

EXPERIMENT

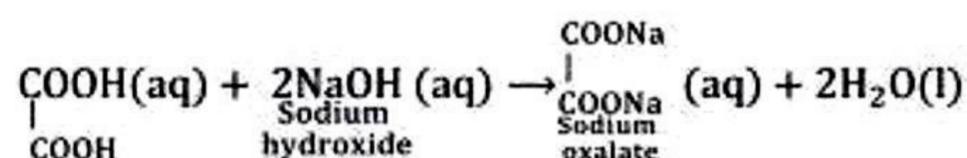
Aim

To determine the strength of a given solution of sodium hydroxide by titrating it against a standard solution of $\frac{N}{10}$ oxalic acid.

MATERIAL REQUIRED

Burette, pipette, conical flask, funnel, $\frac{N}{10}$ oxalic acid, NaOH solution (approximately $\frac{N}{10}$), phenolphthalein.

PROCEDURE



The oxalic acid solution is titrated against NaOH solution using phenolphthalein as an indicator. Oxalic acid is a dibasic acid and sodium hydroxide is a monoacidic base. Hence

$$\text{Equivalent mass of oxalic acid} = \frac{\text{Molecular mass}}{2} = \frac{126}{2} = 63 \text{ g/equiv.}$$

$$\text{Equivalent mass of NaOH} = \frac{\text{Molecular mass}}{1} = \frac{40}{1} = 40 \text{ g/equiv.}$$

- (i) Rinse and fill the burette with the given sodium hydroxide solution.
- (ii) Rinse the pipette with the oxalic acid solution and pipette out 20 ml of this solution in a washed titration flask.
- (iii) Add 1-2 drops of phenolphthalein indicator to the titration flask.
- (iv) Note the initial reading of the burette and run the sodium hydroxide solution slowly in the titration flask till the faint permanent pink colour is obtained.
- (v) Note the final reading of the burette and find out the volume of oxalic acid solution used.
- (vi) Repeat the procedure 4 - 5 times to get a set of at least three concordant readings.

OBSERVATION

Molarity of NaOH solution = 0.1 M

The volume of oxalic acid solution taken in each titration = 10.0 ml

Indicator = phenolphthalein

Endpoint = colourless to pink

S. No.	The initial reading of the burette	Final reading of the burette	Volume of the sodium hydroxide solution used
1.	—	—	— ml
2.	—	—	— ml
3.	—	—	— ml

4.	—	—	— ml
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Calculation In Case Of Normality Given

$$N_1 V_1 = N_2 V_2 \Rightarrow N_{\text{NaOH}} \times V_{\text{NaOH}} = N_{\text{oxalic acid}} \times V_{\text{oxalic acid}}$$

$$N_{\text{NaOH}} = \frac{N_{\text{oxalic acid}} \times V_{\text{oxalic acid}}}{V_{\text{NaOH}}} = \text{_____ N}$$

Strength of NaOH solution = $N_{\text{NaOH}} \times \text{Equivalent wt. of NaOH} = N_{\text{NaOH}} \times 40 = \text{_____ g/L}$

Calculation In Case Molality Is Given

$$n_1 M_1 V_1 = n_2 M_2 V_2$$

$$n_{\text{oxalic acid}} \times M_{\text{oxalic acid}} \times V_{\text{oxalic acid}} = n_{\text{NaOH}} \times M_{\text{NaOH}} \times V_{\text{NaOH}}$$

$$M_{\text{NaOH}} = \frac{n_{\text{oxalic acid}} \times M_{\text{oxalic acid}} \times V_{\text{oxalic acid}}}{n_{\text{NaOH}} \times V_{\text{NaOH}}} = \text{_____ M}$$

Strength of NaOH solution = $M_{\text{NaOH}} \times \text{Molecular weight} = \text{_____ g/L}$

Since n factor for NaOH Sol is 1 NaOH being a monoacidic base, the value of normality of NaOH is equal to its molarity.

RESULT

The strength of the given sodium hydroxide is _____ g/L

PRECAUTIONS

- (i) Do not rinse the conical flask.
- (ii) Wash the conical flask with water after each titration.
- (iii) Rinse the burette and pipette with the solution to be taken in it.
- (iv) Note down the lower meniscus of the colourless solution of NaOH and oxalic acid. All the precautions given in the handling of apparatus under the 'introduction' of this unit should be observed.

VIVA VOCE

Q 1. What is the principle behind titrating a sodium hydroxide solution with N/10 oxalic acid?

Ans. The titration is based on the neutralization reaction between sodium hydroxide and oxalic acid, where the moles of oxalic acid react with an equal number of moles of sodium hydroxide.

Q 2. Why is oxalic acid chosen as the titrant in this experiment?

Ans. Oxalic acid is chosen due to its ability to react stoichiometrically with sodium hydroxide, providing a reliable means for determining the concentration of the sodium hydroxide solution.

Q 3. Explain how the standardization of N/10 oxalic acid is carried out before titrating the sodium hydroxide solution.

Ans. Standardization involves titrating the oxalic acid solution against a primary standard, such as sodium carbonate, to accurately determine its concentration.

Q 4. What indicator would you use in this titration, and why?

Ans. Phenolphthalein is commonly used as an indicator because it undergoes a color change around the pH range of 8.2 to 10, which corresponds to the endpoint of the titration.

Q 5. Discuss the significance of the primary standard in the standardization process.

Ans. A primary standard is a highly pure and stable substance that can be used to determine the concentration of another substance accurately. It ensures precision in the standardization.