
**Cigarettes — Determination
of benzo[a]pyrene in cigarette
mainstream smoke using GC/MS —
Part 1: Method using methanol as
extraction solvent**

*Cigarettes — Dosage du benzo[a]pyrène dans le courant principal
de la fumée de cigarette par CG/SM — Partie 1: Méthode utilisant
du méthanol comme solvant d'extraction*



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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	1
5 Apparatus	2
6 Reagents	2
7 Standards	3
7.1 General	3
7.2 Primary B[a]P stock solution	3
7.3 Secondary B[a]P stock solution	3
7.4 B[a]P-d12 stock solution	3
7.5 B[a]P-d12 spiking solution	3
7.6 Working standard solutions	3
7.7 Storage of standard solutions	3
8 Preparation of sample	3
8.1 Sampling	3
8.2 Smoking	4
8.3 Filter pads extraction	4
8.4 Sample clean-up	4
9 Determination	5
9.1 GC/MS operating conditions	5
9.2 Calibration	5
9.3 Determination of B[a]P	5
9.4 Calculation	6
10 Repeatability and reproducibility	6
11 Test report	6
11.1 General	6
11.2 Characteristic data about the cigarette	7
11.3 Data about sampling	7
11.4 Description of the test	7
11.5 Test results	8
Annex A (informative) Example of a chromatogram of a cigarette smoke extract	9
Bibliography	11

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 126, *Tobacco and tobacco products*.

This first edition of ISO 22634-1 cancels and replaces ISO 22634:2008, of which it constitutes a minor revision.

The main changes compared to the previous edition are as follows:

- the number of ISO 22634 has been changed to ISO 22634-1 as a new part 2 of ISO 22634 has been elaborated;
- the titles of the two parts have been modified accordingly;
- the text has been editorially revised.

A list of all parts in the ISO 22634 series can be found on the ISO website.

Introduction

Between 1999 and 2003, a task force composed of Cooperation Centre for Scientific Research Relative to Tobacco (CORESTA) members studied the existing methodologies for the determination of benzo[a]pyrene (B[a]P) in the mainstream smoke of cigarettes. Several methods have been proposed for this determination, which are mainly based on two types of analytical methodology: high performance liquid chromatography (HPLC) with fluorescence detection and gas chromatography/mass spectrometry (GC/MS). In both cases, it is necessary to purify the smoke condensate extract before performing the chromatography in order to obtain a correct separation of the B[a]P peak.

The task force decided in the first instance to develop a method using HPLC with fluorescence detection. However, after several collaborative experiments, it appeared that achieving a significant reduction of the initially observed variability would be technically very difficult. The task force then decided to investigate a GC/MS method as an alternative and was able to demonstrate, through collaborative experiments, that a lower variability can be obtained with this methodology.

This document, produced through collaborative experiments involving many laboratories in many countries, provides an optimized procedure for the determination of B[a]P in cigarette mainstream smoke. The repeatability and reproducibility of this method have been assessed according to ISO recommendations and are included.

No machine smoking regime can represent all human smoking behaviours:

- it is recommended that cigarettes also be tested under conditions of a different intensity of machine smoking than those specified in this document;
- machine smoking testing is useful to characterize cigarette emissions for design and regulatory purposes, but communication of machine measurements to smokers can result in misunderstandings about differences in exposure and risk across brands;
- smoke emission data from machine measurements may be used as inputs for product hazard assessment, but they are not intended to be nor are they valid measures of human exposure or risks. Communicating differences between products in machine measurements as differences in exposure or risk is a misuse of testing using ISO standards.

Cigarettes — Determination of benzo[a]pyrene in cigarette mainstream smoke using GC/MS — Part 1: Method using methanol as extraction solvent

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies a method for the determination of benzo[a]pyrene (B[a]P) in the total particulate matter of cigarette mainstream smoke using gas chromatography/mass spectrometry (GC/MS) with methanol as extraction solvent.

This method was validated using ISO 3308 smoking parameters and is technically compatible with other smoking regimes.

An alternative method for the determination of B[a]P is specified in ISO 22634-2 with a different clean-up using cyclohexane solvent and a reduced analytical run.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3308, *Routine analytical cigarette-smoking machine — Definitions and standard conditions*

ISO 3402, *Tobacco and tobacco products — Atmosphere for conditioning and testing*

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

ISO 4387, *Cigarettes — Determination of total and nicotine-free dry particulate matter using a routine analytical smoking machine*

ISO 8243, *Cigarettes — Sampling*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Principle

- Sampling of the test cigarettes.
- Conditioning of the test cigarettes.