

Implementation of
ISO 11041:1996

**Workplace air —
Determination of
particulate arsenic and
arsenic compounds and
arsenic trioxide
vapour —
Method by hydride
generation and atomic
absorption
spectrometry**

ICS 13.040.30

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EH/2, Air quality, to Subcommittee EH/2/2, Workplace atmospheres, upon which the following bodies were represented:

- Asbestos Information Centre Limited
- Asbestosis Research Council
- BCIRA
- British Ceramic Research Limited
- British Gas plc
- British Occupational Hygiene Society
- Chemical Industries Association
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Employers Association of Catering Equipment Engineers Limited
- Engineering Equipment and Materials Users Association
- Fibre Cement Manufacturers Association Limited
- Health and Safety Executive
- Institute of Energy
- Institution of Occupational Hygienists
- Institute of Occupational Medicine
- London Transport
- Royal Society of Chemistry

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National foreword

This British Standard reproduces verbatim ISO 11041:1996 and implements it as the UK national standard.

This British Standard is published under the direction of the Health and Environment Sector Board whose Technical Committee EH/2 has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international committee any enquiries on interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

NOTE International and European Standards, as well as overseas standards, are available from Customer Services, BSI, 389 Chiswick High Road, London W4 4AL.

Textual errors

When adopting the text of the international standard, the textual errors listed below were discovered. They have been marked in the text and have been reported to ISO in a proposal to amend the text of the international standard.

1. **8.2.2** “cover with a watch” should read “cover with a watch glass”.
2. **8.2.3** The word “NOTE” should precede “34 The solutions”.
3. **8.4.1** The word “NOTE” should precede “38 The 193,7 nm arsenic line”, and the text should read “but the use of the latter” and not “but its use”, for clarity.

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, the ISO title page, pages ii to iv, page 1 to 18, 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.

INTERNATIONAL STANDARD

**ISO
11041**

First edition
1996-04-15

Workplace air — Determination of particulate arsenic and arsenic compounds and arsenic trioxide vapour — Method by hydride generation and atomic absorption spectrometry

*Air des lieux de travail — Dosage de l'arsenic particulaire, des composés
particulaires de l'arsenic et des vapeurs de trioxyde d'arsenic — Méthode par
production d'hydrures et spectrométrie d'absorption atomique*



Reference number
ISO 11041:1996(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11041 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplace atmospheres*.

Annex A of this International Standard is for information only.

WARNING — Arsenic and arsenic compounds are toxic and are recognized as human carcinogens (see reference [1] in annex A). Avoid any exposure by inhalation. Personal protection (e.g. an effective respirator) must be used in all cases where exposure to arsenic or arsenic compounds is possible.

1 Scope

This International Standard specifies a method for the determination of the mass concentration of particulate arsenic and arsenic compounds and arsenic trioxide vapour in workplace air, using either continuous-flow hydride generation or flow-injection-analysis hydride generation and atomic absorption spectrometry. The method is not suitable for determination of arsenic in the form of metal arsenides which decompose in the presence of water or acid (see 10.1).

The method is applicable to the determination of masses of approximately 100 ng to 125 µg of arsenic per sample, for analysis of test solutions prepared using sample solution aliquots in the recommended range (see 9.3.2). The concentration range for arsenic in air, for which this procedure is applicable, is determined in part by the sampling procedure selected by the user.

The method is applicable to personal and fixed-location sampling.

A number of transition metals may interfere with the determination of arsenic by hydride generation and atomic absorption spectrometry (see 10.3)

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 3585:1991, *Borosilicate glass 3.3 — Properties*.

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 7708:1995, *Air quality — Particle size fraction definitions for health-related sampling*.

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

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

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

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

ISO 8756:1994, *Air quality — Handling of temperature, pressure and humidity data*.

EN 482:1994, *Workplace atmospheres — General requirements for the performance of procedures for the measurement of chemical agents*. EN 482, CEN, Brussels, Belgium (1994).

EN 1232:—¹⁾, *Workplace atmospheres — Pumps for personal sampling of chemical agents — Requirements and test methods*.

3 Principle

3.1 Particulate arsenic and arsenic compounds and arsenic trioxide vapour are collected by drawing a measured volume of air through a cellulose ester membrane filter and a back-up paper pad impregnated with sodium carbonate and mounted in a sampler designed to collect the inhalable fraction of airborne particles.

3.2 The cellulose ester membrane filter, back-up paper pad and collected sample are wet-ashed using nitric acid, sulfuric acid and hydrogen peroxide. The nitric acid and hydrogen peroxide are removed by boiling on a hotplate until dense, white fumes of sulfur trioxide are evolved, and the sample solution is then allowed to cool and diluted to a given volume with water.

NOTE 1 The wet-ashing procedure specified in 8.2.2 is based upon a NIOSH procedure (see reference [2] in annex A) which has been modified to avoid taking the sample solution to dryness.

3.3 A test solution is prepared by transferring an aliquot of the sample solution to a volumetric flask, together with appropriate volumes of dilute sulfuric acid, concentrated hydrochloric acid and potassium iodide solution, and diluting to volume with water.

¹⁾ To be published