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Nanotechnologies — Considerations for the development of chemical nomenclature for selected nano-objects

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 229, *Nanotechnologies*.

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Introduction

For the purposes of this Technical Report, the term *nomenclature* refers to the name and a minimum set of descriptors which are uniquely assigned to a particular nano-object entity or complex. Advanced measurement and instrumentation allows us to "see" at the nanoscale. Measurement tools and techniques are improving our ability to distinguish among nano-objects with the same chemical composition, but which behave differently, based on differences in size, shape or surface functionalization. Yet, the application of established chemical nomenclature systems to describe differences among nano-objects with the same chemical composition has limitations.

For the research and development community, including academia, nomenclature assists in the communication of properties, effects and other relationships or interactions between nano-objects. It also enables effective communication regarding the specific nano-object, which facilitates repeatability of experimental data by other scientists, replication by manufacturers, and application for and protection of patents. For industry and consumer groups, specific names to distinguish nano-objects allow differentiation between products, facilitate patent applications and protect intellectual property rights. Regulators rely on chemical nomenclature to characterize chemical substance and manage the associated environmental and health risks, if and where applicable.

This Technical Report presents an initial effort to support new work Item proposals to pursue chemical nomenclature that is specifically tailored to nano-objects. It identifies categories of nano-objects which could require distinct nomenclature models and discusses essential descriptors to support nano-object nomenclature conventions. A future consideration will be to decide whether to undertake the development of a searchable information system capable of cataloguing a sizable library of names and structural features. This Report also makes recommendations concerning collaboration with existing chemical nomenclature organisations. Finally, this Technical Report considers how the development of nomenclature models for nano-objects will keep pace with and incorporate new science and terminology.

It should be understood that the term "nanomaterials" is broadly defined by ISO to encompass "nano-objects" and "nanostructured materials". In the future, consideration will be given to chemical and nonchemical nomenclature for classes of nanostructured materials, devices and systems at the nanoscale, and strategic application areas.

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TECHNICAL REPORT **ISO/TR 14786:2014(E)**

Nanotechnologies — Considerations for the development of chemical nomenclature for selected nano-objects

1 Scope

This Technical Report is intended to provide information and analyses in support of the development of chemical nomenclature for the naming of "nano-objects". "Nano-objects" have been defined in ISO/TS 80004-1:2010 to mean "materials with one, two, or three external dimensions in the nanoscale", with the nanoscale defined as the "size range from approximately 1 nm to 100 nm". Nano-objects are further defined as nanoplates, nanofibres, and nanoparticles.

More specifically, the nano-objects that are the subject of this Technical Report are discrete chemical entities rather than devices or mixtures (preparations). The nano-objects discussed in this Technical Report are not intended to constitute an exhaustive list.

This Technical Report is intended to facilitate communications between developers and potential users of nomenclature including academia, industry, government and non-governmental organizations.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO/TS 27687:2008, *Nanotechnologies — Terminology and definitions for nano-objects — Nanoparticle, nanofibre and nanoplate*

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

ISO/TS 80004-3:2010, *Nanotechnologies — Vocabulary — Part 3: Carbon nano-objects*

ISO/TS 80004-4:2011, *Nanotechnologies — Vocabulary — Part 4: Nanostructured materials*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 27687, ISO/TS 80004-1, ISO/TS 80004-3, ISO/TS 80004-4 and the following apply.

3.1
carbon nanotube
CNT
nanotube composed of carbon

Note 1 to entry: Carbon nanotubes usually consist of curved graphene layers, including single-wall carbon nanotubes and multiwall carbon nanotubes.

[SOURCE: ISO/TS 80004-3:2010, definition 4.3]

3.2
fullerene
molecule composed solely of an even number of carbon atoms, which form a closed cage-like fused-ring polycyclic system with 12 five-membered rings and the rest six-membered rings

Note 1 to entry: Adapted from the definition in the IUPAC Compendium of Chemical Terminology.

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