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CHM 102

1) IUPAC names of the following organic compounds :
   ~CH3OCH3 – methoxymethane
   ~CH3CH2OCH2CH3 ~ Diethyl ether
   ~(CH3CH2CH2CH2)2O ~
   ~ CH3CH2OCH3 ~ methoxyethane
   ~CH3CH2CH2OCH2CH3 – ethoxypropane

2) PROPERTIES OF ETHERS

   Physical properties –
   1) An ether molecule has a net dipole moment due to the polarity of C-O bonds.
   2)The boiling point of ethers is comparable to the alkanes but much lower than that of alcohols of comparable molecular mass despite the polarity of the C-O bond. The miscibility of ethers with water resembles those of alcohols.
   3)Ether molecules are miscible in water. This is attributed to the fact that like alcohol, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

   Chemical properties –
   Ethers generally undergo chemical reactions in two ways:

   1. Cleavage of C-O bond

   Ethers are generally very unreactive in nature. When an excess of hydrogen halide is added to the ether, cleavage of C-O bond takes place leading to the formation of alkyl halides. The order of reactivity is given as HI>HBr>HCl

   R-O-R + HX → RX + R-OH

2. Electrophilic Substitution

The alkoxy group in ether activates the aromatic ring at ortho and para positions for electrophilic substitution. Common electrophilic substitution reactions are halogenation, Friedel Craft's reaction etc.

3. Halogenation of Ethers

Aromatic ethers undergo halogenation, for example, bromination, upon the addition halogen in the presence or absence of a catalyst.

4. Friedel Craft's Reaction of Ethers

Aromatic ethers undergo Friedel Craft's reaction for example addition of alkyl or acyl group upon the reaction with alkyl or acyl halide in the presence of a Lewis acid as catalyst.

3) TWO METHODS OF PREPARING ETHERS

1)Preparations of Ethers by Williamson Synthesis

Williamson synthesis is an important method for the preparation of symmetrical and asymmetrical ethers in laboratories. In this method, we carry out a reaction of an alkyl halide with sodium alkoxide which leads to the formation of ether. The reaction generally follows SN2 mechanism for primary alcohol.

As we know alkoxides are strong bases and they can react with alkyl halides. Thus, they take part in elimination reactions. Williamson synthesis exhibits higher productivity in case of primary alkyl halides.

An example is the reaction of sodium ethoxide with chloroethane to form diethyl ether and sodium chloride:

$[Na]+[C2H5O]- + C2H5Cl \rightarrow C2H5OC2H5 + [Na]+[Cl]-$

2)Preparation of Ethers by Dehydration of Alcohols

In the presence of protic acids (sulphuric acid), alcohols undergo dehydration to produce alkenes and ethers under different conditions. For

example: in the presence of sulphuric acid, dehydration of ethanol at 443 K yields ethene. On the other hand, it yields ethoxyethane at 413 K. This is an ideal method of preparation for primary alcohols.

4) THREE USES OF ETHYLENE OXIDE

1)It is used to produce ethylene glycols for engine antifreeze that keeps our automobiles performing.
2)Most ethylene oxide is used as an intermediate in the production of other chemicals used to manufacture products, such as fabrics for clothes, upholstery, carpet and pillows.
3)It is also used as a fumigant in certain agricultural products and as a sterilant for medical equipment and supplies.