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MECHATRONICSENGINEERING

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CHEMISTRY 102

CH3OCH3 Methoxymethane CH3CH2OCH2CH3 Ethoxyethane

(CH3CH2CH2CH2)2O Butoxymethane CH3CH2 OCH3 Methoxyethane

CH3CH2CH2OCH2CH3 Ethoxypropane

General properties

(1) Physical states

At room temperature, ethers are colourless, neutral liquids with pleasant odours. The lower aliphatic rthers are highly flammable gases or volatile liquids.

(2) 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 molecules increases, there is a rapid decline in solubility. They are miscible with most organic solvents.

(3) 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

(4) Boiling point

Low molecular mss 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 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,

(5) 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

MANUFACTURE AND PREPARATION OF ETHERS

1. 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 140oC. this process is known as continuous etherification. If excess alcohol is not used, the temperature is as high as 170-180oC, further dehydration to yield alkene occurs

2ROH conc. H_2SO_4 /140oC R-O-R + H_2O

Examples

2CH_3CH_2OH conc. H_2SO_4 /140oC CH_3CH_2-O-CH_2CH_3 + H_2O

2. From Haloalkanes and dry silver (I) oxide

2RX + Ag_2O warm R-O-R + 2AgX

2$CH_3CH_2CH_2Cl$ + Ag_2O warm $CH_3CH_2CH_2O$ $CH_2CH_2CH_3$ + 2AgCl
Propoxypropane

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