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Irish Standard Recommendation
S.R. CEN/TS 17010:2016

Nanotechnologies - Guidance on measurands for characterising nano-objects and materials that contain them

S.R. CEN/TS 17010:2016

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National Foreword

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Nanotechnologies - Guidance on measurands for characterising nano-objects and materials that contain them

Nanotechnologies - Guide sur les mesurandes pour la
caractérisation de nano-objects et des matériaux les
contenant

Nanotechnologien - Leitfaden über Messgrößen zur
Charakterisierung von Nanoobjekten und von
Werkstoffen, die welche enthalten

This Technical Specification (CEN/TS) was approved by CEN on 12 October 2016 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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European foreword

This document (CEN/TS 17010:2016) has been prepared by Technical Committee CEN/TC 352 “Nanotechnologies”, the secretariat of which is held by AFNOR.

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Introduction

The term “nano-object” applies to materials having one, two or three external dimensions in the nanoscale (therefore in the range of approximately 1 to 100 nanometres). Specific properties of nano-objects are usually exhibited in this size range, even if they do not disappear abruptly beyond these limits. Nano-objects, either natural or manufactured, can then be found in the form of nanoplates (one dimension in the nanoscale), nanofibres (two dimensions, or the diameter, in the nanoscale), and nanoparticles (three dimensions in the nanoscale). Nano-objects exhibit higher specific surface areas than larger objects. They are particularly prone to aggregation and agglomeration phenomena due to attractive interactions during their life cycle.

There is increasing use of nano-objects in research and development, industry and commercial applications. Characterization of nano-objects, and their agglomerates and aggregates (sometimes referred to as NOAA) plays an essential role in basic and applied research, through process and product quality control and commercialization to health and environmental protection. Characterization of nano-objects is key to determine their properties, performance and life-time. The methods available for characterization of larger scale materials are often difficult to apply to nano-objects, sometimes due to restrictions of the test systems (e.g. low sensitivity, inadequate resolution of equipment). This has resulted in new techniques and adapting old methods.

One definition of “measurand” used in many ISO standards is the “quantity intended to be measured”. In nanotechnologies measurement and characterization this “intended quantity” could be size, shape, chemical composition, surface charge, etc. However, in reality, an instrument does not always directly measure this fundamental characteristic but measures something else, which is ultimately related to the intended quantity.

This Technical Specification (TS) describes and defines the measurands, both the overarching intended measurands and those actually measured by the instruments, in order to elucidate which measurements can be compared with each other and under which conditions and assumptions. The Technical Specification is split into ten main clauses covering:

- Size and shape (see Clause 6);
- Chemical analysis (see Clause 7);
- Mass and density (see Clause 8);
- Charge (see Clause 9);
- Crystallinity (see Clause 10);
- Optical (see Clause 11);
- Electrical and electronic (see Clause 12);
- Magnetic (see Clause 13);
- Thermal (see Clause 14);
- Other performance related measurands (see Clause 15).

1 Scope

This Technical Specification provides guidelines for the identification of measurands to characterize nano-objects, and their agglomerates and aggregates and to assess specific properties relevant to the performance of materials that contain them. It provides guidance for relevant and reliable measurement.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 481:1993, *Workplace atmospheres - Size fraction definitions for measurement of airborne particles*

EN ISO 3219:1994, *Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate (ISO 3219:1993)*

EN ISO 6892-1:2016, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1:2016)*

CEN ISO/TS 12025:2015, *Nanomaterials - Quantification of nano-object release from powders by generation of aerosols (ISO/TS 12025:2012)*

EN ISO 14577-1:2015, *Metallic materials - Instrumented indentation test for hardness and materials parameters - Part 1: Test method (ISO 14577-1:2015)*

EN ISO 14577-2:2015, *Metallic materials - Instrumented indentation test for hardness and materials parameters - Part 2: Verification and calibration of testing machines (ISO 14577-2:2015)*

EN ISO 14577-3:2015, *Metallic materials - Instrumented indentation test for hardness and materials parameters - Part 3: Calibration of reference blocks (ISO 14577-3:2015)*

EN ISO 14577-4:2007, *Metallic materials - Instrumented indentation test for hardness and materials parameters - Part 4: Test method for metallic and non-metallic coatings (ISO 14577-4:2007)*

EN 15051-1:2013, *Workplace exposure - Measurement of the dustiness of bulk materials - Part 1: Requirements and choice of test methods*

EN 15051-2:2013, *Workplace exposure - Measurement of the dustiness of bulk materials - Part 2: Rotating drum method*

EN 15051-3:2013, *Workplace exposure - Measurement of the dustiness of bulk materials - Part 3: Continuous drop method*

CEN ISO/TS 80004-1:2015, *Nanotechnologies - Vocabulary - Part 1: Core terms (ISO/TS 80004-1:2015)*

ISO/TS 80004-2:2015, *Nanotechnologies - Vocabulary - Part 2: Nano-objects*

CEN ISO/TS 80004-6:2015, *Nanotechnologies - Vocabulary - Part 6: Nano-object characterization (ISO/TS 80004-6:2013)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN ISO/TS 80004-1:2015, ISO/TS 80004-2:2015 and CEN ISO/TS 80004-6:2015 and the following apply.

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