INTERNATIONAL STANDARD

ISO 23506

First edition
2021-04

Workplace air — Analysis of airborne water immiscible mineral oil droplets and vapor with Fourier — Transform infrared spectroscopy

Air des lieux de travail — Analyse par transformée de Fourier des vapeurs et des gouttelettes d'huile minérale non miscibles à l'eau en suspension dans l'air — Spectroscopie infrarouge à transformée de Fourier

This document is a preview generated by EVS

Reference number
ISO 23506:2021(E)

© ISO 2021

This document is a preview generated by EVS

COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Principle **1**
5 Apparatus and reagents **2**
5.1 Collecting materials for analysis and other chemicals 2
5.2 Sampler equipment 3
5.3 Analytical equipment 3
5.4 Other equipment 4
6 Polymer resin preparation **5**
6.1 Drying 5
6.2 Sieving 5
6.3 Purification of unused polymer resin 5
6.3.1 General 5
6.3.2 Step 1: Preparatory purification with ethanol 5
6.3.3 Step 2: Purifying with tetrachloroethene 5
7 Sampling **6**
7.1 Sampler preparation 6
7.1.1 Glass fibre filter (droplets) 6
7.1.2 Polymer resin (vapours) 6
7.1.3 Marking 6
7.1.4 Cleaning 6
7.1.5 Assembly 6
7.2 Sampling 6
7.2.1 Parameters 6
7.2.2 Pump 7
7.2.3 Initial flow rate 7
7.2.4 Flow rate verification 7
7.2.5 Storage and transport 7
8 Analysis **7**
8.1 FTIR scanning parameters 7
8.2 Preparation 7
8.2.1 Sample 7
8.2.2 Solvent blank 7
8.2.3 Collection substrate blank 7
8.3 Calibration 8
8.3.1 General 8
8.3.2 Stock solution 8
8.3.3 Calibration standards 8
8.3.4 Calibration with liquid paraffin 9
8.4 Measurement 9
8.4.1 General 9
8.4.2 Instrument background 9
8.4.3 Filling the cuvette 9
8.4.4 Calibration 9
8.4.5 Sample measurement 9
9 Evaluation **10**
9.1 Calibration 10
9.2 Samples 10

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

10 Interferences **11**
Annex A (informative) **Validation** **12**
Annex B (informative) **Example for estimation of expanded uncertainty** **20**
Bibliography **24**

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

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 146, *Air quality*, Subcommittee SC 2, *Workplace atmospheres*.

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.

This document is a preview generated by EVS

Introduction

Mineral oils are by-products from the distillation of crude oil. The mineral oils produced in this way are used in a wide range of modern applications. Their composition varies according to their application. Mineral oils contain saturated hydrocarbons, cyclic saturated hydrocarbons, aromatic compounds, and unsaturated hydrocarbons.

They are used as fuels, for example in the form of petroleum, diesel and kerosene for internal combustion engines, as heating oil, and as lubricants in the metal processing and application industries. Mineral oils are also found in cosmetics and medical applications. This wide range of applications gives rise to exposure for human beings and the natural environment to mineral oils in the form of vapours and droplets. Since mineral oils and their constituents are harmful to health, it is important for quantification of the exposure to be possible and where necessary for corrective measures to be taken.

The method described in this document is intended to support swift, cost-effective and straightforward quantification of the concentration of mineral oil in a large number of samples. This method has been validated in accordance with the provisions of EN 13936 and ISO 20581 and has an expanded measurement uncertainty in the region of 20 % to 30 % within the measurement range stated.

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

Workplace air — Analysis of airborne water immiscible mineral oil droplets and vapor with Fourier — Transform infrared spectroscopy

This document is a preview generated by EVS

1 Scope

The method described in this document quantifies the absolute exposure to mineral oil vapours and droplets, within a concentration range from 0,5 mg/m^3 to 125 mg/m^3, in the inhalable fraction of the workplace air.

This document contains comprehensive information and instructions on the equipment and chemicals to be used.

This method is applicable for water soluble oils and metal working fluids.

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 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 7708, *Air quality — Particle size fraction definitions for health-related sampling*

ISO 13137:2013, *Workplace atmospheres — Pumps for personal sampling of chemical and biological agents — Requirements and test methods*

ISO 18158, *Workplace air — Terminology*

ISO 20581, *Workplace air — General requirements for the performance of procedures for the measurement of chemical agents*

EN 13936, *Workplace exposure — Procedures for measuring a chemical agent present as a mixture of airborne particles and vapour — Requirements and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18158 apply.

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

A defined airflow is drawn over the sampler with the aid of a pump. The droplets are deposited on the glass fibre filter, the vapours on the polymer resin. By extraction of the glass fibre filter and the polymer resin, the adsorbed mineral oils are desorbed and can be analysed by means of Fourier trasnform infrared spectrocopy (FTIR) and evaluated.

© ISO 2021 – All rights reserved