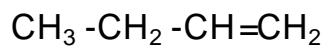


Chapter 5 & 6.

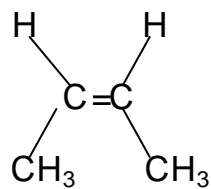
C₄, C₅

. The Butylenes

- the butylenes and butadiene (C₄'s) : by products of refinery process and of the production of ethylene.
- See Table 9.6 for structures (p.121)

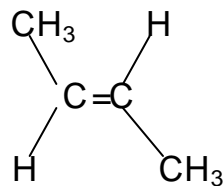


1 -butene



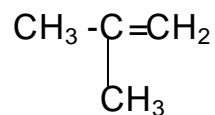
2 -butene

cis -butene



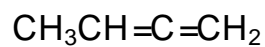
2 -butene

trans -butene

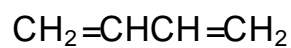


isobutene, isobutylene

2 -methyl propene

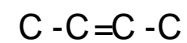


1,2 -butadiene

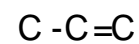


1,3 -butadiene

. n -butenes : straightchain, carbon structure



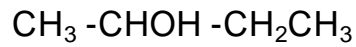
. isobutylene : branched -chain structure



|
C

. n -Butene :

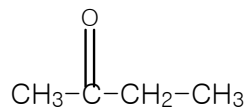
(1) 2-butanol (sec-butanol)



- produced by sulfuric acid esterification of the n-butene (see p.123)

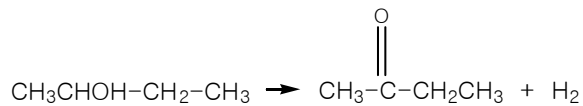
()

methyl ethyl ketone (MEK)

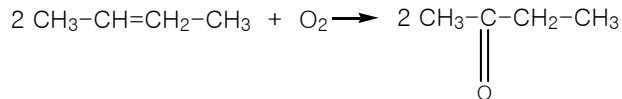


(2) Methyl ethyl ketone

Produced by the dehydrogenation of sec-butanol



Produced directly from the n-butenes



()

(solvent)

.

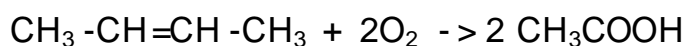
(3) Acetic acid : CH_3COOH

Oxidation of acetaldehyde

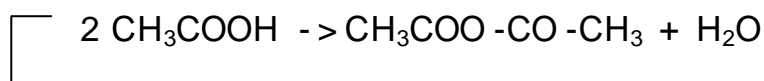
Carbonylation of methanol

Oxidation of butane

Catalytic oxidation of n-butane

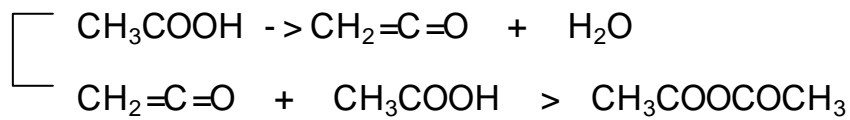


(4) Acetic anhydride (ketone)

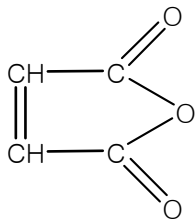


— (net reaction) p.126

() acetic acid ester

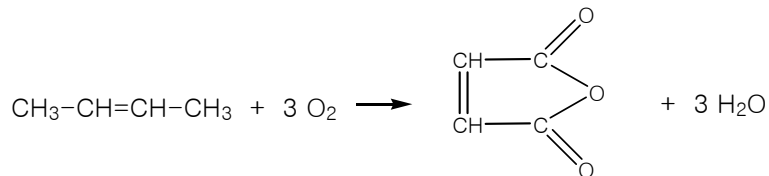


(5) Maleic anhydride :



Oxidation of butane (see p.67)

Oxidation of benzene and n-butene (see cahp.10)



()

- used to modify plastic properties (copolymer)

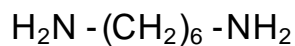
. Isobutylene

. Heptanes

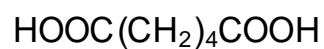
. Butadiene :

Hexamethylene diamine (HMDA)

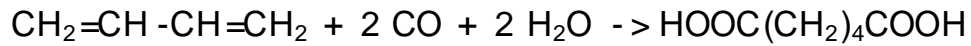
butadiene -> dichlorobutenes -> HMDA



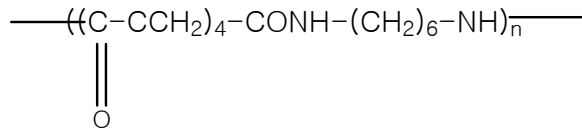
() HMDA + adipic acid -> nylon -66



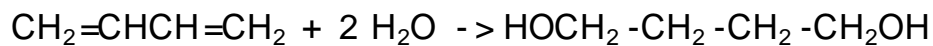
Adipic acid



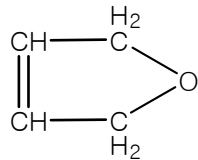
() Nylon -66



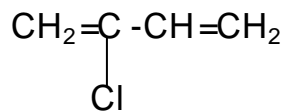
1,4 -butanediol : $(\text{HOCH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{OH})$



() Tetra hydrofuran (THF) :



Chloroprene (2 -chloro -1,3 -butadiene)



- produced from butadiene by chlorination

- produced by addition of hydrogen chloride to vinyl

acetylene,



() rubber : polychloroprene

(excellent resistance to oil, solvent and ozone -
cracking)