CHEM 20482/3 - Basic Organic Chemistry - Chapter 16 Review
Ethers, Epoxides, and Sulfides

Structure & Nomenclature

R-O-R Ether alkyl alkyl ether *or* alkoxy– CH_3CH_2-O-CH_3 = ethyl methyl ether *or* methoxyethane

R-S-R Thioether or sulfide *(You are not responsible for naming these compounds).*

 Epoxide *(You are not responsible for naming these compounds).*

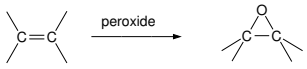
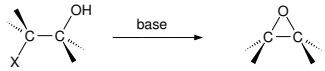
Properties

C–O bond is polar, sp^3-hybridized tetrahedral carbon centers, and cannot form H-bonds

Boiling points tend to be low, and but polarity and water solubility slightly higher than expected.

least polar *highest b.p.*	alkanes alkenes alkynes	<	ethers	<	aldehydes ketones	<	amines < alcohols < carboxylic acids	*most polar* *highest b.p.*
	No H-bonds		*H-bond acceptors*				*H-bond donors and acceptors*	

Synthesis of Ethers, Sulfides, and Epoxides

- R-X + $^-$OR' ⟶ R-O-R' — Williamson. Limited to 1° alkyl halides
- R-X + $^-$SR' ⟶ R-S-R' — Since $^-$SR not a strong base, works with any alkyl halide
-  — Peroxide contains –O–O–, such as RCOOOH or R_3COOH
-  — Base is commonly an alkoxide (RO^-)

Reaction of Ethers

R–O–R' $\xrightarrow{\text{HI or HBr}}$ R–X + R'–X + H_2O

Reactions of Epoxides

A. Good Nucleophile

- Mechanism similar to S_N2 substitution. Nucleophile attacks less-substituted carbon atom.

B. Poor Nucleophile/ Acid Catalyzed

- Acid protonates epoxide "O" atom in first step of reaction mechanism. Positive charge is delocalized around CCO ring, with most the most highly-substituted carbon becoming the most reactive.
- Nucleophile attacks more-substituted carbon atom. (Reverse of S_N2 result).