Chapter 16
Ethers, Epoxides, and Sulfides

16.1
Nomenclature of Ethers, Epoxides, and Sulfides

Substitutive IUPAC Names of Ethers

name as alkoxy derivatives of alkanes

$CH_3OCH_2CH_3$

methoxyethane

$CH_3CH_2OCH_2CH_3$

ethoxyethane

$CH_3CH_2OCH_2CH_2CH_2Cl$

1-chloro-3-ethoxypropane

Functional Class IUPAC Names of Ethers

name the groups attached to oxygen in alphabetical order as separate words; "ether" is last word

$CH_3OCH_2CH_3$

ethyl methyl ether

$CH_3CH_2OCH_2CH_2CH_2Cl$

3-chloropropyl ethyl ether

$CH_3CH_2OCH_2CH_3$

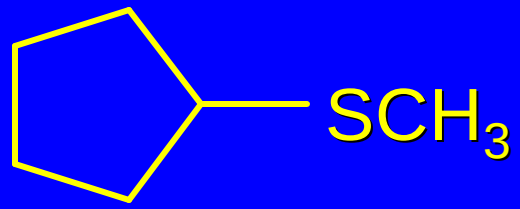
diethyl ether

Substitutive IUPAC Names of Ethers

name as alkylthio derivatives of alkanes

$CH_3SCH_2CH_3$

methylthioethane



(methylthio)cyclopentane

$CH_3CH_2SCH_2CH_3$

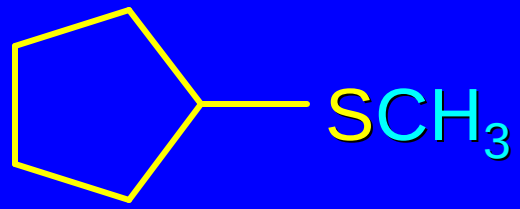
ethylthioethane

Functional Class IUPAC Names of Sulfides

analogous to ethers, but replace “ether” as last word in the name by “sulfide.”

$CH_3SCH_2CH_3$

ethyl methyl sulfide

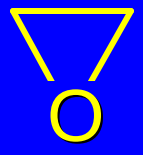


cyclopentyl methyl sulfide

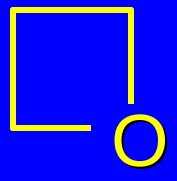
$CH_3CH_2SCH_2CH_3$

diethyl sulfide

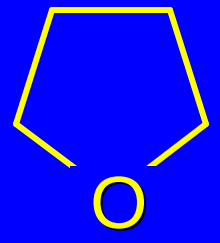
Names of Cyclic Ethers



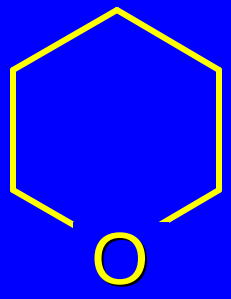
Oxirane
(Ethylene oxide)



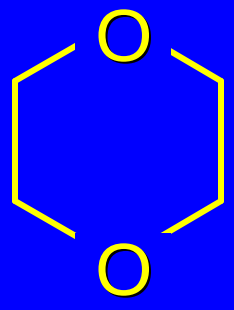
Oxetane



Oxolane
(tetrahydrofuran)

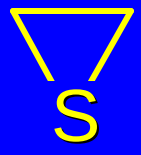


Oxane
(tetrahydropyran)

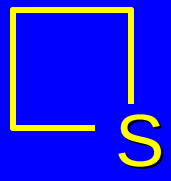


1,4-Dioxane

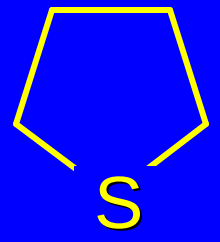
Names of Cyclic Sulfides



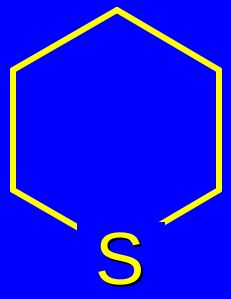
Thiirane



Thietane



Thiolane

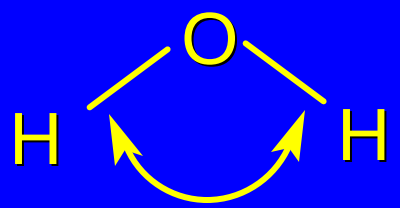


Thiane

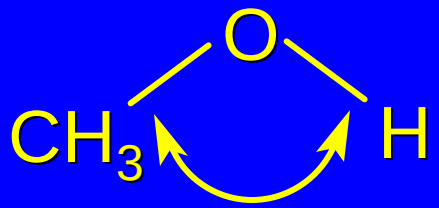
16.2
Structure and Bonding
in
Ethers and Epoxides

bent geometry at oxygen analogous
to water and alcohols

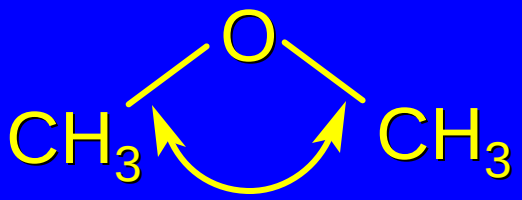
Bond angles at oxygen are sensitive to steric effects



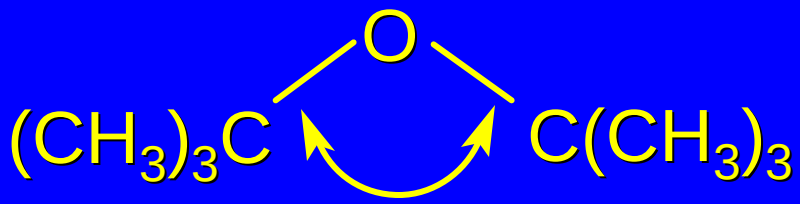
105°



108.5°

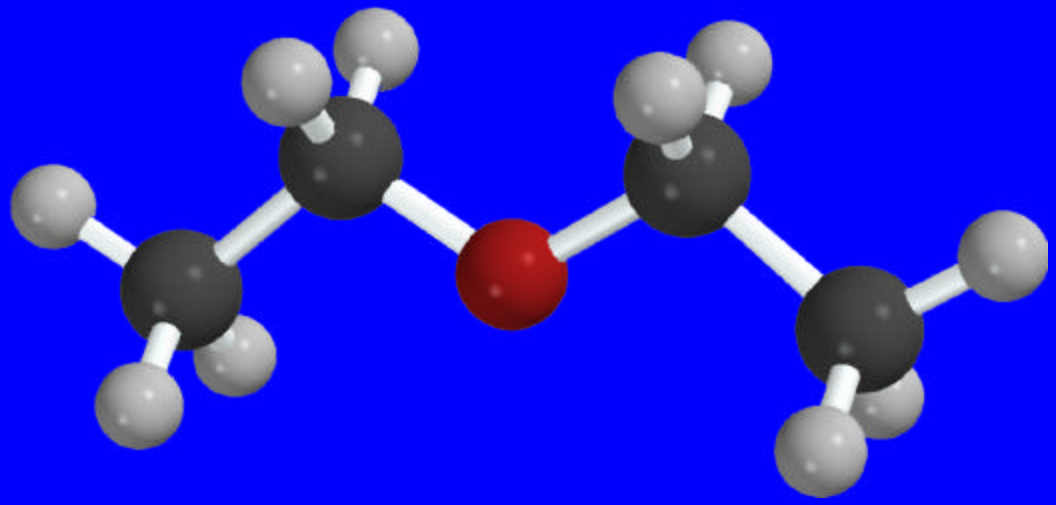


112°



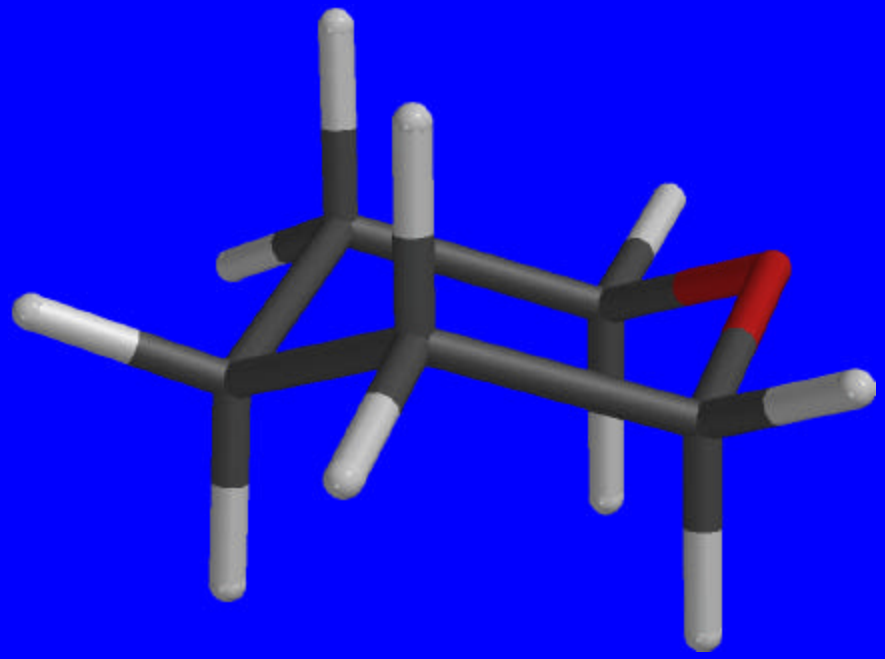
132°

An oxygen atom affects geometry in much the same way as a CH_2 group



most stable conformation of diethyl ether resembles pentane

An oxygen atom affects geometry in much the same way as a CH_2 group



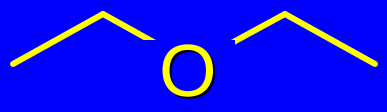
most stable conformation of tetrahydropyran resembles cyclohexane

16.3
Physical Properties of Ethers

Ethers resemble alkanes more than alcohols with respect to boiling point

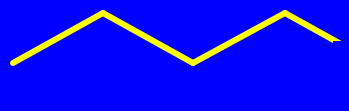
boiling point

36°C



35°C

Intermolecular hydrogen bonding possible in alcohols; not possible in alkanes or ethers.

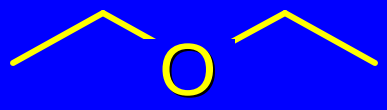


117°C

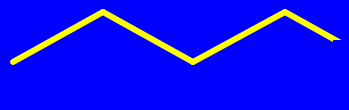
Ethers resemble alcohols more than alkanes with respect to solubility in water

solubility in water (g/100 mL)

very small



7.5



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Hydrogen bonding to water possible for ethers and alcohols; not possible for alkanes.