

Australian Standard 2618.1—1983

**AMBIENT AIR—DETERMINATION OF
GASEOUS AND PARTICULATE
FLUORIDES—SELECTIVE ION
ELECTRODE METHOD**

**Part 1—Gaseous Fluorides and
Acid-soluble Particulate
Fluorides ($1 \mu\text{g}/\text{m}^3$ or
greater)—Automated
Double Paper Tape
Sampling**



STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter



This Australian standard was prepared by Committee CH/19, Methods for Examination of Air. It was approved on behalf of the Council of the Standards Association of Australia on 24 February 1983 and published on 6 June 1983.

The following interests are represented on Committee CH/19:

- 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 Environment and Planning, S.A.
- Department of the Environment, Tasmania
- Electricity Supply Association of Australia
- Environment Protection Authority of Victoria
- National Association of Testing Authorities, Australia
- National Health and Medical Research Council
- Public Health Department, W.A.
- State Pollution Control Commission, N.S.W.
- Technical Association of the Australian and New Zealand Pulp and Paper Industry

To keep abreast of progress in industry, Australian standards are subject to continuous review and are kept up-to-date by the issue of amendments or new editions as necessary. It is important therefore that standards users ensure that their standards are up-to-date. Full details of all SAA publications will be found in the Annual List of Australian Standards; these details are supplemented by listings in the SAA monthly journal 'The Australian Standard'. Information on the Annual List and 'The Australian Standard' may be obtained from any sales office of the Association, where details are also available of the current status of individual standards. Suggestions for improvements to published standards, addressed to the head office of the Association, are welcomed.

First published1983

This standard was issued in draft form for comment as DR 81178.

PREFACE

This standard was prepared by the Association's Committee on Methods for Examination of Air. It is Part 1 of a multi-part standard for the determination of gaseous and particulate fluorides in ambient air using a selective ion electrode.

Other parts* of the standard are as follows:

- Part 2—Gaseous Fluorides and Acid-soluble Particulate Fluorides ($0.1 \mu\text{g}/\text{m}^3$ or greater)—Manual, Double-filter, Paper Sampling
- Part 3—Gaseous Fluorides and Total Particulate Fluorides ($1 \mu\text{g}/\text{m}^3$ or greater)—Automated Double Paper Tape Sampling
- Part 4—Gaseous Fluorides and Total Particulate Fluorides and Acid-soluble Particulate Fluorides ($1 \mu\text{g}/\text{m}^3$ or greater)—Impinger Sampling
- Part 5—Gaseous Fluorides and/or Particulate Fluorides ($0.1 \mu\text{g}/\text{m}^3$ or greater)—Sodium Acetate-coated Tube Absorption Method.

*In course of preparation.

CONTENTS

	<i>Page</i>
FOREWORD	4
METHOD	
1 Scope	4
2 Application	4
3 Referenced Documents	5
4 Principle	5
5 Reagents and Materials	5
6 Apparatus	6
7 Sampling Site	9
8 Procedure	9
9 Calculation and Expression of Results	10
10 Precision and Accuracy	10
11 Report	11

©Copyright — STANDARDS ASSOCIATION OF AUSTRALIA 1983

Users of standards are reminded that copyright subsists in all SAA publications. No part of this publication may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing of the Standards Association of Australia.



2. 4 MAY 1983

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

AMBIENT AIR—DETERMINATION OF GASEOUS AND PARTICULATE FLUORIDES
—SELECTIVE ION ELECTRODE METHODPART 1—GASEOUS FLUORIDES AND ACID-SOLUBLE PARTICULATE FLUORIDES
(1 $\mu\text{g}/\text{m}^3$ OR GREATER)—AUTOMATED DOUBLE PAPER TAPE SAMPLING

FOREWORD

Gaseous and particulate fluorides may be released to the atmosphere from a number of industrial processes. Industries emitting fluoride include aluminium smelters, steel works, power stations, hydrofluoric acid, brick, tile, glass and frit manufacturers and superphosphate fertilizer makers. Fluorides are the most phytotoxic of the recognized air pollutants and may cause injury to susceptible plant species at atmospheric concentrations of less than 0.5 $\mu\text{g}/\text{m}^3$.

Gaseous fluorides such as hydrogen fluoride, silicon tetrafluoride and fluorosilicic acid are more highly toxic to vegetation than are particulate forms of fluoride.

In view of the relative phytotoxicities of the different forms of fluorides, the separate collection and analysis of the particulate and gaseous components are recommended.

The sampling procedure involves the automated separation and collection of particulate and gaseous fluorides and is based on ASTM D 3266-79.

METHOD

1 SCOPE. This standard sets out a method for the preset, sequential, automatic sample separation and collection of acidic gaseous and particulate fluorides from ambient air, for their extraction (except for acid-insoluble particulates) into aqueous solution and their subsequent determination using a fluoride ion selective electrode.

2 APPLICATION. This method is applicable to the measurement of acidic gaseous and acid-soluble particulate fluorides in ambient air at concentrations of 1 $\mu\text{g}/\text{m}^3$ or greater, but is subject to certain interferences.

For a 3 h sample at 0.23 L/s (approximately 14 L/min), an atmospheric concentration of 1 $\mu\text{g}/\text{m}^3$ hydrogen fluoride in air can be measured with an accuracy of possibly 20 percent (see Clause 10). The main limitation to the accuracy is the measurement of the sample volume. Leakage of air into the sampling system can occur where the filter tapes enter the sampling block. The instrument must be carefully prepared to minimize such leakage (see Clause 6).

The detection level can be improved by batching up to 8 \times 3 h samples.

NOTES:

1. Particulate metallic salts such as those of aluminium, iron, magnesium, calcium and rare-earths collected on the initial filter tape (Clause 6(e)) may retain some or all of the gaseous fluorides. The presence of fluorophosphates or fluoroborates could contribute varying amounts of fluorides as they dissociate in an unpredictable fashion.
2. Acidic aerosols or gases may neutralize or acidify the alkali-impregnated final-filter tape (Clause 6(e)) thus preventing the quantitative collection of acidic gaseous fluorides.
3. Although citric acid-impregnated Whatman No 52 or equivalent initial filter tape (Clause 6(e)) has been shown to allow passage of gaseous hydrofluoric acid, it may permit passage of fluoride particles smaller than about 1 μm . Hence these may impinge on the alkali-impregnated final tape. If initial tapes of higher retentivity are required for removal of particles of size less than 1 μm , citric acid-impregnated tapes of Whatman No 42 filter paper or equivalent may be used.
4. Sampling of the atmosphere for long periods of time may result in the collection of a sufficient amount of particulate matter to result in sorption of gaseous fluoride on the particulate matter or a change in the air sampling rate. A sampling period of 3 h or less minimizes this effect.
5. The addition of a total ionic strength adjustment buffer (TISAB) eliminates a number of possible interferents. The effects of metallic ions are minimized by complexing agents. Variations in ionic strength are offset by maintenance of a high concentration of sodium chloride, and the solution is buffered to pH 5 to 6 to avoid negative interference of F^- ions complexing and positive interference of OH^- ions being measured.