CHM 102

AZONDEKON LAURAH MODOUKPE

MECHANICAL ENGINEERING

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1. **MAJOR CLASSIFICATIONS OF ALKANOLS**
2. Alkanols are classified based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are two or three, it is called a primary alcohol. If it is one hydrogen atom, it is called a secondary alcohol and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol.

E.g. Methanol \_ CH3OH Butan-2-ol \_ CH3CH2CH(OH)CH3

 Methylpropan-2-ol \_ (CH3)3C-OH

1. They are also classified based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structures. Dihydric alcohols, also called glycols, have two hydroxyl groups present in the alcohol structure while the trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups.

E.g.

* Propanol (Monohydric alcohol) \_ CH3CH2CH2OH
* Ethane-1,2-diol (Dihydric alcohol) \_ HOCH2CH2OH
* Propane-1,2,3-triol (Trihydric alcohol) \_ OHCH2CH(OH)CH2OH
* Heptane-2,3,4,5,6-pentaol (Polyhydric alcohol) \_ CH3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH3
1. **GRIGNARD SYNTHESIS OF AN ALKANOL USING CH3CH2MgBr AS A GRIGNARD REAGENT**

CH3CH2CH2CH2C=OCH2CH2CH3 + CH3CH2MgBr

 CH2CH3

CH3CH2CH2CH2C OMgBr

 CH2CH2CH3

 CH2CH3

CH3CH2CH2CH2C OH + Mg(OH)Br

 CH2CH2CH3

 3-Butylhexane-3-ol

1. **INDUSTRIAL PREPARATION OF ETHANOL**

Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation.

* STEP I:

 The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60oC for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

2(C6H10O5)n + nH2O nC12H22O11

Carbohydrate 60oC/diastase Maltose

* STEP II:

 The maltose is broken down into glucose on addition to yeast which contains the enzyme maltase and at a temperature of 15oC.

C12H22O11 + H2O 2C6H12O6

Maltase 15oC/maltase Glucose

* STEP III:

 The glucose at constant temperature of 15oC is then converted into alcohol by the enzyme zymase contained also in yeast.

C6H12O6 2CH3CH2OH + 2CO2

Glucose Ethanol

1. **PRODUCT OBTAINED IN THE REDUCTION OF ALKANAL AND** **ALKANONE**

Aldehydes and Ketones are reduced to primary and secondary alcohols respectively by reacting with hydrogen in the presence of a platinum or nickel catalyst or with aluminium isopropoxide or with complex metal hydride, such as lithiumtetrahydridoaluminate(III) or sodiumtetrahydridoborate(III).

 O

 C CH2OH

 H

 H2 (Ni or Pt) cat.

 Or LiAlH4

 Aldehyde Primary Alcohol

 OH

 O

 C CH – CH3

 CH3

 H2 (Ni or Pt) cat.

 Or LiAlH4

 Ketone Secondary Alcohol