



SLOVENSKI STANDARD
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Nanotehnologija - Smernice za ravnanje z odpadki in njihovo odstranjevanje pri proizvodnji in predelavi proizvedenih nanopredmetov

Nanotechnologies - Guidelines for the management and disposal of waste from the manufacturing and processing of manufactured nano-objects

Nanotechnologien - Leitfaden für die Handhabung und Entsorgung des Abfalls von hergestellten und verarbeiteten Nano-Objekten

Nanotechnologies - Lignes directrices pour la gestion et le traitement des déchets issus de la fabrication et la transformation des nano-objets manufacturés

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Nanotechnologies - Guidelines for the management and disposal of waste from the manufacturing and processing of manufactured nano-objects

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This draft Technical Specification is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/TC 352.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a Technical Specification. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a Technical Specification.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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FprCEN/TS 17275:2018 (E)

European foreword

This document (FprCEN/TS 17275:2018) has been prepared by Technical Committee CEN/TC 352 “Nanotechnologies”, the secretariat of which is held by AFNOR.

This document is currently submitted to the Vote on TS.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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Introduction

Innovation in nanotechnology is linked with commercial developments that use nanomaterials to deliver new products or services to the market. In recent years, nanotechnology has moved from the research laboratory to the manufacturing plant and into consumer products. Manufactured nano-objects (MNOs) can be incorporated in products to enhance their performance and create new properties. In the process of making such products, using them or disposing them at the end of their life, MNOs may be released and come in contact with humans and the environment. As of yet, MNO producers and the scientific community do not have a complete understanding of whether nanomaterials, particularly MNOs pose a risk to the health of workers, consumers and the environment. It is thought that some MNOs may pose a hazard to human health and the environment.

Nanomaterials include nano-objects and nanostructured materials. Nano-objects may be naturally occurring, incidental [CEN ISO/TS 80004-1:2015, 2.10], engineered or manufactured [CEN ISO/TS 80004-1:2015, 2.9]. In general, naturally occurring and incidental nano-objects are emitted into the atmosphere by natural process or as a by-product of a process (for example welding fume, combustion fume). Engineered nano-objects (ENOs) or MNOs, a very specific class of nanomaterials, are sometimes incorporated in products to achieve new or enhanced / improved properties, which are only attainable with nanotechnology. In some cases, they may be substituted for highly toxic substances, may lead to waste reduction, or may extend the longevity of a product.

MNOs may have distinct physicochemical properties as a result of their nanoscale formulation. Thus, they may exhibit hazards and risks to human health and to the environment distinct from those presented by non-nanoscale materials. There is therefore a need for specific guidance on the assessment and management of the human health and environmental hazards and risks associated with the management and disposal of waste from the manufacturing and processing of manufactured nano-objects (WMP-MNOs).

The manufacturing of MNOs and their incorporation in products may involve multi-stage processes, including primary synthesis, precipitation, sorting, chemical or physical separation and purification, as well as incorporation in intermediate products.

Each process in the manufacturing chain may generate process wastes, residues and diffuse release of MNOs or their aggregates and agglomerates. Process wastes may result from:

- making more or buying more than necessary (for example overproduction, large batches or excess items that remain in stock);
- making batches that are not at the correct specification or requirements of the customer; and
- making batches with expired specifications or requirements.

Diffuse release means the (unintended) release of chemicals to air, groundwater and soil, which occur in a diffuse way due to processes such as migration or dispersing, and which should be avoided. Diffuse emissions can be controlled via, for example, waste collection and adequate waste treatment, where MNOs will be either eliminated or accumulated in a controlled system.

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In general, WMP-MNOs are expected to be in a powder form, in a liquid suspension and /or contaminated items. Nano-objects resulting from the manufacturing and processing of MNOs can be classified in two categories:

- nano-objects having the same physical and chemical identity as the final intended nano-object production batch, which are generated during manufacturing and processing;
- nano-objects being production residues or being the result of a non-conformed batch production (production refuse). Their physico-chemical characteristics may be known, partially known or unknown due to unintended transformation processes.

Powder-form and liquid WMP-MNOs can be composed purely of nano-objects and non-nanoscale particles.

The industry involved in nanotechnology and nanomaterials is a linear network as illustrated in Figure 1. It involves organizations ranging from raw material producers (suppliers of MNOs), modifiers (producers of semi-products obtained by modifying the composition or the surface of MNOs), to formulators and users of nanomaterials (who incorporate MNOs or semi-products in finished products, resulting in nanostructured materials or nanocomposites).

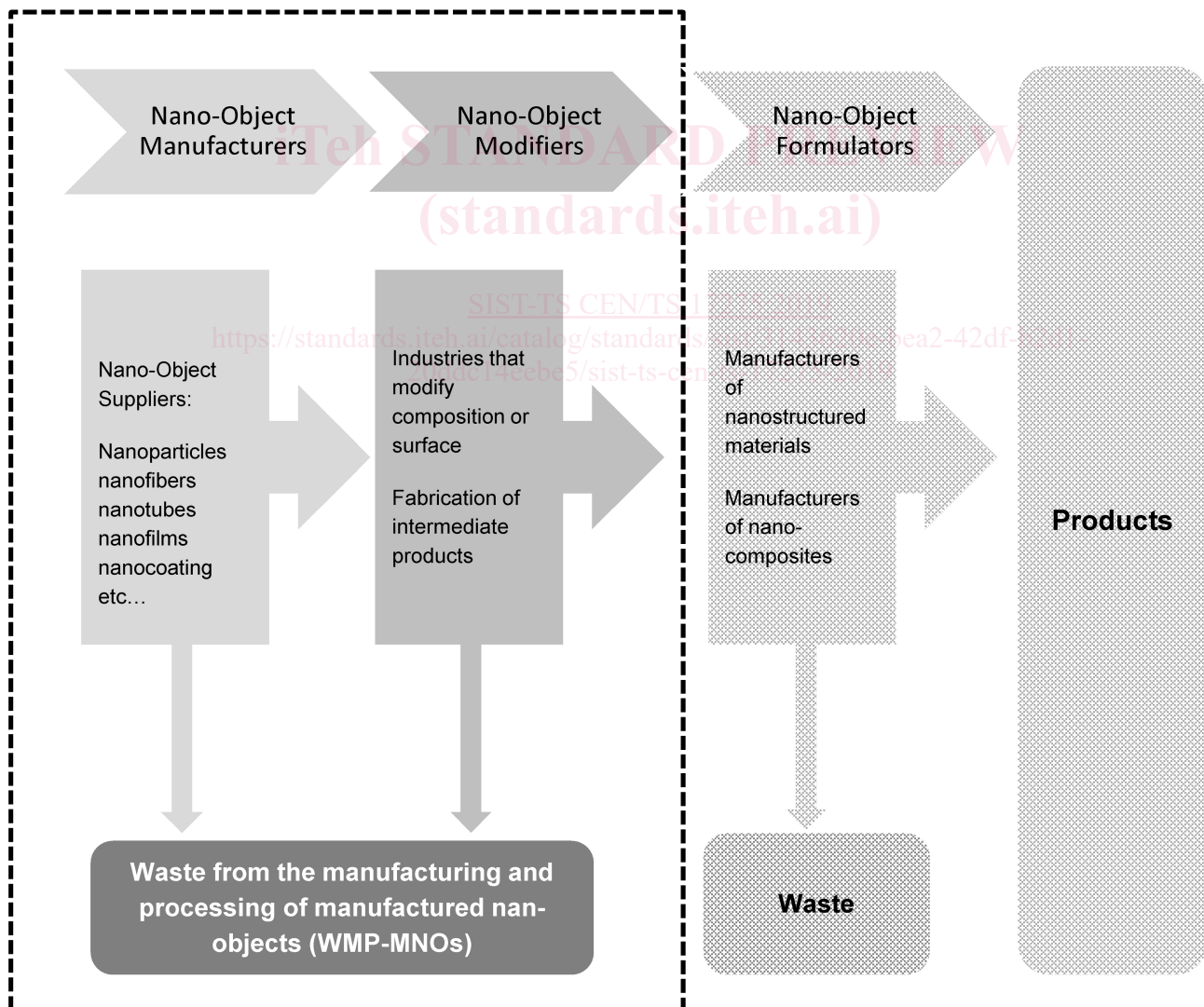


Figure 1 — Overview of the nanotechnology and nanomaterials industry

Disposal routes for non-nanoscale materials are well known and well-regulated in all EU member states by national and the EU directives. It is not the intention of this document to lead on this. This document serves as a guideline to the safe waste management of WMP-MNOs and provides guidelines for all waste management activities from the manufacturing and processing of MNOs as illustrated in Figure 1 by the dotted lines.

This Technical Specification (TS) aims to provide guidance for all waste management activities associated with the manufacturing and processing of MNOs including the management of process waste, residues and diffuse emissions of MNOs and takes into account the uncertainties in this emerging technology and the potential for human and environmental exposure.

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FprCEN/TS 17275:2018 (E)**1 Scope**

This document provides guidelines for all waste management activities from the manufacturing and processing of manufactured nano-objects.

The guidelines apply to all actors in the waste management chain, namely MNO manufacturers, MNO modifiers, as well as waste disposal companies and carriers and consignees of WMP-MNOs.

This document does not intend to provide guidelines on the management and disposal of nanocomposites, waste derived from consumer products containing nano-objects or waste containing only naturally occurring or incidental nano-objects. Also excluded from the scope are any waste from non-nanoscale materials resulting from the manufacturing and processing of MNOs.

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Nanotechnologies general terms**3.1.1****engineered nano-object**

nano-object (3.1.6) designed for specific purpose or function

[SOURCE: CEN ISO/TS 80004-2:2017, 4.1]

3.1.2**incidental nano-object**

nano-object (3.1.6) generated as an unintentional by-product of a process

Note 1 to entry: The process includes manufacturing, biotechnological or other processes.

[SOURCE: CEN ISO/TS 80004-2:2017, 4.3]

3.1.3**manufactured nano-object**

nano-object (3.1.6) intentionally produced to have selected properties or composition

[SOURCE: CEN ISO/TS 80004-2:2017, 4.2]

3.1.4**nanocomposite**

solid comprising a mixture of two or more phase-separated materials, one or more being *nanophase* (2.12 of CEN ISO/TS 80004-1:2015)

Note 1 to entry: Gaseous nanophases are excluded [they are covered by *nanoporous material* (3.4 of CEN ISO/TS 80004-1:2015)].

Note 2 to entry: Materials with *nanoscale* (3.1.7) phases formed by precipitation alone are not considered to be nanocomposite materials.

[SOURCE: CEN ISO/TS 80004-4:2011, 3.2]

3.1.5

nanomaterial

material with any external dimension in the *nanoscale* (3.1.7) or having internal structure or surface structure in the nanoscale

Note 1 to entry: This generic term is inclusive of *nano-object* (3.1.6) and *nanostuctured material* (3.1.8).

Note 2 to entry: See also definitions 2.8 to 2.10 of CEN ISO/TS 80004-1:2015.

[SOURCE: CEN ISO/TS 80004-1:2015, 2.4]

3.1.6

nano-object

discrete piece of material with one, two or three external dimensions in the *nanoscale* (3.1.7)

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

[SOURCE: CEN ISO/TS 80004-1:2015, 2.5]

3.1.7

nanoscale

length range approximately from 1 nm to 100 nm

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

[SOURCE: CEN ISO/TS 80004-1:2015, 2.1]

3.1.8

nanostuctured material

material having internal *nanostucture* (3.1.9) or surface nanostucture

Note 1 to entry: This definition does not exclude the possibility for a *nano-object* (3.1.6) to have internal structure or surface structure. If external dimension(s) are in the *nanoscale* (3.1.7), the term nano-object is recommended.

[SOURCE: CEN ISO/TS 80004-1:2015, 2.7]

3.1.9

nanostucture

composition of inter-related constituent parts in which one or more of those parts is a *nanoscale* (3.1.7) region

Note 1 to entry: A region is defined by a boundary representing a discontinuity in properties.

[SOURCE: CEN ISO/TS 80004-1:2015, 2.6]

FprCEN/TS 17275:2018 (E)**3.2 Waste general terms****3.2.1****ash**

solid residue of effectively complete combustion

[SOURCE: ISO 29464:2017, 3.2.20]

3.2.2**flue gas**

gaseous product of combustion including excess air and particulate matter in form of aerosols

Note 1 to entry: Adapted from EN ISO 13705:2012, 3.1.31.

3.2.3**groundwater**

water which is being held in, and can usually be recovered from, an underground formation

[SOURCE: ISO 6107-1:2004, 41]

3.2.4**intermediate products**

output from a *unit process* that is *input* to other unit processes that require further transformation within the system

[SOURCE: EN ISO 14050:2010, 6.2.1]

3.2.5**landfill**

waste disposal site for the deposit of waste on to or into land under controlled or regulated conditions

[SOURCE: ISO 15270:2008, 3.18]

3.2.6**leachate**

liquid that has percolated through solid wastes

[SOURCE: ISO/TR 14685:2001, 2.29]

3.2.7**contaminant****pollutant**

substance (solid, liquid or gas) that negatively affects the intended use of a fluid

[SOURCE: ISO 29464:2017, 3.1.8]

3.2.8**residue**

material left over from consumption or a process

[SOURCE: ISO 6707-1:2017, 3.8.12]

3.2.9**sedimentation**

process of settling and deposition, under the influence of gravity, of suspended matter carried by water or wastewater

[SOURCE: ISO 6107-1:2004, 62]

3.2.10**sewage**

domestic wastewater

water-borne wastes of a community

[SOURCE: ISO 6107-1:2004, 65]

3.2.11**sludge**

accumulated settled solids separated from various types of water as a result of natural or artificial processes

[SOURCE: ISO 6107-1:2004, 67]

3.2.12**surface water**

water which flows over, or rests on, the surface of a land mass

[SOURCE: ISO 6107-1:2004, 74]

3.2.13**waste**

substances or objects with the holder intends or is required to dispose of

Note 1 to entry: This definition is taken from the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* (22 March 1989), but is not confined in this International Standard to hazardous waste.

[SOURCE: EN ISO 14040:2006, 3.35]

unneded or useless matter which is to be discarded

[SOURCE: ISO 18309:2014, 3.6]

3.2.14**waste treatment**

chemical or physical processing, or both, of waste for interim or ultimate disposal

Note 1 to entry: Adapted from ISO 12749-3:2015, 3.7.12.

3.2.15**waste management**

all administrative and operational activities involved in the handling, pretreatment, treatment, conditioning, transport, material storage, and disposal of waste

Note 1 to entry: Adapted from ISO 12749-3:2015, 3.7.7.

FprCEN/TS 17275:2018 (E)**3.3 Waste management terms****3.3.1****consignor**

party which, by contract with a carrier, consigns or sends goods with the carrier, or has them conveyed by him

[SOURCE: ISO/TS 24533:2012, 2.13]

3.3.2**carrier**

person or organization, which owns and/or operates a transport means, engaged in the transportation of passengers or property by land, rail, air or water

[SOURCE: ISO/TS 24533:2012, 2.7]

3.4 Waste treatment terms**3.4.1****aerobic condition**

descriptive of a condition in which dissolved oxygen is present

[SOURCE: ISO 6107-1:2004, 5]

3.4.2**anaerobic condition**

descriptive of a condition in which dissolved oxygen, nitrate and nitrite are absent

[SOURCE: ISO 6107-1:2004, 6]

3.4.3**centrifugation**

partial removal of water from wastewater sludge by centrifugal force

[SOURCE: ISO 6107-1:2004, 11]

3.4.4**chemical treatment**

process involving the addition of chemicals to achieve a specific result

[SOURCE: ISO 6107-1:2004, 12]

3.4.5**chemical coagulation**

process of adding a chemical (the coagulant) which causes the destabilization and aggregation of dispersed colloidal material into **flocs**

[SOURCE: ISO 6107-1:2004, 13]

3.4.6**filtration**

treatment process whereby water is passed through a porous layer of material in order to remove particulate matter

[SOURCE: ISO 6107-1:2004, 36]

3.4.7**flocculation**

formation of large separable particles by aggregation of small particles; the process is usually assisted by mechanical, physical, chemical or biological means

[SOURCE: ISO 6107-1:2004, 38]

3.4.8**flotation**

raising of suspended matter in water to the surface, for example by the entrainment of a gas on the suspended matter

[SOURCE: ISO 6107-1:2004, 39]

3.4.9**incineration**

controlled burning of waste products or other combustible materials in an incinerator or similar apparatus

[SOURCE: ISO 16165:2013, 2.11.1]

3.4.10**incinerator**

device constructed for the purpose of disposing of materials through thermal oxidation

[SOURCE: ISO 16165:2013, 2.11.2]

3.4.11**reverse osmosis**

flow of water through a membrane from a more concentrated to a less concentrated solution, as a result of applying pressure to the more concentrated solution in excess of the normal osmotic pressure

[SOURCE: ISO 6107-1:2004, 61]

3.4.12**sedimentation**

process of settling and deposition, under the influence of gravity, of suspended matter carried by water or wastewater

[SOURCE: ISO 6107-1:2004, 62]

3.5 Waste analysis terms**3.5.1****electrokinetic potential****zeta potential**

difference in electric potential between that at the slipping plane and that of the bulk liquid

Note 1 to entry: Electrokinetic potential is expressed in volts.

[SOURCE: ISO 13099-1:2012, 2.1.8]