08/10/2015
Thursday

Expt I

Determination of Na_2CO_3 and NaOH in a mixture by titration.

Aim

To determine the amount of Na_2CO_3 and NaOH in a mixture using HCl acid.

Principle

When a known value of the mixture of Na_2CO_3 and NaOH is treated with HCl using phenolphthalein indicator, at the end point all the hydroxide ions (OH^-) and only half of the carbonate ions (CO_3^{2-}) are reacted with HCl acid.

A = all hydroxide ions + half of carbonate ions
B = half the carbonate ions after phenolphthalein end point.
2B = all carbonate ions
A - B = all hydroxide ions

Procedure

Titration I : Standardization of HCl

Pipette out 20 ml of 0.1 N Na_2CO_3 solution into a clean conical flask and add 2-3 drops of methyl orange indicator to the solution. Then titrate the solution against HCl acid taken in the burette. Record end point (burette reading) when colour changes from yellow to orange.

Repeat the titration till the concordant (2 consecutive burette readings exactly same) value is obtained.

Titration II : Estimation of Na_2CO_3 and NaOH in a given mixture.

Dilute the given unknown solution to 100 ml in a std flask using distilled water. Pipette out 20 ml of this made up solution into a clean conical flask. Add 2-3 drops of phenolphthalein to the solution and titrate against standardized HCl. Record end point when disappearance of pink colour is observed. Let's consider this burette reading at 2 end points to be 'A' ml. To the same solution, add 2-3 drops of methyl orange and continue titration till colour changes from yellow to orange. and note down burette reading as methyl orange end point. Consider it to be 'B' ml. Repeat the titration till the conductor value for A and B is obtained.

Result

Amt of Na_2CO_3 present in the given solution = 0.3089 g

Amt of NaOH present in the given solution = 0.0776 g

TITRATION I :- Standardization of HCl

Sl No.	Volume of Na_2CO_3 solution (ml)	Burette Reading		Concordent Values	Indicator
		Initial	Final		
1	20	0	19.5	19.5	Methyl orange.
2	20	0	19.5	19.5	

Calculation

Volume of HCl = 19.5 V_1 ml (end point)
Normality of HCl = 0.0512 N_1

Volume of Na_2CO_3 (V_2) = 20 mL
Normality of Na_2CO_3 (N_2) = 0.05

Normality of HCl (N_1) = $\frac{N_2 V_2}{V_1} = \frac{20 \times 0.05}{19.5}$

= 0.0512 N

TITRATION II - Estimation of Na_2CO_3 and NaOH in a given mixture.

Sl No.	Volume of 2^{nd} unknown sol. (ml)	Burette Reading (ml)		
		Initial	Volume consumed for phenolphthalein end point (A)	Volume consumed for methyl orange end point after phenolphthalein end point (B)
1	20	0	19	30.4
2	20	0	19	30.4
CONCORDANT VALUE			(A) 19	(B) 11.4

CALCULATION

I Estimation of amount of Na_2CO_3.

Volume of HCl (V_1) = 2B = 2 x 11.4 = 22.8 ml
Normality of HCl (N_1) = N_1 = 0.0512
Volume of mixture (V_2) = 20 ml.
Normality of Na_2CO_3 (N_2) = $\frac{V_1N_1}{V_2}$ = $2B \times N_1/V_2$ = $\frac{22.8 \times 0.0512}{20}$ = 0.0583N

Amt of Na_2CO_3 present in whole of given solution = 0.3089 g

$\frac{N_2 \times 53}{10}$ = 0.3089 g

II Estimation of amt of NaOH

Volume of HCl (V_1) = (A-B) ml = 7.6 ml.
Normality of HCl (N_1) = 0.0512 N
Volume of mixture (V_2) = 20 ml.
Normality of NaOH (N_2) = $V_1 \times N_1/20$ = $(7.6 \times 0.0512)/20$ = 0.0194N

Amt of NaOH present in whole given solution = $\frac{N_2 \times 40}{10}$ = 0.0776 g