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MATRIC NO: 19/mHS01/076 COURSE CODE: CHM 102

1. (i) $CH_3OCH_3$ → Methoxymethane
(ii) $CH_3CH_2OCH_2CH_3$ ⇒ Ethoxyethane
(iii) $(CH_3CH_2CH_2CH_2)_2O$ ⇒ Butoxybutane
(iv) $CH_3CH_2OCH_3$ ⇒ Methoxyethane
(v) $CH_3CH_2CH_2OCH_2CH_3$ ⇒ Ethoxypropane

2. General properties
(i) Physical states: At room temperature, ethers are colourless, neutral liquids with pleasant odours. 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 are fairly soluble in water since the molecule are able to form hydrogen bonds with the water molecules but as the ~~hydroge~~ hydrocarbon content of the molecules increases, there is a rapid decline in solubility. They are miscible with most organic 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 ether 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 to approximate those of hydrocarbons of same 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 at moderate temperature. Their inertness at moderate temperatures leads to their wide use as reaction medium.

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3 Preparation of Ethers

i Partial dehydration of alcohol: Simple ethers are manufactured from alcohols by catalytic dehydration The alcohol in excess and concentrated ~~tetroxt~~ $H_2SO_4$ is heated at a carefully maintained temperature of 140°C. This process is known as continuous etherification, If excess alcohol is not used the temperature is as high as 170°C-180°C further dehydration to yields alkene.

$$2ROH \xrightarrow[140^\circ C]{Conc.\ H_2SO_4} R-O-R + H_2O$$

Examples

$$2CH_3CH_2OH \xrightarrow[140^\circ C]{Conc.\ H_2SO_4} CH_3CH_2-O-CH_2CH_3 + H_2O$$

Ethoxyethane

ii From Haloalkanes and dry silver(i) oxide

Ethers are formed from the reaction of haloalkanes and dry silver(i) oxide as follows

$$2Rx + Ag_2O \xrightarrow{Warm} R-O-R + 2AgX$$

$$2CH_3CH_2CH_2Cl + Ag_2O \xrightarrow{Warm} CH_3CH_2CH_2OCH_2CH_2CH_3 + 2AgO$$

Propoxypropane

4 Uses of Ethylene oxide

1 Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol

2 Ethylene oxide is used in the preparation of nonionic emulsifying agents, plastics, plasticizers and several synthetic textiles

3 Ethylene oxide is used as a gaseous sterilizing agent.