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WATERS—DETERMINATION OF ALKALINITY—ACIDIMETRIC TITRATION METHOD



STANDARDS ASSOCIATION OF AUSTRALIA
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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Mining Industry Council
Australian Water Resources Council
Confederation of Australian Industry
CSIRO
Department of Housing and Construction
Department of Science and the Environment
Department of the Environment, Tasmania
Engineering and Water Supply Department, S.A.
Environment Protection Authority (Victoria)
Health Commission of N.S.W.
Melbourne and Metropolitan Board of Works
Metropolitan Water Sewerage and Drainage Board, Sydney
Ministry of Conservation (Victoria)—Fisheries and Wildlife Division
National Association of Testing Authorities, Australia
National Health and Medical Research Council
Royal Australian Chemical Institute
Technical Association of the Australian and New Zealand Pulp and Paper Industry
Water Resources Commission, N.S.W.
Water Quality Council of Queensland

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AUSTRALIAN STANDARD

**WATERS—DETERMINATION
OF ALKALINITY—
ACIDIMETRIC TITRATION
METHOD**

AS 2449—1981

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PREFACE

This standard was prepared by the Association's Committee on Methods for Examination of Waters under the direction of the Chemical Standards Board, in order to provide a method for determining alkalinity in water.

In preparing the method, the responsible committee took cognizance of relevant material contained in 'Standard Methods for the Examination of Water and Wastewater' (14th edition) prepared and published jointly by the American Public Health Association, the American Water Works Association and the US Water Pollution Control Federation.

The standard requires reference to the following Australian standards:

- AS 2031 Recommendations for the Selection of Containers and Preservation of Water Samples for Chemical and Microbiological Analysis Part 1—Chemical
- AS 2164 One-mark Volumetric Flasks
- AS 2165 Burettes and Bulb Burettes
- AS 2166 One-mark Pipettes

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

WATERS—DETERMINATION OF ALKALINITY—ACIDIMETRIC TITRATION
METHOD

FOREWORD

The alkalinity of a water is primarily a function of the carbonate, bicarbonate and hydroxide contents. The measured values may include contribution from borates, phosphates or silicates, if these are present. The result obtained is dependent upon the end-point pH used and, for a particular water, this should be established by a potentiometric titration using a pH meter. The most accurate end-point is obtained from the inflection point of a titration curve. The phenolphthalein alkalinity end-point (*P*) is at pH 8.3 and, for most waters, the total alkalinity end-point (*M*) may be taken as at pH 4.5. Colour indicators may be used for routine and control titrations in the absence of interfering colour and turbidity and for preliminary titrations to select the sample size and strength of titrant.

METHOD

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1 SCOPE. This standard sets out a method for the determination of alkalinity in waters by titration with standard acid solution.

2 APPLICATION. This method is applicable to waters where the alkalinity is in the range 1 mg/L to 2500 mg/L (expressed as CaCO₃) under the conditions of test.

NOTE: The method is subject to interference from soaps, oily matter, suspended solids or precipitates which may coat the glass electrode of the pH meter and cause a sluggish response. If free residual chlorine is present the indicator colour may be impaired. This interference may be overcome by adding sodium thiosulphate as described in Clause 7.2.2(b).

3 PRINCIPLE. The alkalinity in a water is determined by titration with a standard acid solution to a designated pH. The end-point pH is determined by construction of a titration curve.

4 REAGENTS.

4.1 General Requirements. Use only reagents of analytical reagent grade, and only distilled or deionized water which has been freed of carbon dioxide. The water may be freed of carbon dioxide by boiling for 15 min and cooling to room temperature immediately prior to use.

4.2 Reagents.

4.2.1 Standard sodium carbonate solution (approximately 0.025 mol/L). Dry 3 g to 5 g primary standard sodium carbonate (Na₂CO₃) at 250°C for 4 h and cool in a desiccator. Weigh 2.5 ± 0.2 g to the nearest milligram, transfer to a 1 L volumetric flask, dissolve in water, and dilute to volume with water. This reagent shall be maintained free of carbon dioxide.

4.2.2 Standard hydrochloric acid (0.1 mol/L). Dilute concentrated hydrochloric acid (8.3 mL for acid ρ₂₀ 1180 kg/m³ or 10.0 mL for acid ρ₂₀ 1160 kg/m³) to

1 L. Standardize against 50.00 mL of standard sodium carbonate solution (4.2.1) plus 50 mL of water, by titrating potentiometrically in a beaker to a pH of about 5.

Lift out the electrodes, rinse into the same beaker with water, cover with a cover glass and boil gently for 3 min to 5 min. Cool to room temperature. Rinse the cover glass into the beaker, and finish the titration to the pH inflection point. Calculate the concentration using the following formula:

Concentration of hydrochloric acid (mol/L)

$$= \frac{A \times B}{53.00 \times C}$$

where

A = concentration of sodium carbonate solution, in grams per litre (see Clause 4.2.1)

B = volume of sodium carbonate solution taken for titration, in millilitres

C = volume of hydrochloric acid used, in millilitres

Use the determined acid concentration in subsequent calculations or adjust to exactly 0.1000 mol/L.

4.2.3 Standard hydrochloric acid (0.02 mol/L). Dilute 200.00 mL of 0.1000 mol/L standard acid (4.2.2) to 1 L with water. Standardize by potentiometric titration against 15.00 mL of standard sodium carbonate solution (4.2.1) in accordance with the procedure of Clause 4.2.2.

4.2.4 Sodium thiosulphate (approximately 0.1 mol/L). Dissolve 25 g Na₂S₂O₃·5H₂O and dilute to 1 L with water.

4.2.5 Mixed indicator. Dissolve 100 mg bromocresol green, 20 mg methyl red and 1.0 g phenolphthalein in 100 mL of ethanol (950 mL/L).