



SLOVENSKI STANDARD
SIST-TS CEN ISO/TS 80004-8:2015
01-julij-2015

Nanotehnologije - Slovar - 8. del: Procesi nanoproizvodnje (ISO/TS 80004-8:2013)

Nanotechnologies - Vocabulary - Part 8: Nanomanufacturing processes (ISO/TS 80004-8:2013)

Nanotechnologien - Fachwörterverzeichnis - Teil 8: Industrieller Nanoherstellungsprozess (ISO/TS 80004-8:2013)

Nanotechnologies - Vocabulaire - (Partie 8: Processus de nanofabrication (ISO/TS 80004-8:2013)

iTeh STANDARD PREVIEW
(standards.iTeh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iTeh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-c2181c7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

Ta slovenski standard je istoveten z: CEN ISO/TS 80004-8:2015

ICS:

01.040.07	Naravoslovne in uporabne vede (Slovarji)	Natural and applied sciences (Vocabularies)
07.120	Nanotehnologije	Nanotechnologies

SIST-TS CEN ISO/TS 80004-8:2015 **en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN ISO/TS 80004-8

May 2015

ICS 07.030; 01.040.07

English Version

Nanotechnologies - Vocabulary - Part 8: Nanomanufacturing processes (ISO/TS 80004-8:2013)

Nanotechnologies - Vocabulaire - Partie 8: Processus de nanofabrication (ISO/TS 80004-8:2013)

Nanotechnologien - Fachwörterverzeichnis - Teil 8: Industrieller Nanoherstellungsprozess (ISO/TS 80004-8:2013)

This Technical Specification (CEN/TS) was approved by CEN on 16 May 2015 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.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

	Page
Foreword.....	3

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>

Foreword

The text of ISO/TS 80004-8:2013 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 80004-8:2015 by Technical Committee CEN/TC 352 “Nanotechnologies” the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO/TS 80004-8:2013 has been approved by CEN as CEN ISO/TS 80004-8:2015 without any modification.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>

TECHNICAL
SPECIFICATION

ISO/TS
80004-8

First edition
2013-12-15

**Nanotechnologies — Vocabulary —
Part 8:
Nanomanufacturing processes**

*Nanotechnologies — Vocabulaire —
Partie 8: Processus de nanofabrication*

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>



Reference number
ISO/TS 80004-8:2013(E)

© ISO 2013

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword.....	iv
Introduction.....	vi
1 Scope.....	1
2 Terms and definitions from other parts of ISO/TS 80004.....	1
3 General terms.....	3
4 Directed assembly.....	4
5 Self-assembly processes.....	4
6 Synthesis.....	5
6.1 Gas process phase — Physical methods.....	5
6.2 Gas process phase — Chemical methods.....	6
6.3 Liquid process phase — Physical methods.....	7
6.4 Liquid process phase — Chemical methods.....	8
6.5 Solid process phase — Physical methods.....	8
6.6 Solid process phase — Chemical methods.....	10
7 Fabrication.....	11
7.1 Nanopatterning lithography.....	11
7.2 Deposition processes.....	14
7.3 Etching processes.....	16
7.4 Printing and coating.....	18
Annex A (informative) Identification of output resulting from defined synthesis processes.....	19
Annex B (informative) Index.....	21
Bibliography.....	27

ISO/TS 80004-8:2013(E)

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. 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. 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

ISO/TS 80004-8 was prepared jointly by Technical Committee ISO/TC 229, *Nanotechnologies*, and Technical Committee IEC/TC 113, *Nanotechnology standardization for electrical and electronic products and systems*.

Documents in the 80000 to 89999 range of reference numbers are developed by collaboration between ISO and IEC.

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 6: Nano-object characterization*
- *Part 7: Diagnostics and therapeutics for healthcare*
- *Part 8: Nanomanufacturing processes*

The following parts are under preparation:

- *Part 2: Nano-objects: Nanoparticle, nanofibre and nanoplate¹⁾*
- *Part 9: Nano-enabled electrotechnical products and systems*
- *Part 10: Nano-enabled photonic components and systems*
- *Part 11: Nanolayer, nanocoating, nanofilm, and related terms*
- *Part 12: Quantum phenomena in nanotechnology*

1) Revises and replaces ISO/TS 27687^[5].

Graphene and other two-dimensional materials is to form the subject of a future part 13.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST-TS CEN ISO/TS 80004-8:2015

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>

ISO/TS 80004-8:2013(E)

Introduction

Nanomanufacturing is the essential bridge between the discoveries of the nanosciences and real-world nanotechnology products.

Advancing nanotechnology from the laboratory into volume production ultimately requires careful study of manufacturing process issues including product design, reliability and quality, process design and control, shop floor operations, supply chain management, workplace safety and health practices during the production, use, and handling of nanomaterials. Nanomanufacturing encompasses directed self assembly and assembly techniques, synthetic methodologies, and fabrication processes such as lithography and biological processes. Nanomanufacturing also includes bottom-up directed assembly, top-down high resolution processing, molecular systems engineering, and hierarchical integration with larger scale systems. As dimensional scales of materials and molecular systems approach the nanoscale, the conventional rules governing their behaviour may change significantly. As such, the behaviour of a final product is enabled by the collective performance of its nanoscale building blocks.

Biological process terms are not included in this first edition of the nanomanufacturing vocabulary, but considering the rapid development of the field, it is expected that terms in this important area will be added in a future update to this Technical Specification or in companion documents in the 80004 series. This could include both the processing of biological nanomaterials and the use of biological processes to manufacture materials at the nanoscale.

Similarly, additional terms from other developing areas of nanomanufacturing, including composite manufacturing, roll-to-roll manufacturing, and others, will be included in future documents.

There is a distinction between the terms nanomanufacturing and nanofabrication. Nanomanufacturing encompasses a broader range of processes than does nanofabrication. Nanomanufacturing encompasses all nanofabrication techniques and also techniques associated with materials processing and chemical synthesis.

This document provides an introduction to processes used in the early stages of the nanomanufacturing value chain, namely the intentional synthesis, generation or control of nanomaterials, including fabrication steps in the nanoscale. The nanomaterials that result from these manufacturing processes are distributed in commerce where, for example, they may be further purified, be compatibilized to be dispersed in mixtures or composite matrices, or serve as integrated components of systems and devices. The nanomanufacturing value chain is, in actuality, a large and diverse group of commercial value chains that stretch across these sectors:

- the semiconductor industry (where the push to create smaller, faster, and more efficient microprocessors heralded the creation of circuitry less than 100 nm in size);
- electronics and telecommunications;
- aerospace, defence, and national security;
- energy and automotive;
- plastics and ceramics;
- forest and paper products;
- food and food packaging;
- pharmaceuticals, biomedicine, and biotechnology;
- environmental remediation;
- clothing and personal care.

There are thousands of tonnes of nanomaterials on the market with end use applications in several of these sectors, such as carbon black and fumed silica. Nanomaterials which are rationally designed with

specific purpose are expected to radically change the landscape in areas such as biotechnology, water purification, and energy development.

The majority of sections in this document are organized by process type. In the case of [section 6](#), the logic of placement is as follows: in the step before the particle is made, the material itself is in a gas/liquid/solid phase. The phase of the substrate or carrier in the process does not drive the categorization of the process. As an example, consider iron particles that are catalysts in a process by which you seed oil with iron particles, the oil vaporizes and condenses forming carbon particles on the iron particles. What vaporizes is the oil, and therefore it is a gas phase process. Nanotubes grown from the gas phase, starting with catalyst particles that react with the gas phase to grow the nanotubes, thus this is characterized as a gas process. Indication of whether synthesis processes are used to manufacture nano-objects, nanoparticles, or both, is provided in [Annex A](#).

A common understanding of the terminology used in practical applications will enable communities of practice in nanomanufacturing and will advance nanomanufacturing strength worldwide. Extending the understanding of terms across the existing manufacturing infrastructure will serve to bridge the transition between the innovations of the research laboratory and the economic viability of nanotechnologies.

For informational terms supportive of nanomanufacturing terminology, see Reference [\[1\]](#).

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST-TS CEN ISO/TS 80004-8:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/6104cb6b-b174-47b8-bd69-e218fe7d77b9/sist-ts-cen-iso-ts-80004-8-2015>