Al-Mustaqbal University College

Practical Analytical Chemistry

The first stage

Determination of ratio of Na_2CO_3 and $NaHCO_3$ in mixture

Submitted by

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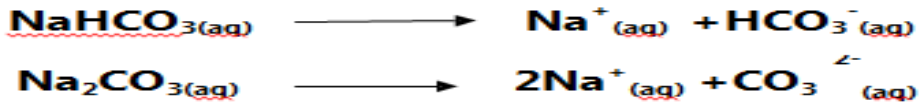
Experiment 4

Determination of ratio of Na2CO3and NaHCO3in mixture

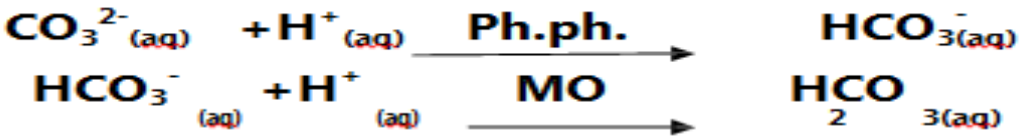
Theory

In this experiment,wehave two analytesinour sample;Sodium Bicarbonate and Sodium Carbonate.Both of these Sodium salts are water soluble andionize uponsolvation in Water:

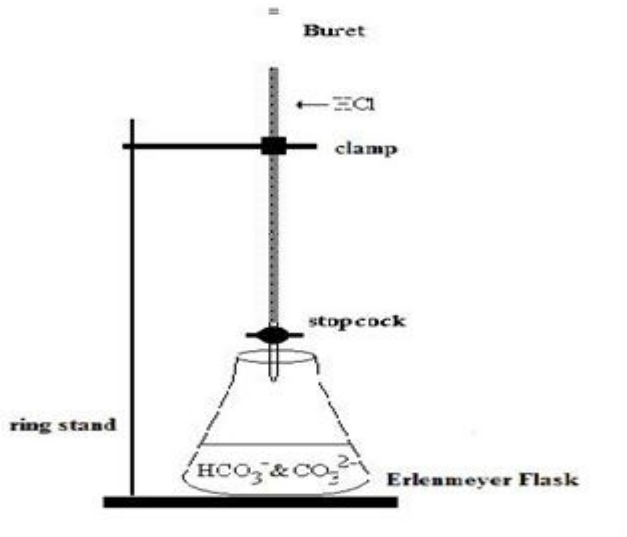


The resulting Bicarbonate(HCO_3^-)and Carbonate(CO_3)ion sare both basic.

Hence,they will react with astrong acid such as hydrochloricAcid(HCl),which itself ion izes oH^+(aq)and Cl^-(aq)in Water.



Therefore,an acid such as HCl can serveas the titrant for our titration



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Because we have two analytes, HCO3- and CO32-, we will need two different indicators,one to indicate the end point for the reaction between H+and CO32- and the other to indicate the end point for the reaction between H+and HCO3-. The indicator phenolphthalein will serve as an endpoint indicator for the form er reaction and methyl orange will indicate the end point for the latter.

We will add acid to a solution of our sample until the acid completely reacts with the Carbonate (CO32-) present to form bicarbonate (HCO3-). The number equivalent carbonate present can be determined from the volume and normality of the acida dde d:at 1s to End Pt;

$$\text{No. eq. } CO_3^{2-} = (1 \text{ eq.} CO_3^{2-} / 1 \text{ eq.} H^+) \times N_{HCl} \times V_{HCl}$$

The endpoint of this reaction can be detected because the Acid-Base Indica to rphenol phthale in will change colour from pink to colour less atthepH prevailing when this reaction is complete.After this endpoint is reached, the acid will begin reacting with the Bicarbonate just generated and the bicarbonate present in the initial sample. And, again, knowing the volume and normality of the added acid, we can determine the number equivalent bicarbonate:1st to 2nd End Pt;

$$\text{No.eq } HCO_3^- \text{Total} = (1\text{eq.}HCO_3^-/1\text{eq.}H^+) \times V_{HCl} \times V_{HCl}$$

Materials and Apparatus

1. Phenol phthalein indicator,
2. Methyl orange indicator
3. Standard 0.1N,amixture of $NaHCO_3$ and Na_2CO_3,
4. Distilled water,
5. Small beaker,burette and pipette,standand burette clam,conical flask

6. ## Procedure

1- Fill the burette with 0.1NHCl standard solution
2- Pipette 10 mL of mixture ($NaHCO_3$ and Na_2CO_3) into conical flask and add one drop of ph.ph.indica to r and the pink solution is obtained.
3- Titrate with0.1 N HCl until the solution becomes colourless.Record the volume of HCl(V_1).
4- Add one drop of methyl orange indicator and yellow solution is obtained.
5- Continue titration with 0.1 N HCl until the colour of the solution changes to onion colour.Record the volume of HCl(V2).
6- Repe at this procedure wice more.

Results and Calculations

$$HCl \equiv Na_2CO_3$$
$$N_1V_1 = N_2V_2$$

$$N_1 x \ 2V_1 = 10 \quad x \quad \frac{Wt}{53} \quad x \quad \frac{1000}{V}$$

V1: the volume of HCl that equivalent half of carbonate
V2: the volume of HCl that equivalent of carbonate+bicarbonate
2V1:volume of acid equaltoall carbonate
V2-V1: volume of acid equal toall bicarbonate

Exp. No.	Volume from burette (mL)	Intial reading	V1 (mL)	V2 (mL)	V2-V1
1	10				
2	10				
3	10				