Determine the Concentration of Sodium Hydroxide Solution

AIM

The objective of the investigation is to measure the concentration of NaOH using titration

INTRODUCTION

Read the initial burette reading and final burette reading. Shake the conical flask and stop titrate when pink color forms and does not fade. Read the final burette reading and can thus calculate the concentration of NaOH solution.

MATERIALS

1-25ml burette

1-10ml pipette

1 pipette suction bulb

3 150-ml conical flask

1 double buret clamp

1-10ml graduated cylinder

0.100 M KHP ($KHC_8H_4O_4$) solution

0.1 M sodium hydroxide (exact concentration needs to be titrated)

Phenolphthalein indicator

1 iron stand

3 beakers (100ml$\times$2, 50ml$\times$1)

1 wash bottle with distilled water

PROCEDURE

1. Obtain about 50ml of KHP in a dry 100-ml beaker

2. Rinse a pipette. Transfer 10.00ml KHP into each of three 250-ml conical flask. Add 10ml of distilled
3. Prepare for the titration by following these steps.
    a. Rinse burette with distilled water and titrant solution, here is NaOH solution.
    b. Eliminate any air bubble in the burette tip after filling NaOH.
    c. Place one flask under the burette tip after filling NaOH.
    d. Adjust the meniscus to level on the “0” line and record the initial burette reading.
4. Titrate the KHP sample until a permanent pale pink endpoint is reached. Record the final burette reading to the nearest two decimal places.
5. Refill the burette, record the initial volume reading, and titrate the second KHP sample.
6. Repeat the titration for the third KHP sample.

RAW DATA TABLE

# Experiment	Initial burette reading (mL)	Final burette reading (mL)
1	10.20±0.05	21.70±0.05
2	1.60±0.05	10.00±0.05
3	10.00±0.05	21.60±0.05

PROCESSED DATA TABLE

# Experiment	Change in Volume of KHP solution (mL)
1	11.5±0.1
2	8.4±0.1
3	11.6±0.1

$$\bar{V} = \frac{11.5 + 8.4 + 11.6}{3} = 10.5ml$$
$$\Delta\bar{V} = 0.1ml$$
$$\bar{V} = 10.5 \pm 0.1ml$$

Data Processing

$$n = c_{KHP} \cdot V_{KHP} = 0.100M \times 10.00cm^3 \times 10^{-3} = 1 \times 10^{-3}mol$$

Because $KHP + NaOH \rightarrow H_2O + KNaP$, $n_{KHP} = n_{NaOK} = 1 \times 10^{-3}mol$

$$c_{NaOH} = \frac{1 \times 10^{-3}}{10.5 \times 10^{-3}} = 0.0952mol/L$$

$$\frac{\Delta c_{NaOH}}{c_{NaOH}} = \frac{\Delta V}{V} = \frac{0.1}{10.5}$$

$$\Delta c_{NaOH} = \frac{0.1}{10.5} \times 0.0952 = 0.0009mol/L$$

So the concentration is $c_{NaOH} = 0.0952mol/L \pm 0.0009mol/L$.