Australian Standard®

Methods for sampling and analysis of ambient air

Method 5.1: Determination of oxides of nitrogen—Direct-reading instrumental method

PREFACE

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee EV-007, Methods for Examination of Air, to supersede AS 3580.5.1—1993, *Methods for sampling and analysis of ambient air,* Method 5.1: *Determination of oxides of nitrogen—Chemiluminescence method.* After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than as an Australian/New Zealand Standard.

This Standard has been developed as a performance-based standard to include chemiluminescence and other direct-reading instrumental methods.

The requirements for instruments found to be suitable for using this method are given in the United States Environmental Protection Agency (US EPA) Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53)—*Ambient Air Monitoring Reference and Equivalent Methods, Subpart B—Procedures for Testing Performance Characteristics of Automated Methods*.

FOREWORD

Nitrogen oxides, which are produced by combustion and industrial processes, are emitted into the air predominantly as nitric oxide (NO) and, to a lesser extent, as nitrogen dioxide (NO_2). In the atmosphere, chemical reactions oxidize NO to produce NO_2, which may undergo further reaction to produce nitric acid, and various gaseous and particulate organic nitrates.

Oxides of nitrogen (NO_x), as determined by this method, is the sum of the NO and NO_2 concentrations in the air sample. It is usually found that where atmospheric nitrogen dioxide concentrations reach levels of concern to health, NO_x consists predominantly of NO and NO_2.

For chemiluminescent instruments employing catalytic converters, this method provides a procedure for the direct measurement of NO and the conversion of NO_2 to NO for direct measurement separately. The measurement of NO_x is the sum of the NO and converted NO_2 concentrations. In addition to NO_2, other gaseous nitrogenous species (e.g. peroxyacetyl nitrate (PAN), nitric acid, ammonia, organic amines, organic nitrates and nitrites), are also converted to NO by the catalytic converter and therefore are also detected. The efficiency of conversion to NO of the other species can be variable and non-quantitative however these typically comprise a very small proportion of the analyser response.

METHOD

1 SCOPE

This Standard sets out the method for the determination of oxides of nitrogen in ambient air using a direct-reading instrumental method. This method applies to the determination of oxides of nitrogen in ambient air where the concentration typically lies within the range 0 to 5 p.p.m. by volume (equivalent to approximately 0 to 6700 μg/m^3 of nitric oxide).

2 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS/NZS		
3580	Methods for sampling and analysis of ambient air	
3580.1.1	Method 1.1	Guide to siting air monitoring equipment
3580.2.2	Method 2.2:	Preparation of reference test atmospheres—Compressed gas method
ISO		
Guide to the expression of uncertainty in measurement (ISO GUM)		
US EPA		
40 CFR	Part 53	US Code of Federal Regulations, Title 40—Protection of Environment, Part 53—Ambient Air Monitoring Reference and Equivalent Methods

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Fall time

The time interval, after a step decrease in input concentration, between initial instrument response and 90% of final instrument response.

3.2 Full scale (FS)

The nominated maximum concentration for which an instrument has been calibrated. The full scale is selected to cover the normal range of values expected in the sampling environment.

3.3 Interference equivalent

Positive or negative instrument response caused by a substance other than the one being measured.

3.4 Lag time

The time interval between a step change in input concentration and the first observable corresponding change in instrument response.

3.5 Level 1 calibration

A simplified, two-point analyser calibration used when analyser linearity does not need to be checked or verified.

3.6 Level 2 check

A simple check of an analyser's response. These checks may be performed using non-certified test atmospheres (e.g. permeation tubes, expired gas cylinders).