International Standard

ISO 16179

Footwear — Critical substances potentially present in footwear and footwear components — Determination of organotin compounds in footwear materials

Chaussures — Substances critiques potentiellement présentes dans les chaussures et les composants de chaussures — Détermination des composés organostanniques dans les matériaux de chaussures

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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

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Foreword

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This document was prepared by Technical Committee ISO/TC 216, *Footwear*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 309, *Footwear*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO/TS 16179:2012), which has been technically revised.

The changes are as follows:

— the technical specification becomes an ISO standard;

— GC-MS/MS technique added in 8.9.3 and in Clause B.2;

— new extraction solvent in Clause 4;

— new Table 1 (certain substances added) in Clause 4;

— change in the safety instructions at the preparation of the sodium tetraethylborate solution in Clause 8;

— sample preparation reference to ISO 21061 in Clause 7;

— new Table 2 (certain substances added) in 8.3.1;

— deletion of the need for duplicate determinations in Clause 7;

— new Annex B for mass spectroscopy;

— deletion of the reference to ISO 22744-1 in the Bibliography.

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

Certain organotin compounds have been identified as carcinogenic. Thus, several countries have restricted them in articles such as footwear, e.g. in the European Union by commission regulation (EU) 276/2010[1] amending regulation (EC) No 1907/2006[2].

Further organotin compounds are restricted by footwear brands in their restricted substances lists (RSL).

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Footwear — Critical substances potentially present in footwear and footwear components — Determination of organotin compounds in footwear materials

1 Scope

This document specifies a test method for the qualification and quantification of organotin compounds by applying gas chromatography coupled with mass spectrometry. This test method is applicable to all types of footwear materials except metal hardware (see ISO/TR 16178).

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

ISO 4787, *Laboratory glass and plastic ware — Volumetric instruments — Methods for testing of capacity and for use*

ISO 21061, *Footwear — Chemical tests — General principles on the preparation of samples*

3 Terms and definitions

No terms and definitions are listed in this document.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

The organotin substances are extracted from the footwear material with methanol, in a medium-strength acidic condition, using tropolone as a complexing agent.

In the previous version of this test method, the extraction solvent was a mixture of methanol-ethanol. Comparisons have shown that methanol gives equivalent results to methanol-ethanol solution. It is still possible to use extraction with methanol-ethanol solution.

The polar and high-boiling organotin is then converted to the corresponding volatile alkyl derivative, by reaction with sodium tetraethylborate, $NaB(Et)_4$. Finally, it is detected and quantified by using a gas chromatograph fitted with a mass selective detector [gas chromatograph with a single quadrupole mass spectrometer (GC-MS) or gas chromatograph with a triple quadrupole mass spectrometer (GC-MS/MS)].

Table 1 indicates the list of target compounds which can be analysed with the method defined in this document. This document is also applicable for further organotin substances provided that the method is validated with the additional compounds.

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