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DEPT: MBBS.

MATRICK: 19/MHS01/416.

COURSE: CHN 102.

ASSIGNMENT.

1. Give the IUPAC names of the following organic compounds.

a. CH_3OCH_3 - Methoxy methane.

b. $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ - Ethoxy ethane.

c. $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$ - Methoxy propane.

d. $\text{CH}_3\text{CH}_2\text{OCH}_3$ - Methoxy ethane.

e. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$ - Ethoxy methane.

2. Discuss the properties of Ethers

Physical Properties:

- i. An ether molecule has a net dipole moment. We can attribute this to the polarity of C-O bonds.
- ii. The boiling point of ethers is comparable to the alkanes. However, it is much lower compared to that of alcohols of comparable molecular mass. This is despite the fact of the polarity of the C-O bond.
- iii. The miscibility of ethers with water resembles those of alcohols.
- iv. Ether molecules are miscible in water. We can attribute this to the fact that like alcohols, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

Chemical Properties.

i. Cleavage of C-O bond: Ethers are generally very unreactive in water. When we add excess of hydrogen halide to the ether, cleavage of C-O bond takes place. It leads to the formation of alkyl halides. The order of reactivity is as follows: $\text{HI} > \text{HBr} > \text{HCl}$
 $\text{R-O-R} + \text{HX} \rightarrow \text{RX} + \text{R-OH}$

ii. 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.

iii. Halogenation of ethers: Aromatic ethers undergo halogenation, for example, bromination, when we add a hydrogen halogen in the presence or absence of a catalyst.

iv. Friedel-Craft's reaction of ethers: Aromatic ethers undergo Friedel-Craft's reaction for example addition of alkyl or acyl group when we introduce it to an alkyl or acyl halide in the presence of a Lewis acid as catalyst.

3. Discuss explicitly two methods of preparing ethers and show equations of reactions.

i. Dehydration of Alcohols: In the presence of 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 443K yields ethane whereas it yields ethoxyethane at 413K . This is an ideal method

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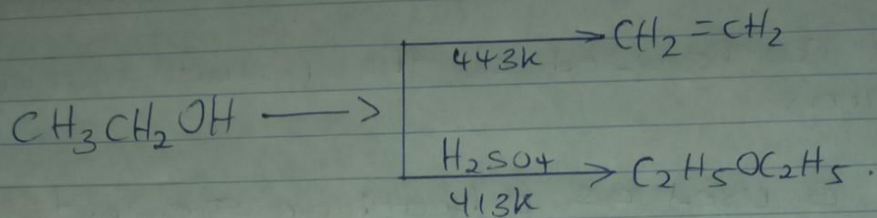
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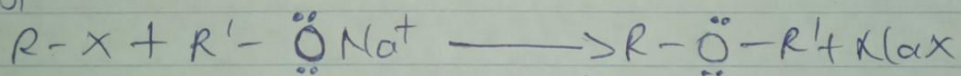
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of preparation through primary alcohols.



The preparation of ethers by dehydration of alcohol is a nucleophilic substitution reaction. The alcohol involved in reaction play two roles: one alcohol molecule acts as a substrate while the other act as a nucleophile. It can follow either an $\text{S}_{\text{N}}1$ or $\text{S}_{\text{N}}2$ mechanism. The choice of the mechanism depends on whether the protonated alcohol loses water before or simultaneously upon the attack of a second alcohol molecule.

2. By Williamson Synthesis: It is an important method for 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 follows the $\text{S}_{\text{N}}2$ mechanism for primary alcohol.



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

4. State three uses of ethylene oxide.

- i. It is used in the production of ethylene glycol.
- ii. It can be used in the production of glycol ethers.

iii. It is used as a healthcare sterilant.