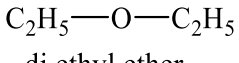
ETHERS

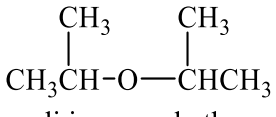
1.**Structure and nomenclature of ethers**

Ethers are compounds of general formula **R-O-R** and **Ar-O-R** or **Ar-O-Ar** (is phenyl or some other aromatic group) , To name ethers we usually name the two groups that are attached to oxygen , and follow these names by the word ether :-

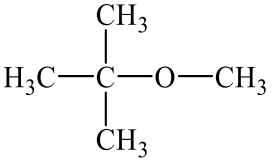
Examples:-



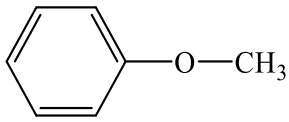
di ethyl ether



di isopropyl ether



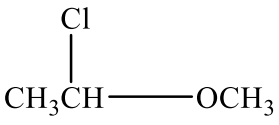
tert- butyl methyl ether



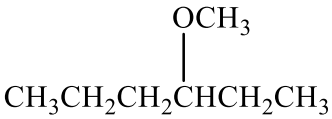
methylphenylether

- If one group has no simple name , the compound may be named as an alkoxy derivatives :-

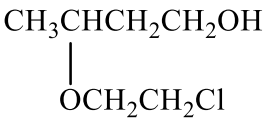
1-methoxypropane



1-chloro-1-methoxyethane



3-Methoxy hexane



3-(2/-chloroethoxy)-1-butanol

- If the two groups are identical the ether is said by symmetrical (e.g. di ethyl ether , di isopropyl ether).
- If the two groups are different the ether is said by unsymmetrical (e.g. tert-butyl methyl ether)

2-**Physical properties of ethers**

- Much less polar than alcohols
- Not soluble in water. The modest solubility of di ethyl ether to in water it similar to that of its isomer 1- butanol because each can form a hydrogen bond to water.
- Lower boiling point and melting point than alcohols. For example:- the b.p of diethyl ether ($35C^{o}$) and ethanol ($78C^{o}$).
- Chemically inert.
- All ethers are very flammable

Used as anesthetics

Di ethyl ether – first general anesthetics , halogenated ethers – common anesthetics

- Penthrane CH_3-O-CF_2CHCl_2
- Enthrane CH_2F-O-CF_2CHFCl

Special hazard

Many ethers will form peroxides

If they sit too long they can say explosive

Testing ethers for the presence of peroxides

$CH_3CH_2OCH_2CH_3 + O_2 \longrightarrow CH_3CH_2OCHCH_3$ (OOH: peroxide)

$\downarrow$ $FeSO_4$ ferroussulphate

Fe^{+3}

$\downarrow$ SCN^-

Red colour

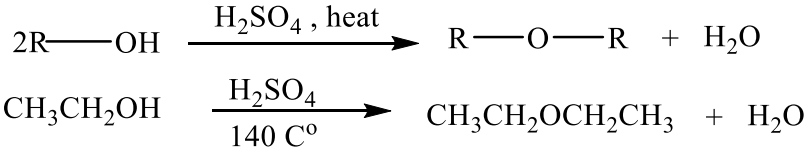
If the ether contains solid wastes this means it contains a lot of peroxides and the ether must be discarded.

Ethers containing small amount of peroxides can be treated with ferrous sulfate $FeSO_4$ to get red colour of the peroxide.

3- Industrial Sources of ethers

Dehydration of alcohols

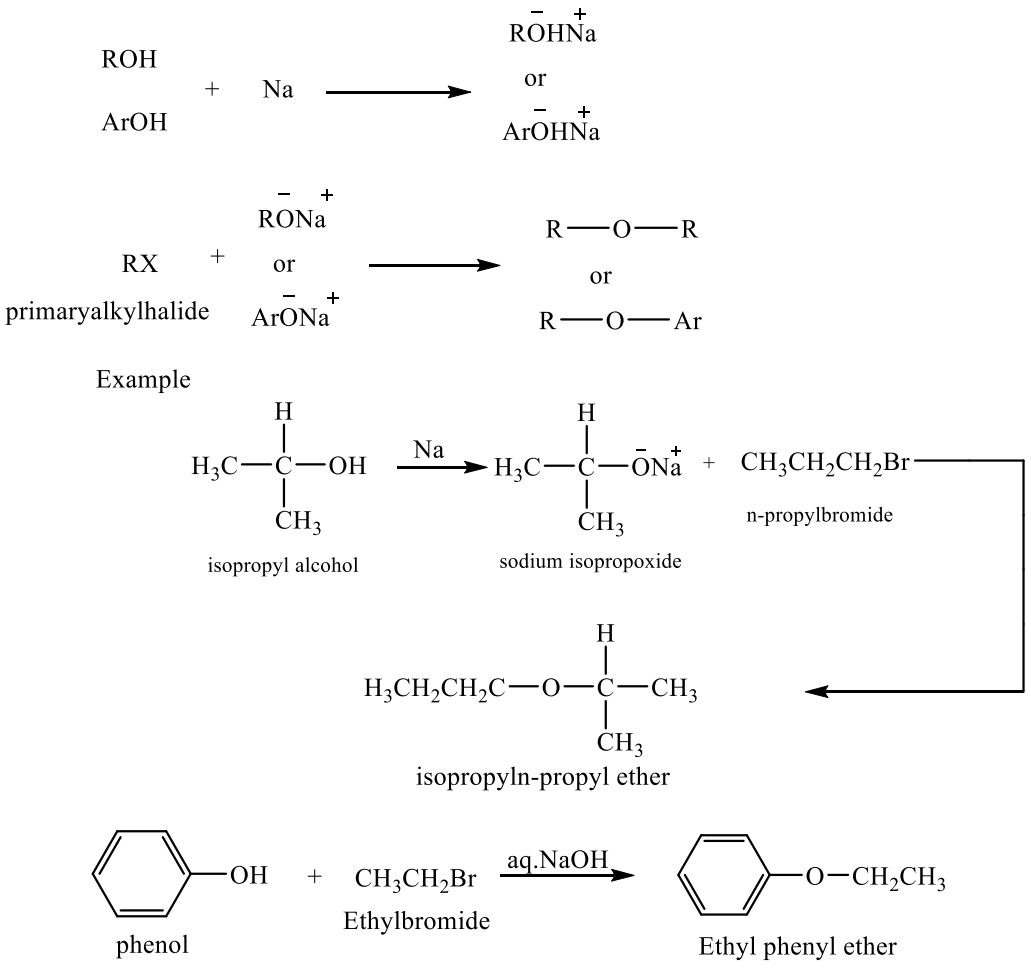
A number of symmetrical ethers containing the lower alkyl groups are prepared on a large scale , chiefly for use as a solvents . the most important of these is di ethyl ether . these ethers are prepared by reaction of the corresponding alcohols with sulfuric acid since a molecule of water is lost for every pair of alcohol molecules



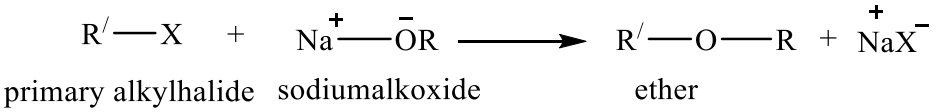
4-**Preparation of ethers**

The following methods are generally used for the laboratory preparation of ethers (the Williamson Synthesis is used for the preparation of alkyl or aryl ethers Industrially as well).

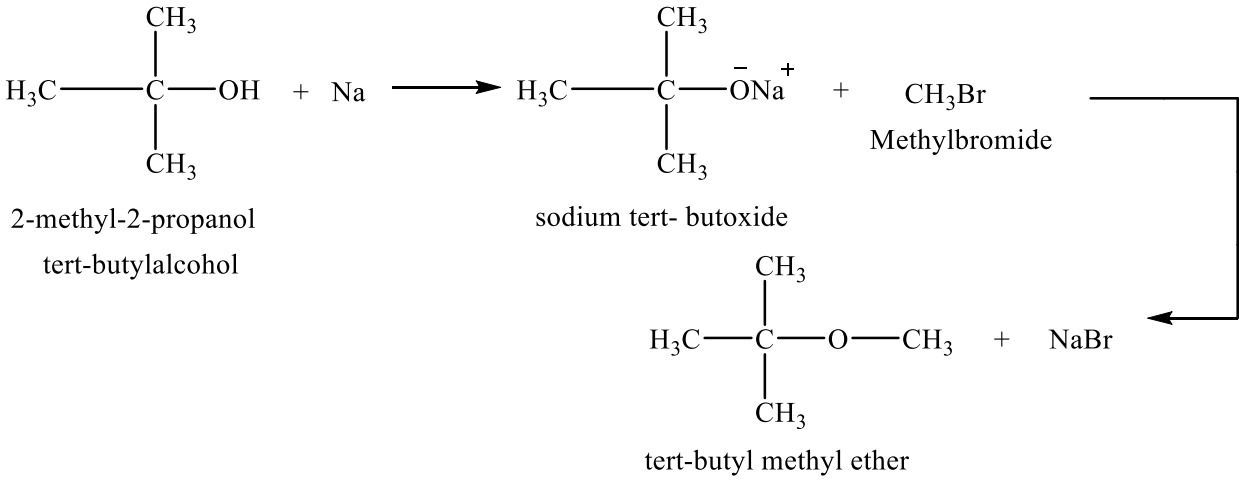
- Williamson Synthesis



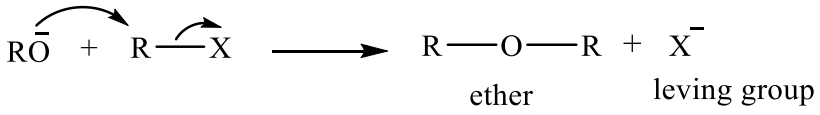
- In Williamson Synthesis an primary alkyl halide is allowed to react with a sodium alkoxide.



Example:-

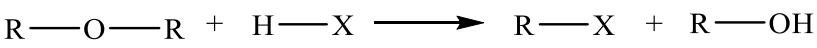


- This reaction involves nucleophile substitution of alkoxide ion for halide ion.



5- **Reactions of ethers**

Cleavage by strong acids:-



Cleavage take place only under quite vigorous condition ; concentrated acids (usually HI or HBr) and high temperatures.