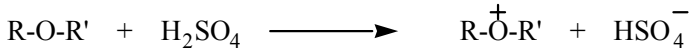
Ethers

General formula R-O-R'

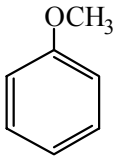
Properties
Ethers are generally unreactive, but due to the presence of the lone pairs on oxygen, unlike hydrocarbons, they are soluble in concentrated sulfuric acid:



Nomenclature

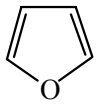
The IUPAC rules name the R-O- group as an alkoxy group attached to the longest chain, however the compounds are often named as ethers.

CH_3OCH_3	$CH_3CH_2OCH_3CH_2$	$CH_3OCH_2CH_3$
dimethyl ether	diethyl ether or ether	methylethyl ether
methoxymethane	ethoxyethane	methoxyethane

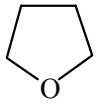


anisole
methoxybenzene
methylphenyl ether

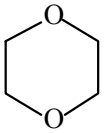
ethylene oxide
oxirane
oxycyclopropane



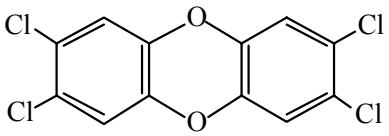
furan



tetrahydrofuran
oxacyclopentane



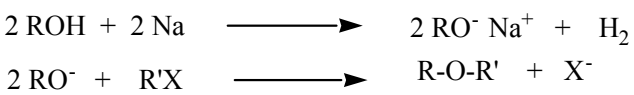
1,4-dioxane



2,3,7,8-tetrachlorodibenzodioxin

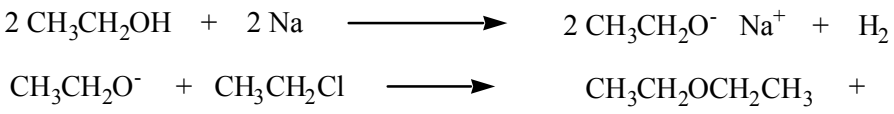
Synthesis

1. From alcohols and phenols - the Williamson ether synthesis

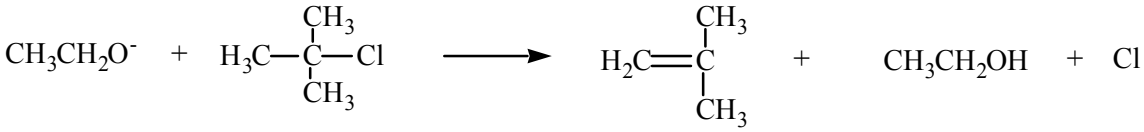


This is an S_N2 reaction so is fast when R'X is a primary halide, but does not go when R'X is a tertiary halide.

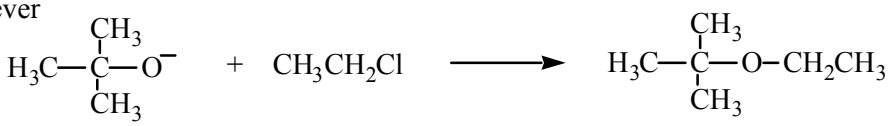
for example



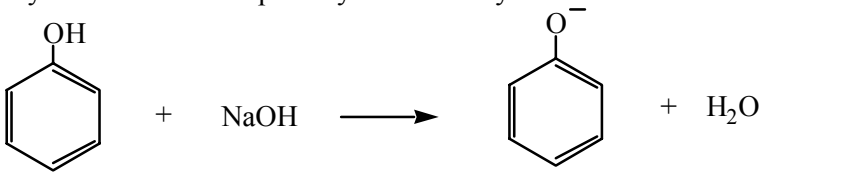
but

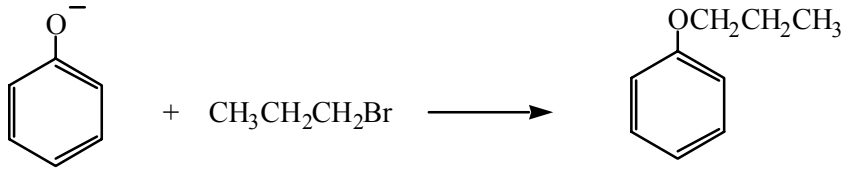


however

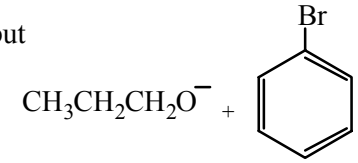


For the Williamson ether synthesis to go, the alkoxide can be primary, secondary or tertiary, but the alkyl halide should be primary or secondary.



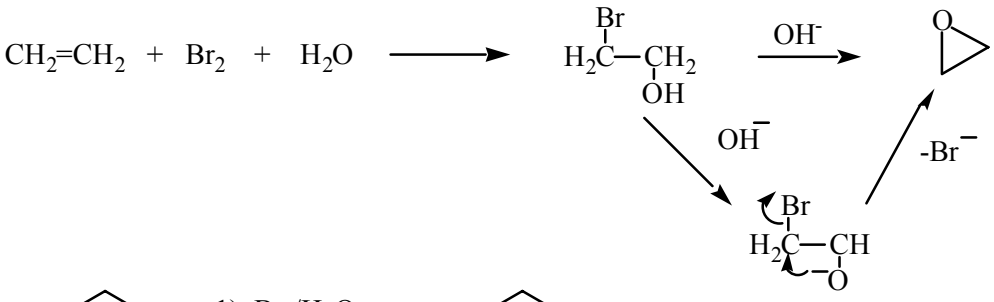


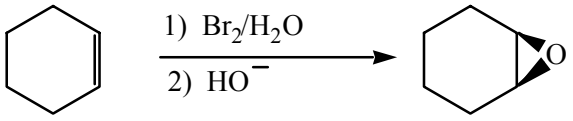
but



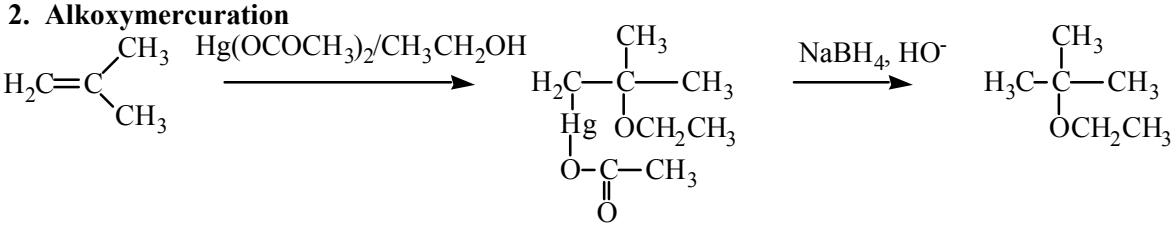
no reaction

Preparation of epoxides by internal Williamson type synthesis



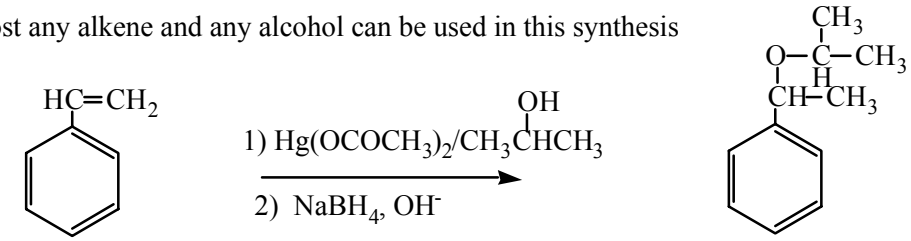


2. Alkoxymercuration



Almost any alkene and any alcohol can be used in this synthesis

e.g.

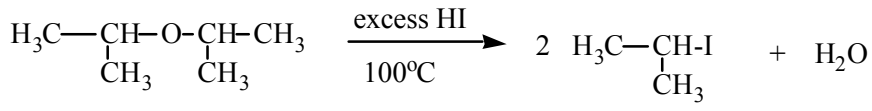


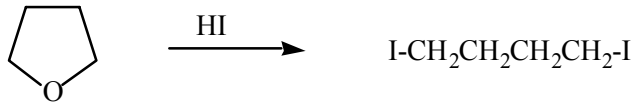
Reactions of ethers

Inert chemically

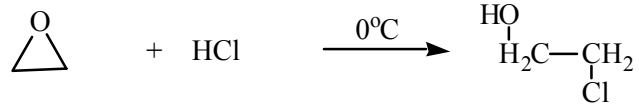
The most important reaction is cleavage by hydrogen iodide

e.g.

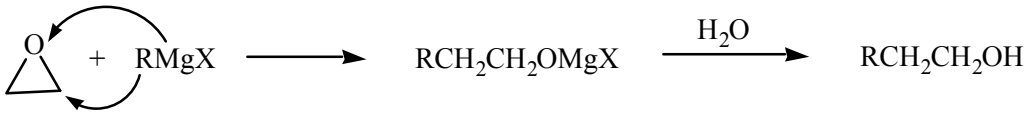




Epoxides are very reactive due to the angle strain in the 3-membered ring. They are very useful in syntheses

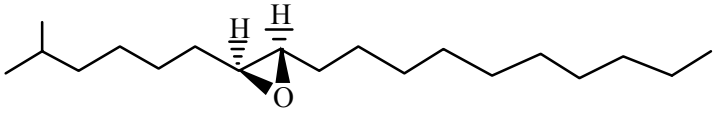


Epoxides can be used in the synthesis of alcohols

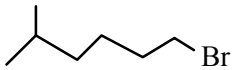


This reaction can be used to increase the alkyl chain by 2 carbon units

Synthesis of cis-7,8-epoxy-2-methyloctadecane



cis 7,8-epoxy-2-methyl-octadecane

Synthesise this molecule from HC≡CH , Br $(CH_2)_9CH_3$ and  and any inorganic reagents needed.