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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 $\mu g/m^3$ or greater)—Automated Double Paper Tape Sampling

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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
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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 μg/m³ or greater)—Manual, Double-filter, Paper Sampling

Part 3—Gaseous Fluorides and Total Particulate Fluorides (1 μg/m³ or greater)—Automated Double Paper Tape Sampling

Part 4—Gaseous Fluorides and Total Particulate Fluorides and Acid-soluble Particulate Fluorides (1 μg/m³ or greater)—Impinger Sampling

Part 5—Gaseous Fluorides and/or Particulate Fluorides (0.1 μg/m³ or greater)—Sodium Acetate-coated Tube Absorption Method.

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*In course of preparation.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
AMBIENT AIR—DETERMINATION OF GASEOUS AND PARTICULATE FLUORIDES —SELECTIVE ION ELECTRODE METHOD

PART 1—GASEOUS FLUORIDES AND ACID-SOLUBLE PARTICULATE FLUORIDES ($1\ \mu g/m^3$ 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 $0.5\ \mu g/m^3$.

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 fluoride 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 $1\ \mu g/m^3$ 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 $1\ \mu g/m^3$ 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 × 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.