SLOVENSKI STANDARD
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Tekstilni proizvodi in nanotehnologije - Napotki za preskuse simulacije sproščanja nanodelcev - Izpostavljenost kože

Textile products and nanotechnologies - Guidance on tests to simulate nanoparticle release - Skin exposure

Leitlinien für Messverfahren für unterschiedliche Aufnahmewege für Nanopartikel - Hautaufnahme

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07.120	Nanotehnologije	Nanotechnologies
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Textile products and nanotechnologies - Guidance on tests to simulate nanoparticle release - Skin exposure

Leitlinien für Messverfahren für unterschiedliche Aufnahmewege für Nanopartikel - Hautaufnahme

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (FprCEN/TR 17222:2017) has been prepared by Technical Committee CEN/TC 248 "Textiles and textile products", the secretariat of which is held by BSI.

This document is currently submitted to the Vote on TR.

1 Scope

The effects of synthetic nanoparticles on human health and the environment are still poorly understood and therefore uncertain. In particular, it is unclear in which are nanoparticles-dose caused negative effects in the organism or in the environment (unknown dose-response relationship). The underlying toxicological mechanisms and possible effects of nanoparticle exposure over long periods of time are poorly understood.

In product advertisements on the Internet and in reports in international journals, especially the functional properties of "nanotextiles" are described. The type of integration of the nanoparticles in textiles is often described only sparsely. Therefore, the present document is based primarily on research studies that include information on the integration of the nanoparticles in the textile material.

The purpose of the present document is to give some guidance on tests to nanoparticle release. The determination of the release of nanoparticles could be performed either through quantification by chemical analysis (5.1), or by determining the linting (5.2), for example.

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.

EN ISO 105-C06, *Textiles — Tests for colour fastness — Part C06: Colour fastness to domestic and commercial laundering (ISO 105-C06)*

EN ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration (ISO 105-E04)*

EN ISO 9073-10, *Textiles — Test methods for nonwovens — Part 10: Lint and other particles generation in the dry state (ISO 9073-10)*

CEN ISO/TS 80004-1:2014, *Nanotechnologies — Vocabulary — Part 1: Core terms (ISO/TS 80004-1:2010)*

CEN ISO/TS 80004-2:2017, *Nanotechnologies — Vocabulary — Part 2: Nano-objects (ISO/TS 80004-2:2015)*

ISO/TS 18110:2015, *Nanotechnologies — Vocabularies for science, technology and innovation indicators*

ISO 19430:2016, *Particle size analysis — Particle tracking analysis (PTA) method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 18110, ISO 19430, CEN ISO/TS 80004-1:2014 or CEN ISO/TS 80004-2:2017 and the following apply.

NOTE They are repeated here for context and better understanding.

3.1
nanoscale
size range from approximately 1 nm to 100 nm

Note 1 to entry: Properties that are not extrapolations from a larger size are predominantly exhibited in this length range.

[SOURCE: CEN ISO/TS 80004-1:2014, 2.1]

3.2
nanoscience
study, discovery and understanding of matter where size- and structure-dependant properties and phenomena manifest, predominantly in the nanoscale (2.9), distinct from those associated with individual atoms or molecules or extrapolation from larger sizes of the same material

[SOURCE: ISO/TS 18110:2015, 2.12]

3.3
nanotechnology
application of scientific knowledge to manipulate and control matter predominantly in the nanoscale (2.9) to make use of size- and structure-dependent properties and phenomena distinct from those associated with individual atoms or molecules or extrapolation from larger sizes of the same material

[SOURCE: ISO/TS 18110:2015, 2.13]

3.4
nanomaterial
material with any external dimension in the nanoscale (3.1) or having internal structure or surface structure in the nanoscale

[SOURCE: ISO 19430:2016, 3.13]

Note 1 to entry: In Commission Recommendation of 18 October 2011 on the definition of nanomaterial (2011/696/EU), the term "nanomaterial' means "a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm-100 nm".

3.5
nano-object
discrete piece of material with one, two or three external dimensions in the nanoscale (3.1)

Note 1 to entry: The second and third external dimensions are orthogonal to the first dimension and to each other.

[SOURCE: CEN ISO/TS 80004-1:2014, 2.2]

3.6
nanofibre
nano-object with two similar external dimensions in the nanoscale (3.1) and the third dimension significantly larger

Note 1 to entry: The largest external dimension is not necessarily in the nanoscale.

Note 2 to entry: The terms nanofibril and nanofilament can also be used.

Note 3 to entry: See CEN ISO/TS 80004-2:2017, 4.4, Note 1.

[SOURCE: CEN ISO/TS 80004-2:2017, 4.5]

3.7
nanoparticle
nano-object (3.5) with all external dimensions in the nanoscale (3.1) where the lengths of the longest and the shortest axes of the nano-object do not differ significantly

Note 1 to entry: If the dimensions differ significantly (typically by more than 3 times), terms such as nanofibre (3.6) or nanoplate (CEN ISO/TS 80004-2:2017, 4.6) may be preferred to the term nanoparticle.

[SOURCE: CEN ISO/TS 80004-2:2017, 4.4]

3.8
nanotextile
textile incorporating nanoparticles

4 Nanoparticles in textile products

4.1 Textile manufacturing process

Various nanotechnologies can be used to produce “nanotextiles”.

The nanoparticles are:

a) integrated into the fibres, or

b) applied on the fibre surface (e.g. as a finish, a coating).

The present document is intended to clarify nanotextile manufacturing processes and application areas.

4.2 Application areas and products

Nanotechnology in the development of new materials in the textile industry is used:

- to improve existing functionality, or
- to produce a textile material with entirely new properties.

Foremost among the applications currently feasible are, in particular dirt and/or water-repellent and antibacterial textiles and, although they are as yet produced on a very small scale, textiles which give UV radiation protection and so-called “cosmetotextiles” (e.g. ladies tights) with woven-in nano-capsules containing special body care substances. Bullet-proof vests containing carbon nanotubes are also currently available, as are heat isolating and moisture-absorbent textiles.

Table 1 gives an overview of nanomaterials in relation to the possible properties of the “nanotextiles”.

Table 1 — Overview of nanomaterials in relation to the possible properties of the "nanotextiles"

		Carbon nanotubes	Graphene	Nano titaniumdioxide	Nano zincoxide	Nanosilver, or other nanometals	Nano aluminiumoxide	Nano ceriumoxide	Nano antimoniumtrioxide	Nano silica	Nanoclay	Nano calcium carbonate	Nanocellulose	Nano silica	Quantom dots	Dendrimers
Mechanical	Mechanical strength	x	X							x	x	x	x	~~x~~		X
	Dimensional stability		X							x	X					
	Rheological modification									x	x	x	x			X
	Impact strength, toughness and stiffness	x	X							x		x	x	~~x~~		X
	Low density, light weight	x											X			
	Scratch resistance	x					x			X						
	Tenacity	x								x			X			
	Smoothness									X						
	Processing aid	x	X											~~X~~		
Electrical	Conductivity, antistatic		X								X					
Thermal and optical	Temperature resistance		X								X					
	UV resistance			X	x		x							~~x~~	X	
	Transparency and optical effects	x					x		x	x				~~x~~	X	
	Colour improvements									X					x	
	Thermal conductivity	x														
	Infrared absorption								X							

		Carbon nanotubes	Graphene	Nano titaniumdioxide	Nano zincoxide	Nanosilver, or other nanometals	Nano aluminiumoxide	Nano ceriumoxide	Nano antimoniumtrioxide	Nano silica	Nanoclay	Nano calcium carbonate	Nanocellulose	Nano silica	Quantom dots	Dendrimers
Chemical	Chemical resistance	x	X													X
	Chemical reactivity															X
	Fire resistance						x		x		X					
	Antimicrobial					X										
	Barrier properties		x							x	x		X			
Automization	Self cleaning			X												
	Self healing	x														