TECHNICAL SPECIFICATION

ISO/TS 80004-4

First edition
2011-12-01

Nanotechnologies — Vocabulary —

Part 4: Nanostructured materials

Nanotechnologies — Vocabulaire —

Partie 4: Matériaux nanostructurés

Reference number
ISO/TS 80004-4:2011(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 80004-4 was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*.

ISO/TS 80004 consists of the following parts, under the general title *Nanotechnologies — Vocabulary*:

— *Part 1: Core terms*

— *Part 3: Carbon nano-objects*

— *Part 4: Nanostructured materials*

— *Part 5: Nano/bio interface*

— *Part 7: Diagnostics and therapeutics for healthcare*

The following parts are under preparation:

— *Part 2: Nano-objects: Nanoparticle, nanofibre and nanoplate*[1)]

— *Part 6: Nanoscale measurement and instrumentation*

— *Part 8: Nanomanufacturing processes*

1) ISO/TS 27687:2008, *Nanotechnologies — Terminology and definitions for nano-objects — Nanoparticle, nanofibre and nanoplate,* will be revised as ISO 80004-2.

Introduction

With increasing scientific knowledge and a growing number of technical terms in this field, the purpose of this Technical Specification is to define important terms for nanostructured materials.

Nanostructured materials are characterized by internal structures or surface structures at the nanoscale. Nano-objects (material with one, two or three external dimensions in the nanoscale) can be nanostructured.

A material should not be classified as nanostructured based solely on its crystalline properties (three-dimensional arrangements of atoms or molecules forming a crystallite, short range order of atoms in amorphous or quasi-amorphous phases, grain boundaries, intragranular interfaces, dislocations, etc.). In contrast, materials with a grain size distribution having a significant fraction of grains in the nanoscale (nanocrystalline), voids and pores in the nanoscale, or precipitations in the nanoscale (i.e. nano-objects in a solid matrix) are sufficient features for materials to be classified as "nanostructured" (see ISO/TS 80004-1:2010, 2.4, nanomaterial). Similarly, almost all materials always have surfaces with morphological and chemical heterogeneities in the nanoscale. Only surfaces that have been intentionally modified or textured to have morphological or chemical heterogeneities in the nanoscale identify materials as "nanostructured".

Five categories of nanostructured materials are covered in this Technical Specification (see Figure 1):

1) nanostructured powder;
2) nanocomposite;
3) solid nanofoam;
4) nanoporous material;
5) fluid nanodispersion.

For some of these five categories, a number of subcategory terms are also defined. The category and subcategory terms are not comprehensive; additional categories and subcategories will be added in later revisions of this Technical Specification.

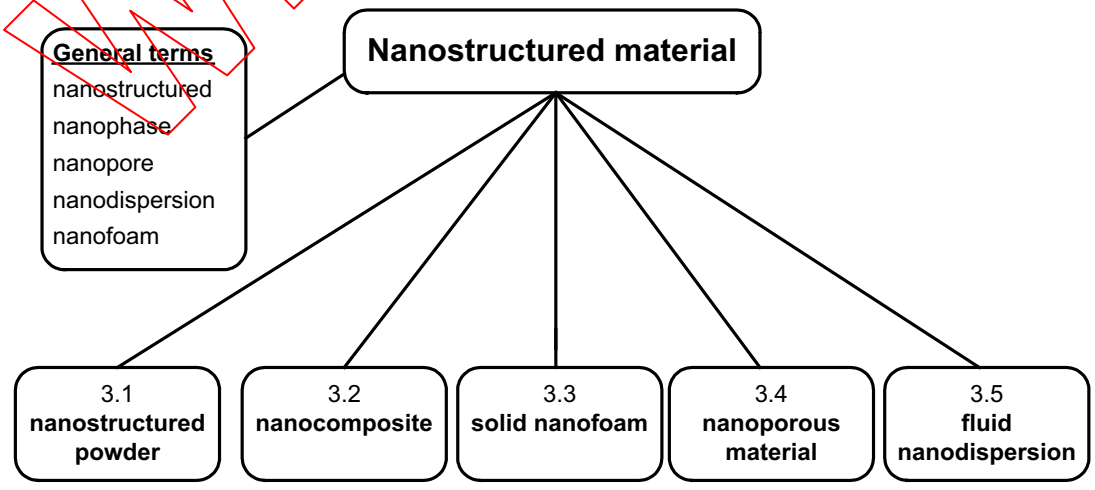

Figure 1 — Categories of nanostructured materials defined in this Technical Specification

In both nanopowders and fluid nanodispersions, the nano-objects (or their aggregates or agglomerates) are arranged in a non-random distribution (generating a short-range order, i.e. a structure). Also, it is recognized that in many cases the nano-objects (or their aggregates or agglomerates) will interact with the molecules of the liquid (particularly in polar liquids) in a thin boundary layer on the surface of each particle. The homogeneity of properties in the liquid is modified in terms of a “nanostructure”. The effects can be revealed by physico-chemical measurements.

If, on the other hand, the liquid medium serves as a background and there is no particular interrelation among the nano-objects contained within it, then such a nanosuspension is not considered “nanostructured” as a whole but rather just as an ensemble of nano-objects. In this sense, the term “nanosuspension” as defined here recognizes a grey zone between nanostructured material and a material consisting of nano-objects. Overall, the conclusion was that the term “nanosuspension” should be included in this Technical Specification because of its current and expanding usage to describe materials in the field.