

Preparation of a standard sodium hydroxide solution

Background

Sodium hydroxide cannot be used as a primary standard as it readily absorbs water and carbon dioxide from the air. In this experiment you will make up a solution of NaOH which is approximately 0.1 mol L⁻¹ and standardise this with standard approximately 0.1 mol L⁻¹ HCl prepared in Experiment 32.

The equation for the titration is



At the equivalence point of the reaction, the pH changes from about 10 to 4 over the addition of only 0.1 mL of acid. Consequently any indicator which changes colour within this pH range is suitable.

Equipment required

Sodium hydroxide [NaOH] (3 g) Balance
Beaker (250 mL)
Volumetric flask (500 mL)
Storage bottle (approximately 500 mL) Beakers (two 100 mL)
Washbottle
Burette and stand
Conical flask (250 mL)
Funnel
Pipette (20 mL)
Standard hydrochloric acid [HCl] approximately 0.1 mol L⁻¹
from Experiment 32 (150 mL)
Methyl orange or phenolphthalein (a few drops)

Safety Note

- Sodium hydroxide pellets are very corrosive and must not be allowed to come in contact with your skin.
- Use a spatula or plastic spoon to handle the NaOH pellets.



A Making the Approximately 0.1 mol L⁻¹ Sodium Hydroxide Solution

- #1 Calculate the mass of NaOH needed to make up 500 mL of 0.1 mol L⁻¹ solution.
- #2 Quickly weigh out this amount, to the nearest pellet, in a clean dry 250 mL beaker.
- #3 Dissolve the NaOH in about 100 mL of distilled water and transfer the solution to a 500 mL volumetric flask.
- #4 Stopper the flask and swirl the contents to mix them. If the solution is warm, wait until it cools, and then make it up to the graduation mark with distilled water. Place the stopper in the top and invert and swirl the flask several times to ensure that the water in the neck is mixed thoroughly with the solution in the bottom.
- #5 Transfer the approximately 0.1 mol L⁻¹ NaOH to a clean storage bottle which has been rinsed with a little of the solution. Label the solution

B Standardisation of the Sodium Hydroxide Solution

- #1 Using the appropriate technique pipette 20 mL of NaOH solution into a 250 mL conical flask. Add 2-3 drops of methyl orange or phenolphthalein.
- #2 With your standard HCl from Experiment 32 in the burette do a rapid titration to obtain a rough estimate of the volume of HCl needed to neutralise the 20 mL of NaOH solution.
- #3 Carry out repeat titrations, adding the acid more slowly near the end point, until consistent titration volumes are obtained. Record your results as before

Processing of results, and questions

1 From the equation for the reaction, the volume of NaOH used, and the volume and concentration of the standard HCl, calculate the concentration of the NaOH. Mark this on the label of the NaOH storage bottle.

2 What is meant by deliquescence? Why is a substance which is deliquescent unsuitable for use as a primary standard?

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