International Standard

ISO 6529

Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases

Habillement de protection — Protection contre les produits chimiques — Détermination de la résistance des matériaux utilisés pour la confection des vêtements de protection à la perméation par des liquides et des gaz

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Foreword

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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 document 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 94, *Personal safety — Personal protective equipment*, Subcommittee SC 13, *Protective clothing*.

This fourth edition cancels and replaces the third edition (ISO 6529:2013), which has been technically revised.

The main changes are as follows:

— Restrictions have been placed on the volatility of the challenge chemical. This is because involatile chemicals will not evaporate into a gaseous collection medium to be carried to the detector.

— Restrictions have been placed on the solubility of the challenge chemical. This is because chemicals that are insoluble in a liquid collection medium will not be carried to the detector. Furthermore, chemicals that are only slightly soluble in a liquid collection medium might not sufficiently dissolve in order for detection levels to yield a breakthrough time or cumulative permeation data.

— A requirement has been made that if the above restrictions are not met, then another test method shall be used.

— A requirement has been added to ensure that the pressure inside the collection side of the permeation test cell relative to the pressure in the challenge side of the permeation test cell shall not exceed a certain value. This is because it has been shown that excessive pressure causes the test specimen to deform, become thinner, and have an increased surface area. This renders the test specimen more susceptible to faster permeation.

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

Persons involved in the production, use, transportation and emergency response with liquid and gaseous chemicals can be exposed to numerous compounds capable of causing harm upon contact with the human body. The deleterious effects of these chemicals can range from acute trauma such as skin irritation and burn to chronic degenerative disease, such as cancer. Since engineering controls may not eliminate all possible exposures, attention is often placed on reducing the potential for direct skin contact through the use of protective clothing. Such protective clothing is typically designed to resist permeation and penetration of hazardous chemicals and degradation of the clothing that may be caused by such chemicals.

The test methods described in this document are intended to be used to evaluate the barrier effectiveness of materials used for protective clothing against ingress by liquid or gaseous chemicals.

These test methods provide options for reporting test results in terms of cumulative permeation, permeation rate and breakthrough time. These parameters are key measures of the effectiveness of a clothing material to act as a barrier to the test chemical. Low cumulative permeation mass (CPM), low permeation rates and long breakthrough times are characteristic of effective barrier materials.

Resistance to penetration by liquid chemicals should be determined by using ISO 6530 while resistance to penetration by liquid chemicals under pressure should be determined by using ISO 13994.

It has been assumed in the drafting of this document that the execution of its provisions will be entrusted to appropriately qualified and experienced persons with a sound understanding of analytical chemistry and uncertainty of measurement. Appropriate precautions should be taken when carrying out this type of testing in order to avoid injury to health and contamination of the environment.

Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases

1 Scope

This document describes laboratory test methods to determine the resistance of materials used in protective clothing, including gloves and including footwear, when the footwear is an integral part of the clothing, to permeation by liquid or gaseous chemicals under the conditions of continuous contact. This test method is referred to in ISO 16602-3.

Method A is applicable to testing against liquid chemicals, either volatile or sufficiently soluble in water (such that detection limits are possible that allow breakthrough times and/or cumulative permeation parameters to be measured), that are expected to be in continuous contact with the protective clothing material.

Method B is applicable to testing against gaseous chemicals expected to be in continuous contact with the protective clothing material.

These test methods assess the permeation resistance of the protective clothing material under laboratory conditions in terms of cumulative permeation, permeation rate and breakthrough time. These test methods also enable qualitative observations to be made of the effects of the test chemical on the material under test.

These test methods are only suitable for measuring permeation by liquids and gases. Permeation by solid challenge chemicals is beyond the scope of this document.

NOTE It can be difficult or impossible to normalize the results of permeation tests carried out against solid challenge chemicals. The normalized rate of permeation is dependent on the area of fabric exposed to the challenge chemical. In the case of solids this will, in turn, depend also on factors such as particle size, size distribution, particle shape and packing considerations.

These test methods address only the performance of materials or certain materials' constructions (e.g. seams). These test methods do not address the design, overall construction and components, or interfaces of garments, or interfaces between garments and gloves or garments and footwear, or other factors which can affect the overall chemical protection offered by protective clothing, gloves or footwear or combinations of chemical protective clothing, gloves and footwear.

It is emphasized that these tests do not necessarily simulate conditions to which materials are likely to be exposed in practice. In most cases the conditions of the permeation test will be far more challenging than expected workplace conditions.

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 2286-2, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate*

ISO 2286-3, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 3: Method for determination of thickness*

ISO 11610, *Protective clothing — Vocabulary*