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Cigarettes — Determination of selected carbonyls in the mainstream smoke of cigarettes with an intense smoking regime — Method using high performance liquid chromatography

Cigarettes — Dosage de carbonyles sélectionnés dans le courant principal de la fumée de cigarette avec un régime de fumage intense — Méthode par chromatographie liquide haute performance

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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.

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Introduction

At the outset of this work, discussions in the CORESTA (www.coresta.org) Special Analytes Sub-Group (since 2017 the Sub-Group changed its name to Smoke Analytes) determined that most laboratories used a method involving derivatization of carbonyls with 2,4-dinitrophenylhydrazine (DNPH) because they considered it the most suitable. This was chosen as the basis of the CORESTA Recommended Method (CRM). The CRM comprised smoke collection in impinger traps, derivatization of carbonyls with DNPH followed by their determination using reversed phase High Performance Liquid Chromatography with Ultra Violet or Diode Array Detection (HPLC-UV or HPLC-DAD).

This document was produced from a 2012 collaborative study involving 19 laboratories from 11 countries and included 10 samples with different tar yields[1][2]. This method includes recommendations about critical steps that should be controlled to provide data as robust and consistent as the repeatability and reproducibility data provided. Cigarettes were smoked using the intense smoking regime parameters given in Health Canada Official Method T-115. At the time the collaborative study was conducted, the study protocol stipulated the use of Health Canada Official Method (T-115) for intense conditions as there was not an International Standard that defined intense smoking conditions. ISO 20778 was published in 2018 and is equivalent to Health Canada Intense conditions. Statistical evaluations were carried out according to ISO 5725-1[3] and ISO 5725-2[4].

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.

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1 Scope

This document specifies a method for the determination of selected carbonyls (formaldehyde, acetaldehyde, acetone, acrolein, propionaldehyde, crotonaldehyde, 2-butanone and *n*-butyraldehyde) as their 2,4-dinitrophenylhydrazones by reversed phase HPLC-UV/DAD in mainstream smoke using an intense smoking regime.

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*

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

Cigarettes are smoked on a standard smoking machine as specified in ISO 20778 that has been fitted with impingers, but without a glass fibre filter pad as described in ISO 20778 [e.g. Cambridge filter pad[1)] (CFP), for example of equivalent product] and the filter pad holder, with the ISO 20778 smoking regime.

The carbonyls in mainstream tobacco smoke are trapped by passing each puff through an impinger device containing an acidified solution of 2,4-dinitrophenylhydrazine (DNPH) in 1:1 acetonitrile:water.

1) Cambridge filter pad (CFP) is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

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