AS 2509—1981
UDC 546.217:546.224-31

Australian Standard 2509—1981

AMBIENT AIR— DETERMINATION OF ACID GASES (EXPRESSED AS SULPHUR DIOXIDE)

PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA
STANDARDS HOUSE, 80 ARTHUR ST, NORTH SYDNEY, N.S.W.

Incorporated by Royal Charter

C

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

Australian and New Zealand Pulp and Paper Industry Technical Association

Australian Chemical Industry Council

Australian Institute of Petroleum

Australian Mining Industry Council

Australian Timber Producers Council

Clean Air Society of Australia and New Zealand

Confederation of Australian Industry

CSIRO, Division of Fossil Fuels

Department of Home Affairs and the Environment

Department of the Environment, Tasmania

Electricity Supply Association of Australia

National Association of Testing Authorities, Australia

National Health and Medical Research Council

State Pollution Control Commission, N.S.W.

This standard, prepared by Committee CH/19, Methods for Examination of Air, was approved on behalf of the Council of the Standards Association of Australia on 8 September 1981, and was published on 14 December 1981.

First published 1981

This standard was issued in draft form for public review as DR 80016.

ISBN 0 7262 2409 X

PREFACE

This standard was prepared by the Association's Committee on Methods for Examination of Air. It is one of a series of methods of test for determining pollutants in ambient air.

In the preparation of this standard, consideration was given to BS 1747, Measurement of Air Pollution, Part 3—Determination of Sulphur Dioxide, and to Draft International Standard ISO/DIS 4219, Air Quality—Determination of Gaseous Sulphur Compounds in Air-sampling Equipment. Acknowledgement is made of the assistance obtained therefrom.

Because of their widespread distribution, acid gases, of which sulphur dioxide is often the main constituent, have long been regarded as a principal gaseous atmospheric pollutant and the need is recognized for investigations at various sites, including measurement of the day-to-day variations in concentration. The method described in this standard is considered suitable for determining acid gases in the atmosphere, preferably as an average over a 24 h period at a particular location. However, it is emphasized that the method is not specific for sulphur dioxide.

A filter is specified as an integral part of the apparatus, in order to avoid interference from suspended matter; the filter also enables suspended matter to be measured separately within a limited size range.

This standard requires reference to the following standards:

AS 2165 Burettes and Bulb Burettes

BS 2461 Gas Washing Bottles

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

AMBIENT AIR—DETERMINATION OF ACID GASES (EXPRESSED AS SULPHUR DIOXIDE)

1 SCOPE. This standard sets out a method for the determination of acid gases (expressed as sulphur dioxide) in ambient air and incorporates requirements for the assembly, installation and use of apparatus.

2 APPLICATION. The method is applicable to ambient air in which the sulphur dioxide concentration ranges from approximately 20 $\mu g/m^3$ to 10 000 $\mu g/m^3$ (0.007 p.p.m. to 3.5 p.p.m.).

3 PRINCIPLE. Sulphur dioxide with varying, but normally much smaller amounts of other acid and alkaline gases (see Note 1), is absorbed in a solution of hydrogen peroxide and the net acidity resulting is titrated to pH 4.5 with standard alkali.

NOTES:

1. Acid mists will mainly be retained on the filter paper in the smoke filter (see Fig. 1) and will not affect the result appreciably.

   If it is desired to make a correction for ammonia, it is necessary to measure the concentration by some independent method. The correction seldom reaches + 25 $\mu g/m^3$ except in farming areas or in certain indoor situations, where the concentration of ammonia may be sufficient to neutralize all the sulphur dioxide and produce a negative result.
2. At pH 4.5 there is no interference from dissolved carbon dioxide arising from normal atmospheric concentrations or from the reagents used.

4 REAGENTS AND MATERIALS.

4.1 General Requirements. All reagents shall be of recognized analytical reagent grade. Water used shall be distilled or deionized or be of equivalent purity.

4.2 Hydrogen Peroxide Stock Solution. Dilute 10 mL of hydrogen peroxide 30 percent *m/V* (known as '100 vol') to 1 L with water and mix well. Remove 50 mL by pipette, add about 0.1 mL of indicator solution (4.4) and titrate with hydrochloric acid (4.3.2) or sodium hydroxide (4.3.3), as appropriate, to the pH 4.5 change point. Add to the remaining 950 mL of stock solution 19 times the amount of acid or alkali used in the titration, mix well and check that the pH is 4.5. Alternatively, the whole of the solution may be titrated directly to pH 4.5, using a suitable pH meter to determine the change point.

The stock solution should be contained in a stoppered borosilicate glass or polyethylene bottle and stored in a cool, dark place; any residual solution should be discarded after 2 weeks.

4.3 Standard Solutions.

4.3.1 *Sodium carbonate solution,* 0.002 mol/L, accurately standardized.

NOTE: It is advisable not to use standard solutions for more than three months without checking. Where the concentration of sulphur dioxide is high, it may be convenient to use 0.005 mol/L solutions and to modify the calculation accordingly; in this case, smaller burettes may be convenient. It is also permissible to use a standardized solution of sodium borate in place of sodium carbonate.

4.3.2 *Hydrochloric acid,* 0.004 mol/L, accurately standardized.

NOTE: It is advisable not to use standard solutions for more than three months without checking. Where the concentration of sulphur dioxide is high, it may be convenient to use 0.01 mol/L solutions and to modify the calculation accordingly; in this case, smaller burettes may be convenient. It is also permissible to use a standardized solution of sulphuric acid, in place of hydrochloric acid.

4.3.3 *Sodium hydroxide,* 0.01 mol/L, accurately standardized.

4.4 Indicator.

4.4.1 *Mixed indicator solution.* Mixed indicator with a colour change at pH 4.5*. A suitable indicator can be prepared as follows:

Solution A. Dissolve 2 g thymol-sulphonephthalein (Thymol blue RAL) in 45 mL 0.1 mol/L sodium hydroxide solution, warming if necessary to assist dissolution, and make up to 1 L with water.

*BDH 4.5 indicator solution is suitable, giving a neutral steel grey colour at pH 4.5. This indicator should not be added to the hydrogen peroxide solution before it is used for absorption. This coloured indicator solution does not react with hydrogen peroxide, but certain other types of indicator may do so.