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Geology
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2.

i. Physical states: At room temperature, ethers are colourless, neutral liquids with pleasent colours. The lower aliphatic ethers are highly flammable gases or volatile liquids.

ii. Solubility: Ethers are less soluble in water than are the corresponding alcohols. Lower molecular weight ethers such as ~~methy~~ methoxymethane and methoxyethane are fairly solube in water since the molecule are able to form hydrogen bonds with the water molecules but as the hydrogen content of the molecules increases, there is a rapid decline in solubility. They are miscible with the most Orgain solvents.

iii. Density: Most of the simple ethers are less dense than water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are in fact denser than water.

iv. Boiling point: Low Molecular mass ethers have a lower boiling point than the corresponding alcohols but those ethers containing alkyl radicals larger than four carbon atoms, the reverse is true. The boiling point of ethers tend approximate those of hydrocarbons of some relative molecular mass from which it can be concluded that the molecules are not associated in the liquid phase as there are no suitably available hydrogen for association through hydrogen bonds.

v. Reactivity: Ethers are inert moderate temperature. Their inertness at moderate temperature leads to their wide use as reaction media.

3. Partial dehydration of alcohols: Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated

tetraoxosulphate (VI) acid is heated at a carefully maintained temperature of 140°C. this process is known as continous etherification. If excess alcohol is not used, the temperature is as high as 140-180°C further dehydration to yield alkene occurs.

$$2ROH \xrightarrow{conc\ H_2SO_4\ /\ 140°C} ROR + H_2O.$$

Examples:

$$2CH_3CH_2OH \xrightarrow{conc\ H_2SO_4\ /\ 140°C} CH_3CH_2-O-CH_2CH_3 + H_2O.$$

ii Williamson synthesis: It is an important method of the preparation of symmetrical and asymmetrical ethers in laboratories. In this method, an alkyl halide is reacted with sodium alkoxide which leads to the formation of ether. The reaction generally follow the $S_N2$ mechanism for primary alcohols.

$$R-X + R-\ddot{\underset{..}{O}}\ \overset{+}{Na} \longrightarrow R-\ddot{\underset{..}{O}}-R + NaX$$

As we know alkoxides are strong bases and they can react with alkyl halides leading to elimination reactions. Williamson synthesis exhibits higher productivity in the case of primary alkyl halides. In the case of primary alkyl halides. In the case secondary alkyl halides, elimination competes with substitution whereas, we observe the formation of elimation products only in the case of tertiary alkyl halides.

4i Ethylene Oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol.

ii Ethylene Oxide is used in the preparation of nonionic emulsifying agents, plastics, plasticizers and several synthetic textiles.

iii Ethylene Oxide is used as a gaseous sterilizing agent.

1. $CH_3OCH_3 \longrightarrow$ Methoxymethane.

$CH_3CH_2OCH_2CH_3 \longrightarrow$ Ethoxyethane.

$(CH_3CH_2CH_2CH_2)_2O \longrightarrow$ Butoxymethane.

$CH_3CH_2OCH_3 \longrightarrow$ Methoxyethane.

$CH_3CH_2CH_2OCH_2CH_3 \longrightarrow$ Ethoxypropane.