

Characterization of air quality —

Part 3: Workplace atmospheres —

Section 3.2 Method for the determination of particulate lead and lead compounds by flame atomic absorption spectrometry

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Environment and Pollution Standards Policy Committee (EPC/-) to Technical Committee EPC/35, upon which the following bodies were represented:

- Association of Consulting Scientists
- British Coal Corporation
- British Gas plc
- British Steel plc
- Department of Health
- Department of the Environment (Her Majesty's Inspectorate of Pollution)
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Department of Trade and Industry (Warren Spring Laboratory)
- Electricity Supply Industry in England and Wales
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Institute of Occupational Hygiene
- Institute of Petroleum
- Institution of Environmental Health Officers
- Institution of Gas Engineers
- Lead Development Association
- National Society for Clean Air
- Society of Chemical Industry

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Asbestos Information Centre Ltd.
- Asbestosis Research Council
- Chemical Industries Association
- Council for Environmental Conservation
- Engineering Equipment and Materials Users' Association
- Fibre Cement Manufacturers' Association Limited,
- Institute of Occupational Medicine
- London Regional Transport
- Royal Society of Chemistry

This British Standard, having been prepared under the direction of the Environment and Pollution Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 31 May 1991

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The following BSI references relate to the work on this standard:
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National foreword

This Section of BS 6069, which has been prepared under the direction of the Environment and Pollution Standards Policy Committee, is identical with ISO 8518:1990 “*Workplace air — Determination of particulate lead and lead compounds — Flame atomic absorption spectrometric method*”. The International Standard was prepared by Technical Committee 146, Air quality, of the International Organization for Standardization (ISO) with the active participation and approval of the UK.

BS 6069 is being published in a series of Parts and Sections that will generally correspond to particular International Standards arising from the UK participation in the work of ISO/TC 146. This Section of BS 6069 is one of several relating to workplace atmospheres that are being published as Sections of Part 3. Methods concerning stationary sources are being published as Sections of Part 4 of BS 6069. Topics relating to other aspects of air quality characterization will be published as further Parts or Sections of BS 6069.

The following Parts of BS 6069 are being published.

- *Part 1: Units of measurement (complete);*
- *Part 2: Glossary (complete);*
- *Part 3: Workplace atmospheres;*
- *Part 4: Stationary source emissions.*

Methods for the determination of particular constituents of ambient air are being published as Parts of BS 1747 “*Methods for the measurement of air pollution*”.

Cross-references

International Standard	Corresponding British Standard
ISO 1042:1983	BS 1792:1982 <i>Specification for one-mark volumetric flasks</i> (Identical)
ISO 3585:1976	BS 2598 <i>Glass plant, pipeline and fittings</i> Part 1:1980 <i>Specification for properties of borosilicate glass 3.3</i> (Identical)
BS 3696:1987	BS 3978:1987 <i>Specification for water for laboratory use</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 648, ISO 6955, ISO/TR 7708 and ISO 8655-1 to ISO 8655-4, which are referred to in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to ISO 648:1977 is BS 1583:1986 “*Specification for one-mark pipettes*”.

Textual error. When adopting the text of the International Standard, the textual error given below was discovered. It has been marked in the text, and has been reported to ISO in a proposal to amend the text of the International Standard. In 6.1.4 and note 7, “established according to national standards” should read “traceable to national standards”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard specifies a flame atomic absorption spectrometric method for the determination of the time-weighted average mass concentration of particulate lead and lead compounds in workplace air.

The method is applicable to the determination of masses of approximately 10 µg to 200 µg of lead per sample using the normal procedure without dilution. The concentration range for lead in air for which this procedure is applicable is determined in part by the sampling procedure selected by the user (see 7.1).

The method is applicable to personal and fixed location sampling.

The normal sample dissolution procedure (8.2.2) is not effective for all lead compounds (see clause 4). The use of an alternative more vigorous dissolution procedure is necessary when lead compounds which are insoluble in normal sample dissolution procedures are present in the test atmosphere (see 10.1).

Anions which give a precipitate with lead interfere, but this interference is overcome by the addition of the disodium salt of ethylenediamine tetraacetic acid (EDTA) when necessary (see 10.2).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 648:1977, *Laboratory glassware — One-mark pipettes*.

ISO 1042:1983, *Laboratory glassware — One-mark volumetric flasks*.

ISO 3585:1976, *Glass plant, pipeline and fittings — Properties of borosilicate glass 3.3*.

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*.

ISO 6955:1982, *Analytical spectroscopic methods — Flame emission, atomic absorption, and atomic fluorescence — Vocabulary*.

ISO/TR 7708:1983, *Air quality — Particle size fraction definitions for health-related sampling*.

ISO 8655-1:—, *Piston and/or plunger operated volumetric apparatus (POVA) — Part 1: Definitions*¹⁾.

ISO 8655-2:—, *Piston and/or plunger operated volumetric apparatus (POVA) — Part 2: Operating considerations*¹⁾.

ISO 8655-3:—, *Piston and/or plunger operated volumetric apparatus (POVA) — Part 3: Methods of test*¹⁾.

ISO 8655-4:—, *Piston and/or plunger operated volumetric apparatus (POVA) — Part 4: Specifications*¹⁾.

3 Principle

A known volume of air sample is drawn through a filter to collect particulate lead and lead compounds. The filter and collected sample are then wet-ashed using nitric acid and hydrogen peroxide[1]. Sample solutions are aspirated into the oxidizing air-acetylene flame of an atomic absorption spectrometer equipped with a lead hollow cathode lamp or electrodeless discharge lamp. Absorbance measurements are made at 283,3 nm, and analytical results are obtained by the analytical-curve technique (see 6.1.1 of ISO 6955:1982).

4 Reactions

In general, the overwhelming majority of particulate lead compounds which are commonly found in samples of workplace air are converted to watersoluble lead ions (Pb^{2+}) by the wet-ashing procedure described in 8.2.2. However, certain lead compounds, for example lead silicate, are not dissolved. If there is any doubt about the effectiveness of this procedure for the dissolution of particulate lead compounds which may be present in the test atmosphere, then investigate this before proceeding with the method (see 10.1).

5 Reagents

During the analysis, use only reagents of recognized analytical grade, and only water as specified in (5.1).

5.1 Water, complying with the requirements for ISO 3696, grade 2 water (electrical conductivity less than 0,1 mS/m and resistivity greater than 0,01 MΩ m at 25 °C).

The concentration of lead shall be less than 0,01 µg/ml.

5.2 Nitric acid (HNO_3), concentrated, ρ about 1,42 g/ml, 69 % (m/m) to 71 % (m/m).

¹⁾ To be published