Australian/New Zealand Standard™

AS/NZS 3580.9.15:2014

Methods for sampling and analysis of ambient air

Method 9.15: Determination of suspended particulate matter—Particulate metals high or low volume sampler gravimetric collection—Inductively coupled plasma (ICP) spectrometric method

PREFACE

This Standard was prepared by the joint Standards Australia/Standards New Zealand Committee EV-007, Methods for Examination of Air, to supersede AS 2800—1985, *Ambient air—Determination of particulate lead—High volume sampler gravimetric collection—Flame atomic absorption spectrometric method.*

Reference was made to the US Environmental Protection Agency, *Compendium of methods for the determination of inorganic compounds in ambient air, including Chapter IO-3.4 Determination of metals in ambient particulate matter using inductively coupled plasma (ICP) spectroscopy* and European Standard, EN 14902, *Ambient air quality—Standard method for the measurement of Pb, Cd, As and Ni in the Pm10 fraction of suspended particulate matter*, in preparing this Standard.

The objective of this Standard is to provide regulatory and testing bodies with a standard method for the determination of the concentrations of metals present in suspended particulate matter in ambient air.

FOREWORD

Both natural and anthropogenic processes and sources emit metals and their compounds into the air. Metals occur naturally in soil and rocks and can be released into air as particulate matter through weathering, mining activities and wind-blown dust. Anthropogenic sources of particulate metals include mineral processing, incineration and combustion of fuels containing metals. Some metals, upon inhalation or ingestion, can lead to a range of health effects such as cancer, neurotoxicity and reproductive toxicity.

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METHOD

1 SCOPE

This Standard sets out a method for the determination of particulate metals collected from ambient air by either a high or low volume sampler using inductively coupled plasma/atomic emission spectroscopy (ICP-AES) or inductively coupled plasma/mass spectrometry (ICP-MS).

This method is applicable to the determination of hydrochloric/nitric acid-soluble metals present in particulate matter. While dilute nitric acid is the preferred matrix for ICP-MS analysis, as this reduces polyatomic interferences, a hydrochloric/nitric acid mixture is specified as it has been shown to be a better matrix for extraction of metals from quartz filters (US EPA IO-3.5).

This method is suitable for the determination of the following metals: aluminium, arsenic, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, thallium, tin, titanium, vanadium and zinc. Other elements may be determined by this method if adequate performance is demonstrated.

Concentrations greater than or equal to 1 nanogram per cubic metre (ng/m^3) may be determined for samples collected by a high volume sampler over a 24 h sampling period, with subsequent analysis by ICP-MS.

Metals present in the vapour phase and volatile metal compounds are not effectively collected by the filter-based methods used to obtain samples for determination by this procedure.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

2162 Verification and use of volumetric apparatus
2162.1 Part 1 : General—Volumetric glassware
2162.2 Part 2 : Guide to the use of piston-operated volumetric apparatus (POVA)

2164 Laboratory glassware—One-mark volumetric flasks

2166 Laboratory glassware—One-mark pipettes

3641 Recommended practice for atomic emission spectrometric analysis
3641.1 Part 1 : Principles and techniques
3641.2 Part 2 : Inductively coupled plasma excitation

4873 Recommended practice for inductively coupled plasma-mass spectrometry (ICP-MS)
4873.1 Part 1 : Principles and techniques
4873.2 Part 2 : Quantitative determination—Water