OMUEKA MICHAEL 19/ENG04/043 Elec mec Engineering

CHM 102

(1) HCOOH → Methanoic Acid

HOOC − CH_2 − CH_2 − COOH → Butanedioic acid

$CH_3CH_2CH_2$ − COOH → Butanoic acid

H_3C − COOH → Ethanoic acid

CH_2CH = $CHCH_2$ − CH_2 − COOH → Hex − 2 − enoic acid

(2) Physical properties

Appearance − The simple aliphatic carboxylic acids are liquids at room temperature having unpleasant odours. Some carboxylic acids are solid at room temperature e.g. ethanoic acid, butanoic acid, hexanoic acid, octanoic acid, benzoic acid, palmitic acid, stearic acid, oxalic acid, tartaric acid, citric acid.

Boiling point − Increases with increase in molecular mass. Aliphatic carboxylic acids are polarized and have higher melting points than the aliphatic acids parts of comparable relative molecular mass.

Solubility − Low molecular mass carboxylic acids with up to 4 carbon atoms in their molecules are soluble in water.

(3) From ethanal

CH_2CH = CH_2 (Ethyne) $\xrightarrow{dil\ H_2SO_4}$ CH_3CHO (Ethanal) $\xrightarrow{O_2}$ CH_3COOH (Ethanoic acid)

From carbon dioxide

$CO_2 \xrightarrow{NaOH}$ $HCOONa$ $\xrightarrow{H_2SO_4}$ $HCOOH + Na + HSO_4$

Methanoic acid

(4) Oxidation of primary alcohols and aldehydes

$CH_3CH_2OH \xrightarrow[K_2Cr_2O_7 \text{ or } KMnO_4]{[O]} RCHO \xrightarrow{[O]} RCOOH$

Ethanol

$CH_3CH_2OH \longrightarrow CH_3CHO \longrightarrow CH_3COOH$

Ethanal Ethanoic acid

b) Carbonation of grignard reagent − Aliphatic carboxylic acids are obtained by bubbling carbon (iv) oxide into the grignard reagent and then hydrolysed with dilute acid

$RMgBr + CO_2 \xrightarrow{(C_2H_5)_2O} RCOOMgBr \xrightarrow{H_2O} RCOOH + MgBrOH$

$C_6H_5MgBr + CO_2 \xrightarrow{(C_2H_5)_2O} C_6H_5COOMgBr \xrightarrow[+MgBrOH]{H_2O} C_6H_5COOH$

(5) Reduction of Primary alcohol

$CH_3CH_2CH_2COOH \xrightarrow{LiAlH_4} CH_3CH_2CH_2CH_2OH$

Butanoic acid Butanol