PD ISO/TS 21237:2020



BSI Standards Publication

Nanotechnologies — Air filter media containing polymeric nanofibres — Specification of characteristics and measurement methods

bsi.

National foreword

This Published Document is the UK implementation of ISO/TS 21237:2020.

The UK participation in its preparation was entrusted to Technical Committee NTI/1, Nanotechnologies.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 03923 8

ICS 07.120

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2020.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TS 21237:2020

TECHNICAL SPECIFICATION

ISO/TS 21237

First edition
2020-03-31

Nanotechnologies — Air filter media containing polymeric nanofibres — Specification of characteristics and measurement methods



Reference number
ISO/TS 21237:2020(E)

© ISO 2020



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020, Published in Switzerland

All rights reserved. Unless otherwise specified, 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
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO 2020 – All rights reserved

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **2**
5 Characteristics to be measured and their measurement methods **3**
5.1 General 3
5.2 Mandatory and optional characteristics and their measurement methods 3
5.3 Descriptions on characteristics and their measurement methods 4
5.3.1 General 4
5.3.2 Fibre diameter 4
5.3.3 Morphology 4
5.3.4 Specific surface area 4
5.3.5 Chemical composition content 5
5.3.6 Thermal stability 5
5.3.7 Crystalline structure 5
5.3.8 Crystallinity 5
5.3.9 Crystallite size 6
6 Reporting **6**
Annex A (informative) **Typical structures of air filter media containing nanofibres** **7**
Annex B (informative) **Test report format for mandatory characteristics** **9**
Annex C (informative) **Test report format for optional characteristics** **10**
Bibliography **11**

© ISO 2020 – 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 229, *Nanotechnologies*.

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.

© ISO 2020 – All rights reserved

Introduction

Air filter media play an important role in the performance and efficiency of different types of air filters. In this respect, most air filter media take advantage of nonwovens to separate solid or liquid particles. Air filter media have a wide range of applications such as gas turbine inlet air, industrial dust collectors, respiratory masks, personal protective equipment, heating, ventilation and air conditioning systems, cleanrooms, etc.

In recent years, air filter media containing nanofibres have been commercialized and widely used by different industries due to their high filtration efficiency along with a low pressure drop created by the slip flow effect[6]. Air filter media containing nanofibres are normally produced by depositing one or more types of polymer-based nanofibres directly on the surface of a suitable porous substrate during spinning.

Since the diameter of nanofibres is significantly smaller than that of conventional microfibres employed in filters, it offers a higher chance of inertial impaction and interception, i.e. a more optimum filtration efficiency. The slip flow also results in a reduced pressure drop and more contaminants passing near the surface of the nanofibres. Hence, the inertial impaction and interception efficiencies rise. As a result, the filtration capability of the nanofibres layer increases for the same pressure drop as compared with a conventional fibre layer. Additionally, the very high surface area of nanofibres facilitates the adsorption of contaminants from the air. All these desirable features have led to a wide range of air filter media containing nanofibres being used for air filtration applications[6][7][8].

Different techniques such as electrospinning, force spinning and other methods have been used to produce air filter media containing nanofibres. The deposited nanofibres form a web-like nonwoven layer on the surface of the substrate. Nanofibres can exhibit different crystalline structures, morphology and diameter. The surface area and crossed-fibres porosity of the formed nonwoven layer is mainly affected by the nanofibre diameter as well as the morphology. Polymeric nanofibres such as polyamide, polyvinylidene fluoride (PVDF), polyacrylonitrile (PAN) and polyurethane (PU) are normally used for air filter media. Nanofibres can be deposited on different kinds of woven and nonwoven substrates. Annex A shows a schematic of the cross-section of an air filter medium (see Figure A.1) and SEM images relating to the morphology of the nanofibres (see Figures A.2 and A.3).

This document facilitates the communication between sellers and buyers and supports the growing trade of this new class of air filter media.

© ISO 2020 – All rights reserved

TECHNICAL SPECIFICATION **ISO/TS 21237:2020**

Nanotechnologies — Air filter media containing polymeric nanofibres — Specification of characteristics and measurement methods

1 Scope

This document specifies the characteristics to be measured of air filter media containing polymeric nanofibres on the surfaces of a substrate. It also describes measurement methods for determining the individual characteristics.

This document does not cover characteristics specific for health and safety issues.

NOTE The properties/performances assessment of air filter media related to applications requires the use of relevant published standards. The physical properties and performances of filtration media, such as pressure drop, and the particle removal efficiency of air filter media are measured with test methods suitable for specific applications.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
air filter
filter
device for separating solid or liquid *particles* (3.6) or gaseous contaminant from an air stream passing through the device

Note 1 to entry: The device is generally formed of a layer or layers of porous, fibrous or granular material.

Note 2 to entry: Air being cleaned by a filter must pass through the filter, whereas an air cleaner can reduce air contamination by any method.

[SOURCE: ISO 29464:2017, 3.1.16, modified — The preferred term has been changed to “air filter”.]

3.2
air filter medium
porous permeable material employed in *filtration* (3.3) within which the filtrate is trapped or deposited

Note 1 to entry: The filter medium is composed of a *nanofibre* (3.5) layer(s) and *substrate* (3.7).

[SOURCE: ISO 9912-1:2004, 2.27, modified — “air” has been added to the term and Note 1 to entry has been added.]

© ISO 2020 – All rights reserved