
**Cigarettes — Determination of
selected volatile organic compounds
in the mainstream smoke of cigarettes
with an intense smoking regime —
Method using GC/MS**

*Cigarettes — Dosage de composés organiques volatils sélectionnés
dans le courant principal de la fumée de cigarette avec un régime de
fumage intense — Méthode par GC-SM*



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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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.

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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For an explanation of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The CORESTA (www.coresta.org) Special Analytes Sub-Group (since 2017 the Sub-Group changed its name to Smoke Analytes Sub-Group) carried out a collaborative study in 2005 to compare smoke analyte yields of selected volatile organic compounds (volatiles) obtained from different laboratories using their own preferred methodologies. This study reported significant and unacceptable differences in volatiles yields, especially for 1,3-butadiene and acrylonitrile and suggested that further work was required to understand factors influencing the variability. Key parameters of existing methodologies were reviewed and further studies were conducted on selected volatiles between 2008^[1] and 2009^[2]. These studies investigated critical method steps that required optimization before incorporation into a CORESTA Recommended Method (CRM). The CRM was based on collecting the volatiles from mainstream cigarette smoke in cryogenically cooled impinger traps containing methanol. The impinger solutions were fortified with benzene-D₆ and analysed by gas chromatography/mass spectrometry (GC-MS).

This document was produced through a CORESTA collaborative study conducted in 2011, involving 17 laboratories from 11 countries and included 10 samples with different tar yields^[3]-^[5]. Cigarettes were smoked with the intense smoking regime specified in Health Canada Official Method T-115 (equivalent to ISO 20778). Statistical evaluations carried out according to ISO 5725-1 and ISO 5725-2 are included.

No machine smoking regime can represent all human smoking behaviour.

- 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 as 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 International Standards

Cigarettes — Determination of selected volatile organic compounds in the mainstream smoke of cigarettes with an intense smoking regime — Method using GC/MS

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 any other restrictions prior to use.

1 Scope

This document specifies a method for the quantification of selected volatile organic compounds (VOCs: 1,3-butadiene, isoprene, acrylonitrile, benzene and toluene) by gas chromatography/mass spectrometry (GC-MS) in mainstream cigarette smoke using ISO 20778 smoking parameters.

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

ISO 8243, *Cigarettes — Sampling*

ISO 20778, *Cigarettes — Routine analytical cigarette smoking machine — Definitions and standard conditions with an intense smoking regime*

ISO 20779, *Cigarettes — Generation and collection of total particulate matter using a routine analytical smoking machine with an intense smoking regime*

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:

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

4 Principle

Selected volatiles are collected by passing the mainstream smoke of cigarettes through a glass fibre filter pad as specified in ISO 20778 into cryogenic traps containing methanol.

The impinger solutions are fortified with internal standard and analysed by GC-MS.

5 Apparatus

In addition to the list provided below, usual laboratory apparatus and equipment are needed for preparation of samples and standards.