Green University of Bangladesh

Department of Computer Science and Engineering

Lab report-2

Course Title: Chemistry Laboratory

Course code: CHE-102

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Experiment No: 02

Experiment name: Standardization of Commercial Hydrochloric acid solution with standard Sodium Hydroxide solution.

Theory:

The strength determination of both commercial Hydrochloric acid and NaOH is done
by means of titration. In presence of a suitable indicator, a chemical substance that
detects the end point of a reaction by changing its color, the volumetric analysis in
which a standard solution is added in another solution to reach its end point and to
determine the strength of that solution is called titration. The reaction between NaOH and Oxalic acid is ,

$2NaOH + HOOC\text{-}COOH \longrightarrow NaOOC\text{-}COONa + 2H_2O$

Indicator – Phenolphthalein, and the reaction between HCl and NaOH is -

$NaOH + HCl \longrightarrow NaCl + H_2O$

Indicator – Methyl Orange

Apparatus:

1. Conical flask,
2. Burette,
3. Pipette,
4. Volumetric flask,
5. Stand
6. Funnel

Chemical Reagents:

1. Standardized NaOH solution
2. HCl solution
3. Distilled water
4. Oxalic Acid
5. Phenolphthalein
6. Methyl Orange

Experimental Data:

Standardization of NaOH solution with standard Oxalic Acid solution

Number of Observation	Volume of NaOH (ml)	Burette Reading (ml)		Volume of Acid (ml)	Average Reading (ml)	Strength Of NaOH (M)
		Initial Reading	Final Reading			
1	10	0	10	10	10	
2	10	10	21.5	21.5	11.5	10
3	10	21.5	31.5	31.5	10	

Standardization of HCl solution with standard NaOH solution

Number of Observation	**Volume of NaOH (ml)**	**Burette**	**Reading (ml)**	**Volume of Acid (ml)**	**Average Reading (ml)**	**Strength Of NaOH (M)**
Initial Reading	Final Reading					
1	10	0	15	15		
2	10	15	25.5	10.5	10.5	1
3	10	25.5	36	10.5		

Calculation:

We know that, $V_{acid} \times S_{acid} = 2V_{base} \times S_{base}$

Determination of the molarity of NaOH :

Here,

V_{acid}	= 10 ml (average)
S_{acid}	= 0.5 M
V_{base}	= 10 ml
S_{base}	= ?

So, $S_{base} = (2\times 10 \times 0.5) / 12$

= 1 M

Determination of Molarity of HCl :

Here,

V_{acid}	= 10.5 ml (average)
S_{acid}	= ?
V_{base}	= 10 ml
S_{base}	= 1 M

So, $S_{HCl\ (dilute)} = (10 \times 1) / 10.5$

= 0.95 M

We also know,

$V_{concentrated} \times S_{concentrated} = V_{dilute} \times S_{dilute}$,

Here,

$V_{HCl(concentrated)} = 4$ ml

$S_{HCl(concentrated)} = ?$

$V_{HCl(dilute)} = 100$ ml

$S_{HCl(dilute)} = 0.95$ M

So, $S_{HCl\ (concentrated)} = (100 \times 0.95) / 4$

= 23.75 M

Result:

The strength of HCl (dilute) is found: 0.95 M

The strength of the supplied HCl (concentrated) is: 23.75 M

Discussion:

The following causes can be assumed for the possible cause of error.

1) It is very difficult to determine the end point accurately. So the measured value is deviated from the actual value due to either over titration or under titration. This can also be one of the reasons of the error. This is the main cause of error.

2) Another problem may rise from faulty burette reading. If these causes could be avoided we could have got more accurate result of the strength of commercial Hydrochloric Acid.