90 - 120	C_7 - C_8	Lösungsmittel
Benzin	100 - 200	C_7 - C_{12}	Motortreibstoff
Kerosin	200 - 315	C_{12} - C_{16}	Flugbenzin
Diesel-, Heizöl	250 - 375	C_{15} - C_{18}	Motortreibstoff, Brennstoff
Schmieröl und -fett	> 350	C_{16} - C_{20}	Schmiermittel
Paraffinwachs	Smp. 50 - 60	C_{20} - C_{30}	Kerzen
Asphalt, Bitumen	nichtflüchtig, hochviskos		Straßenbau
Rückstand	fest		Festbrennstoff

Strukturisomerie (Konstitutionsisomerie)

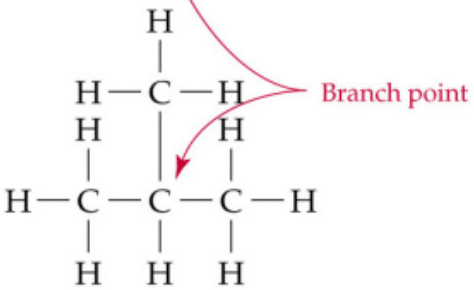




C_4H_{10}

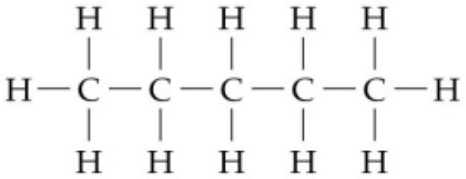


Butane (straight chain)

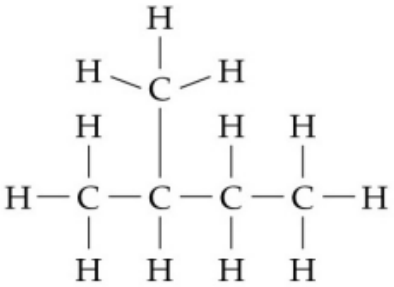


2-Methylpropane (branched chain)

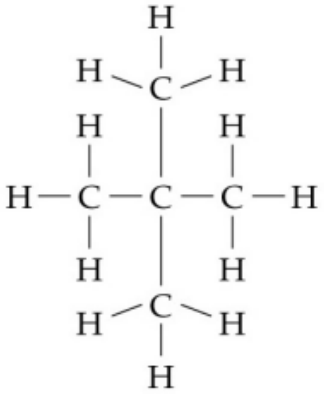
C_5H_{12}



Pentane
(straight chain)

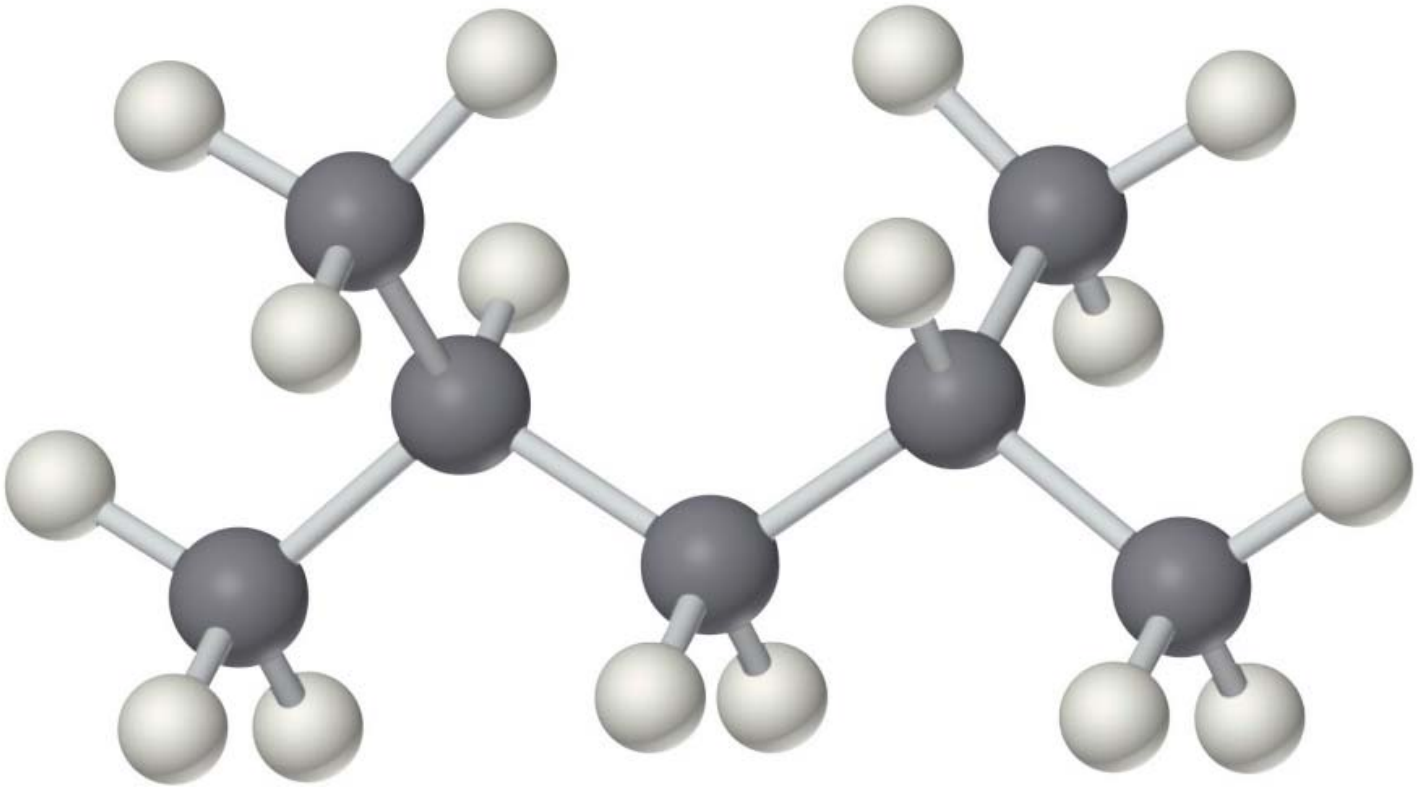


2-Methylbutane
(branched chain)

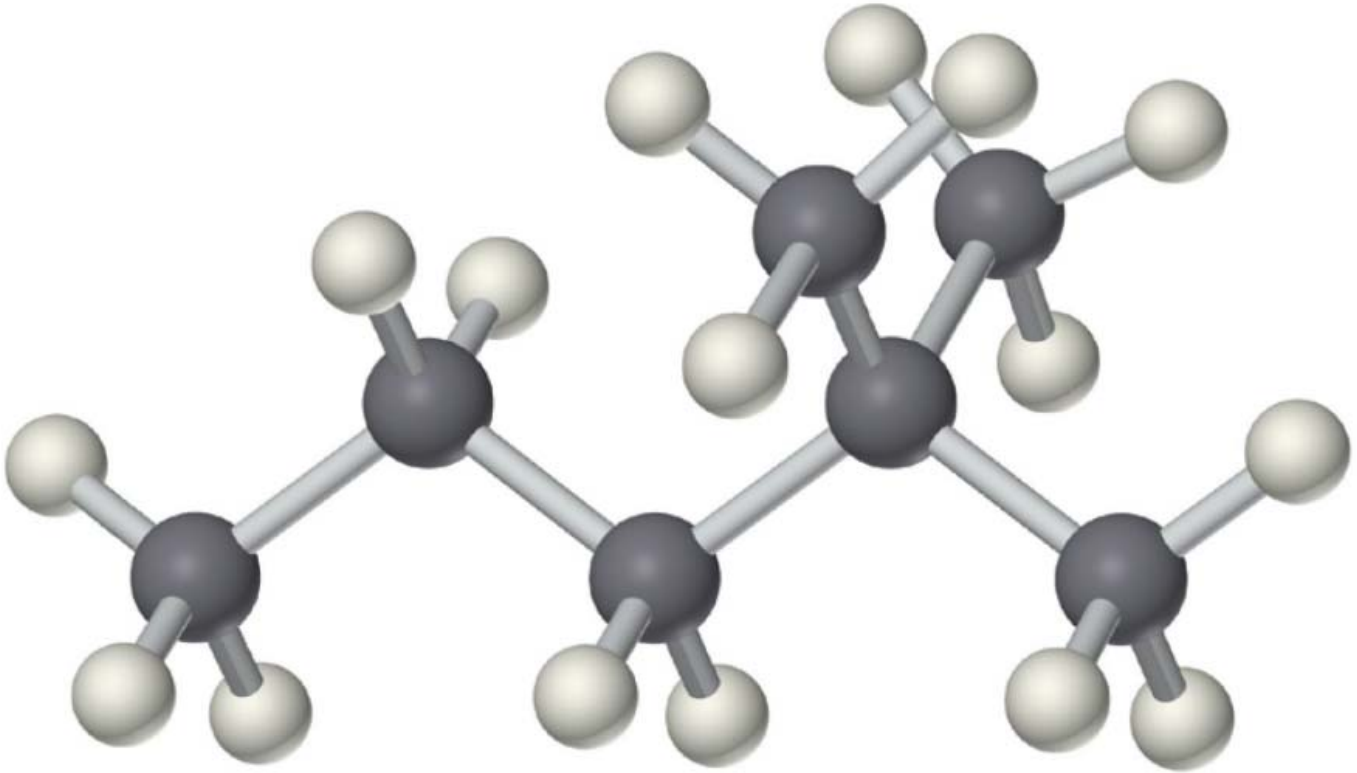


2,2-Dimethylpropane
(branched chain)

Strukturformel von 2,4-Dimethylpentan



Wie heißt dieser aliphatische Kohlenwasserstoff?

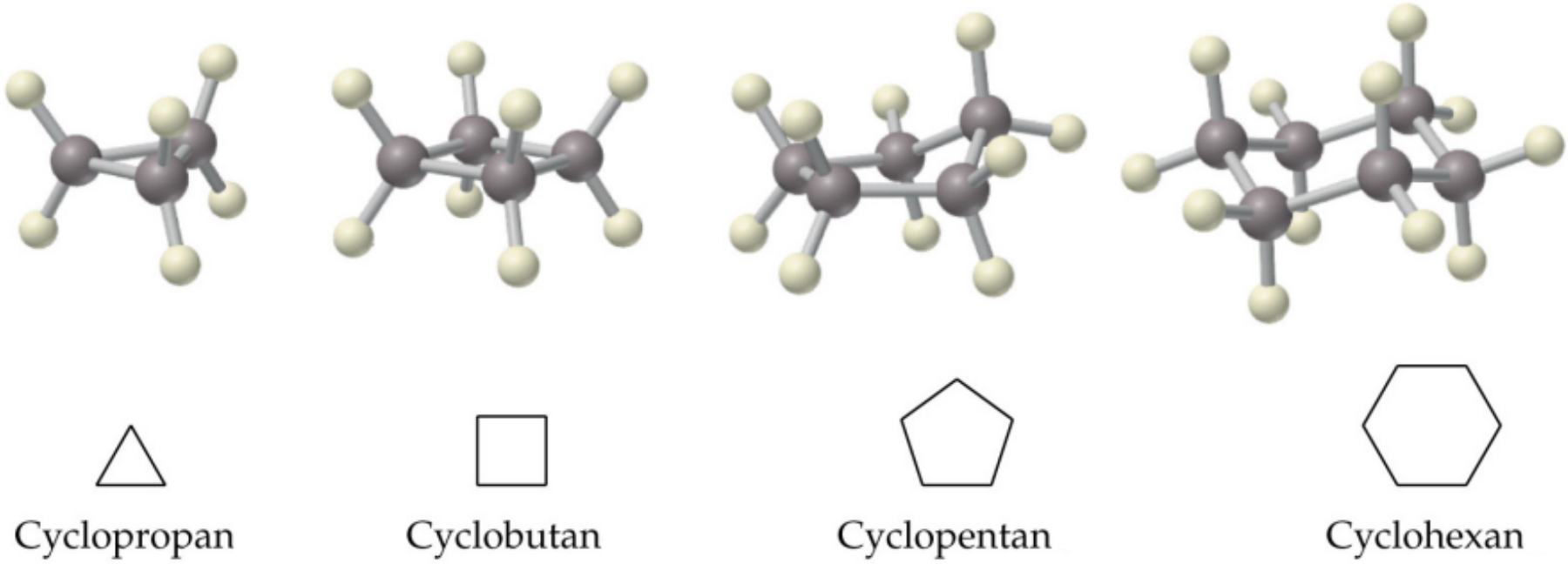


Einfache Alkyl-Reste

Formel	Name	Abkürzung in Formeln
CH_3	Methyl	Me
C_2H_5	Ethyl	Et
C_3H_7	Propyl	Pr*
$CH(CH_3)_2$	*i*-Propyl (*iso*-Propyl)	*i*-Pr*
C_4H_9	Butyl	Bu
CH_2-$CH(CH_3)_2$	2-Methylpropyl (*i*-Butyl)	(*i*-Bu)**
$CH(CH_3)$-C_2H_5	1-Methylpropyl (sec-Butyl)	(sec-Bu)
$C(CH_3)_3$	*t*-Butyl *(tertiär*-Butyl)	*t*-Bu
C_nH_{2n+l} (beliebiger Rest)	Alkyl	R

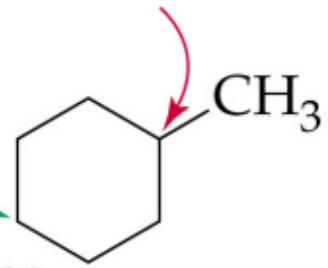
* Die Abkürzung Pr für Propyl ist unglücklich, als Pr das offizielle Symbol für das Element Praseodym ist.
* * Unglückliche Bezeichnung, da sie stets zu Verwechslungen führt mit sec-Butyl

Beispiele für cyclische aliphatische Kohlenwasserstoffe

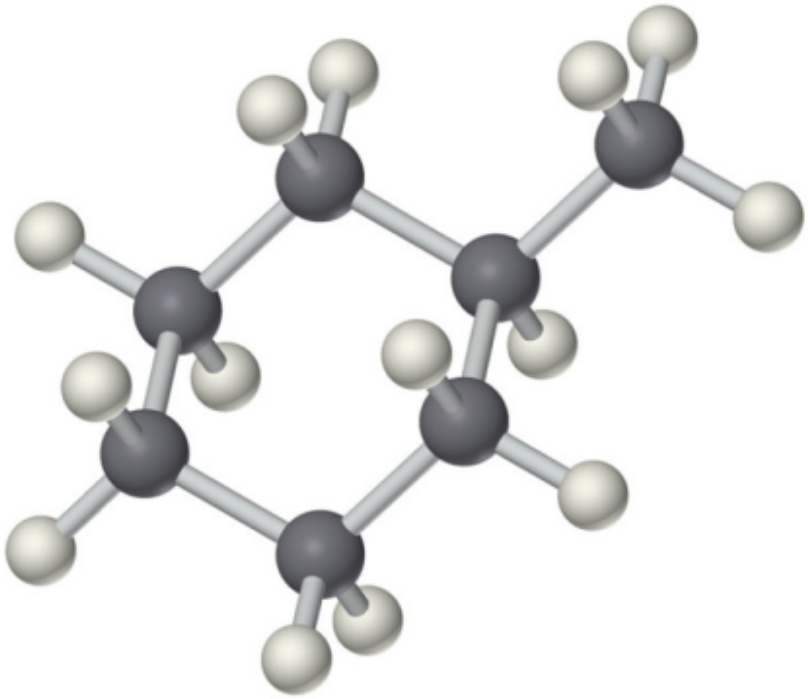


Cyclopropan Cyclobutan Cyclopentan Cyclohexan

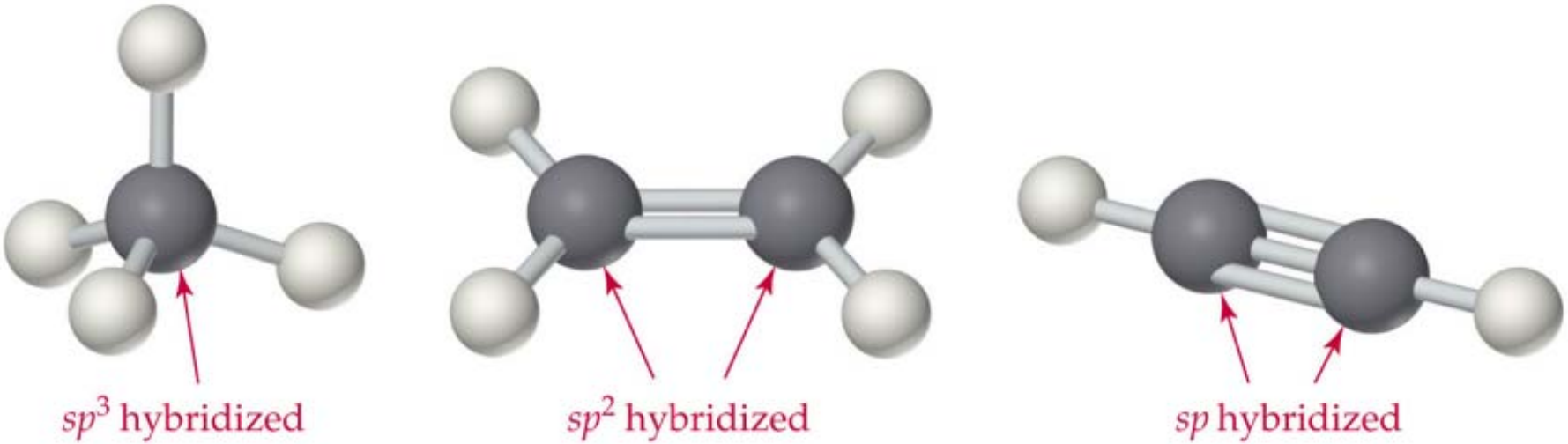
This three-way intersection is a CH group.



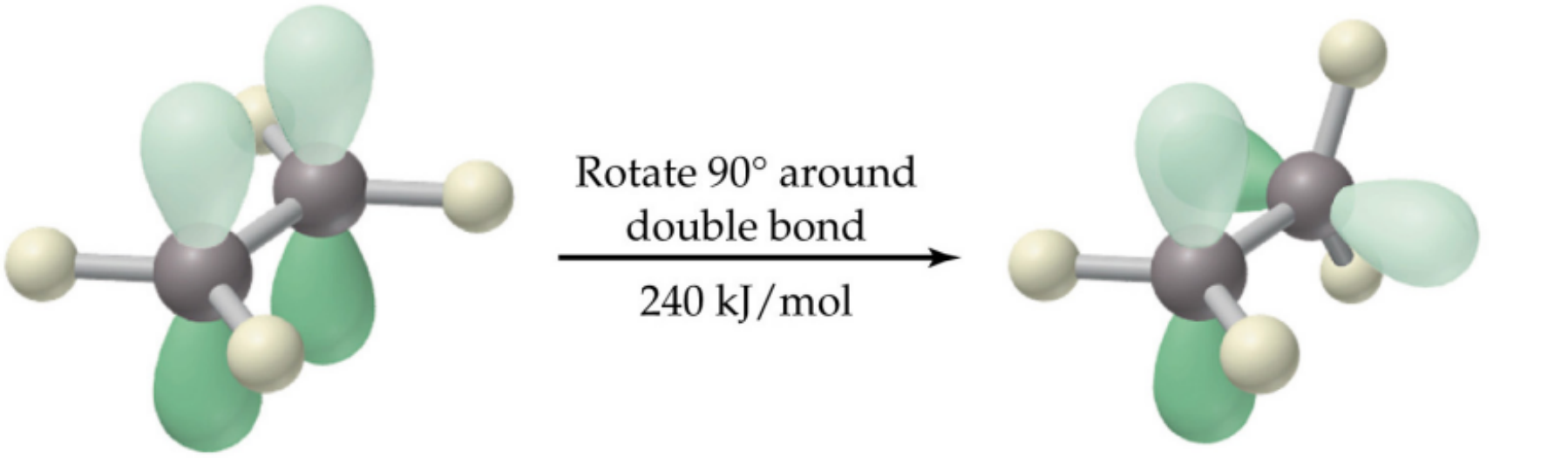
This intersection is a CH_2 group.

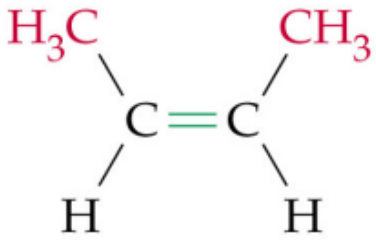


Methylcyclohexane

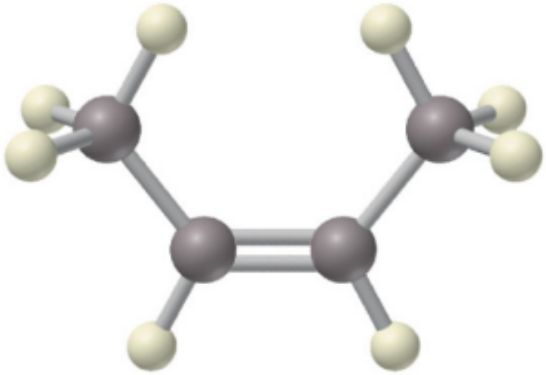

sp^3 hybridized
sp^2 hybridized
sp hybridized

Die Drehung um eine Doppelbindung erfordert einen sehr hohen Energieaufwand, d.h. die Bindung ist „starr“

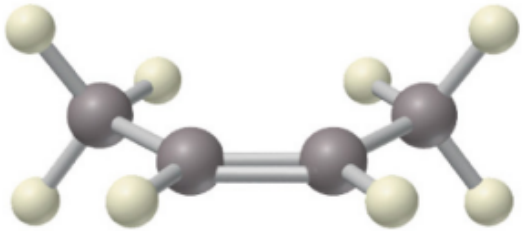




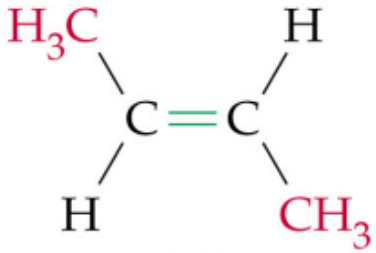
cis-2-Butene
(methyl groups on
the same side)



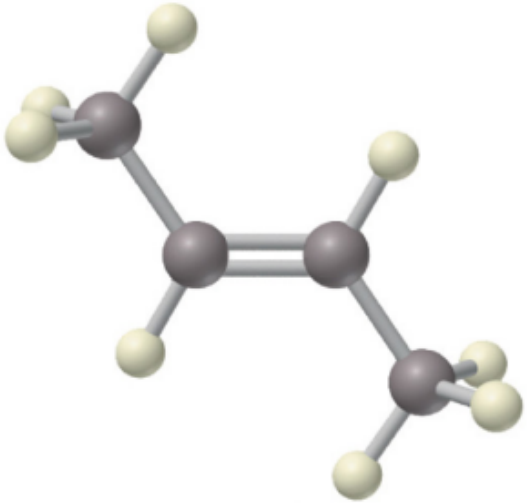
(Top view)



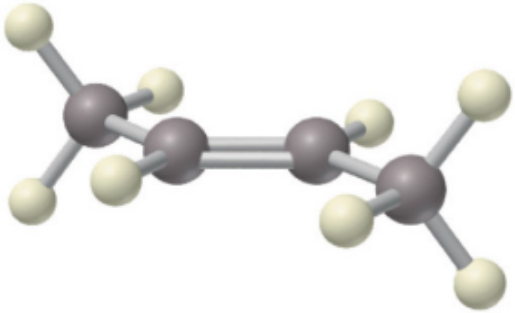
(Side view)



trans-2-Butene
(methyl groups on
opposite sides)



(Top view)



(Side view)

Einige wichtige Polymere, die sich von Alkenen bzw. subsituierten Alkenen ableiten

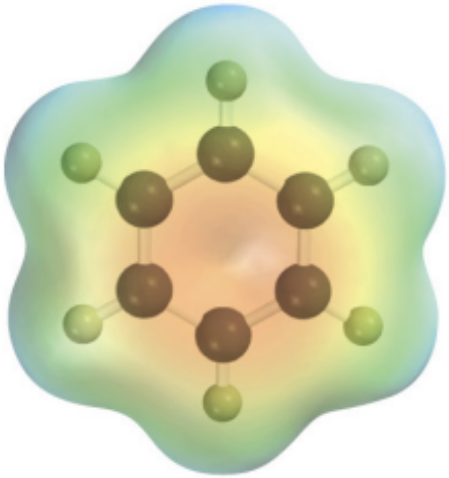
TABLE 23.3 Some Alkene Polymers and Their Uses

Monomer Name	Structure	Polymer Name	Uses
Ethylene	$H_2C{=}CH_2$	Polyethylene	Packaging, bottles
Propylene	$H_2C{=}CH{-}CH_3$	Polypropylene	Bottles, rope, pails medical tubing
Vinyl chloride	$H_2C{=}CH{-}Cl$	Poly(vinyl chloride)	Insulation, plastic pipe
Styrene		Polystyrene	Foams and molded plastics
Acrylonitrile	$H_2C{=}CH{-}C{\equiv}N$	Orlon, Acrilan	Fibers, outdoor carpeting

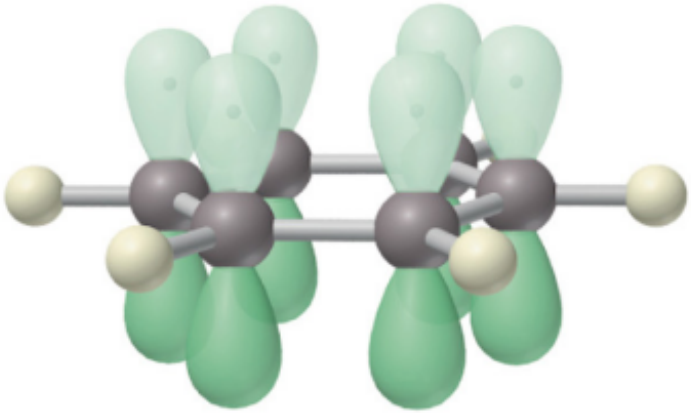
Nomenklatur ungesättigter aliphatischer Kohlenwasserstoffe

Alkene C_nH_{2n}	**Alkine C_nH_{2n-2}**
-	-
C_2H_4 Ethen	C_2H_2 Ethin
C_3H_6 Propen	C_3H_4 Propin
C_4H_8 Buten	C_4H_6 Butin
C_5H_{10} Penten	C_5H_8 Pentin
C_6H_{12} Hexen	C_6H_{10} Hexin
C_7H_{14} Hepten	C_7H_{12} Heptin
C_6H_{16} Octen	C_6H_{14} Octin
C_9H_{18} Nonen	C_9H_{16} Nonin
$C_{10}H_{20}$ Decen	$C_{10}H_{18}$ Decin

Strukturformel und Elektronenverteilung im Benzol



(a)



(b)

(c)

Strukturformel von Naphthalin