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Nanotechnologies - Vocabulary - Part 1: Core terms (ISO/TS 80004-1:2010)

Nanotechnologies - Vocabulaire - Partie 1: Termes "coeur" (ISO/TS 80004-1:2010)

Nanotechnologien - Fachwörterverzeichnis - Teil 1: Kernbegriffe (ISO/TS 80004-1:2010)

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Foreword

The text of ISO/TS 80004-1:2010 has been prepared by Technical Committee ISO/TC 229 “Nanotechnologies” of the International Organization for Standardization (ISO) and has been taken over as CEN ISO/TS 80004-1:2014 by Technical Committee CEN/TC 352 “Nanotechnologies” the secretariat of which is held by AFNOR.

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Endorsement notice

The text of ISO/TS 80004-1:2010 has been approved by CEN as CEN ISO/TS 80004-1:2014 without any modification.

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Introduction

Many predict that applications of nanotechnologies will ultimately pervade virtually every aspect of life, and enable dramatic advances in communication, health, manufacturing, materials and knowledge-based technologies. Even if this is only partially realized, there is a need to provide industry and researchers with suitable tools to assist with the development, application and communication of nanotechnologies.

An essential tool is the harmonization of terminology and definitions, in order to promote common understanding and consistent usage across the industrial sectors where nanotechnologies are being developed and used.

In the context of the ISO/TS 80004 series of standards, “terminology” refers to the following:

a) a structured or conceptual presentation of vocabulary employed in nanotechnologies, and

b) assigned definitions for specific units of the language in this vocabulary.

This part of ISO/TS 80004 presents terminology and definitions for core terms in this emerging vocabulary, and serves as the foundation for a broader vocabulary constituted collectively by the ISO/TS 80004 series of standards.

Nano-object (2.5) and **nanoscale** (2.1) are examples of core terms in nanotechnologies. These respective definitions employ size and geometric boundaries to express fundamental and measurable aspects of nanomaterials. In the case of the term “nanoscale”, the definition acknowledges that the actual size range of nano-objects may fall outside the precise boundaries normally associated with the concept of scale, by indicating that the upper and lower boundaries are approximate.

As commercial applications continue to emerge, certainty will be tempered by current scientific understanding. There remains debate concerning whether to acknowledge that fullerenes are molecular rather than nanoscale in nature. It is also acknowledged that health and safety considerations associated with intentionally produced and incidental nano-objects do not abruptly end at dimensions of 100 nm. As knowledge expands, it is abundantly clear that a robust terminology will need to capture and convey effectively the performance aspects of intentionally produced nano-objects and nanostructured materials in their definitions, apart from their fundamental size and shape.

Terminology development is proceeding at an intensive pace and needs to be responsive to the needs of the community. There are a number of associated challenges. Care needs to be taken to ensure that the terminology system as a communication tool is not too rigid, too flexible or too general. A definition that is too rigid might overemphasize an aspect that might not be pivotal in every case, or it might not be flexible enough to describe new and related discoveries, whereas a system that is too general might assign meaning to an unanticipated usage that is in fact very different.

It needs to be recognized that nanomaterials, which have dimensions or contain structural regions in the nanoscale, might have intrinsic properties or functionalities that are distinct from those associated with individual atoms, molecules or bulk materials. Furthermore, it is important to recognize that articles fabricated to contain nanomaterials are not necessarily nanomaterials themselves.

It will be an ongoing challenge to communicate complex concepts in definitions in a manner that is meaningful and practical for stakeholders in research, commercial applications and government. The development of core terms and their definitions has benefited from discussion over time concerning scientific, regulatory and consumer usage. The science is still emerging, as is our capacity to measure and characterize nanomaterials, or more generally matter, in the nanoscale. Care needs to be taken to ensure the latest scientific information is incorporated into the terminology as it becomes available. Since the inception of ISO/TC 229 and IEC/TC 113, nanotechnologies have evolved and continue to evolve. It is important to acknowledge that the associated terms and their definitions will likewise follow an evolutionary path.

Many of the definitions in this part of ISO/TS 80004 are determined intentionally to be in harmony with a rational framework and hierarchical system of terminology for nanotechnologies. Figure 1 provides an example, which is applicable to the definitions for **nanomaterial** (2.4), **nano-object** (2.5) and **nanostructured material** (2.7). This hierarchy is not intended to exclude the possibility for a nano-object to have internal structure or surface structure in the nanoscale.

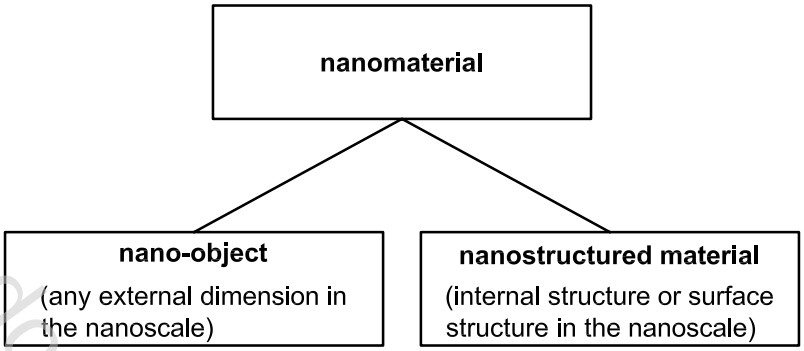

Figure 1 — Nanomaterial framework

Nanotechnologies — Vocabulary —

Part 1:
Core terms

1 Scope

This part of ISO/TS 80004 lists terms and definitions related to core terms in the field of nanotechnologies. It is intended to facilitate communications between organizations and individuals in industry and those who interact with them.

2 Terms and definitions

2.1
nanoscale
size range from approximately 1 nm to 100 nm

NOTE 1 Properties that are not extrapolations from a larger size will typically, but not exclusively, be exhibited in this size range. For such properties the size limits are considered approximate.

NOTE 2 The lower limit in this definition (approximately 1 nm) is introduced to avoid single and small groups of atoms from being designated as nano-objects or elements of nanostructures, which might be implied by the absence of a lower limit.

[ISO/TS 27687:2008, definition 2.1]

2.2
nanoscience
study, discovery and understanding of matter in the **nanoscale** (2.1), where size- and structure-dependent properties and phenomena, as distinct from those associated with individual atoms or molecules or with bulk materials, can emerge

2.3
nanotechnology
application of scientific knowledge to manipulate and control matter in the **nanoscale** (2.1) in order to make use of size- and structure-dependent properties and phenomena, as distinct from those associated with individual atoms or molecules or with bulk materials

NOTE Manipulation and control includes material synthesis.

2.4
nanomaterial
material with any external dimension in the **nanoscale** (2.1) or having internal structure or surface structure in the nanoscale

NOTE 1 This generic term is inclusive of **nano-object** (2.5) and **nanostructured material** (2.7).

NOTE 2 See also **engineered nanomaterial** (2.8), **manufactured nanomaterial** (2.9) and **incidental nanomaterial** (2.10).