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

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National foreword

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Foreword

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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.

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 micro fibres 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.

TECHNICAL SPECIFICATION ISO/TS 21237:2020

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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.]