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Course: CHM 102

Assignment on Ether

1(i). CH_3OCH_3 → Methoxy methane

(ii). $CH_3CH_2OCH_2CH_3$ → Ethoxyethane

(iii). $(CH_3CH_2CH_2CH_2)_2O$ → Butoxybutane

(iv). $CH_3CH_2OCH_3$ → Methoxy ethane

(v). $CH_3CH_2CH_2OCH_2CH_3$ → Ethoxypropane

2. Properties of Ethers

(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 such as methoxymethane and methoxyethane are fairly soluble in water since the molecule are able to form hydrogen bonds with the water molecules but as the hydrocarbon content of the molecule 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 ethers have a lower boiling point than the corresponding alcohols but 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 suitable hydrogen available 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 media. Simple ethers are not found commonly in nature but the ether linkage is present in such natural products as sugars, starches and cellulose.

3. Methods of preparing Ethers

(i). 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 continuous Etherification. If excess alcohol is not used, the temperature is as high as 170-180°C, further dehydration to yield alkene occurs.

$$2ROH \xrightarrow{\text{conc. } H_2SO_4/140^\circ C} R-O-R + H_2O$$

Examples:

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

(ii). From Haloalkanes and dry silver (I) oxide

$$2RX + Ag_2O \xrightarrow{\text{warm}} R-O-R + 2AgX$$

Example:

$$2CH_3CH_2CH_2Cl + Ag_2O \xrightarrow{\text{warm}} CH_3CH_2CH_2OCH_2CH_2CH_3 + 2AgCl$$

Propoxypropane

4. Uses of ethylene oxide

(i). Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol.

(ii). Ethylene oxide is used in the preparation of non-ionic emulsifying agents, plastics, plasticizers and several synthetic textiles.

(iii). Ethylene oxide is also used as a gaseous sterilizing agent for medical equipment.