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## Nanotechnologies - Standard terms and their definition for cellulose nanomaterial

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## National foreword

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## **Nanotechnologies — Standard terms and their definition for cellulose nanomaterial**

*Termes normalisés et leur définition pour les nanomatériaux à base  
de cellulose*



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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](http://www.iso.org/directives)).

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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 voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*.

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## Introduction

Cellulose is a polymer produced by nature. In plants, animals, algae and bacteria, cellulose is extruded from terminal enzyme complexes (TC). TCs are made up of many identical subunits, each containing at least one catalytic site from which a single cellulose chain is synthesized. Cellulose chains from a single TC combine to form an elementary fibril. As TCs in plants, animals, algae, and bacteria have different numbers and configurations of subunits, the elementary fibrils they produce have different geometries. [4] Whether cellulose nanomaterials are separated by industrial processes or produced directly by organisms, they all contain a common structural component, which is the elementary fibril. This common component, the elementary fibril, provides a way to describe cellulose nanomaterials from all manufacturing methods and cellulose sources.

In industrial productions, cellulose nanomaterials can be manufactured by conversion of wood pulp through chemical, biological or mechanical processes. In the case of bacterium-based cellulose nanomaterials, they are produced directly by bacteria and can be further acid-hydrolysed to smaller dimensions. Besides trees and bacteria, algae is another potential sources of cellulose nanomaterials for industrial applications. Due to their renewable nature and unique properties, cellulose nanomaterials have developed into platform materials that have application potential in a wide range of products including those that currently utilize petroleum-based ingredients.

In the current stage of development, several terms to describe cellulose nanomaterials coexist and have created confusion among users. Rather than delaying standards development until knowledge accumulated with market maturity is available, we have an opportunity to define a standard vocabulary for cellulose nanomaterials as they enter the market place. It is anticipated that as the market for cellulose nanomaterials matures, so too will the standard vocabulary. Beginning to define a standard vocabulary now will facilitate future communication, eliminate confusion, remove trade barriers and provide policy makers and regulators with a set of consensus-based terms.

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# Nanotechnologies — Standard terms and their definition for cellulose nanomaterial

## 1 Scope

This document defines terms and definitions for different types of cellulose nanomaterials including secondary components found in cellulose nanomaterials due to their manufacturing processes. The document also gives information on cellulose micromaterials in [Annex A](#).

Where necessary, terms from the ISO/IEC 80004 vocabulary series are included in this document. Terms in this document are applicable to all types of cellulose nanomaterials regardless of production methods and their origin (plants, animals, algae or bacteria).

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 Core nanotechnology terms related to cellulose nanomaterials

#### 3.1.1

##### **nanoscale**

length range approximately from 1 nm to 100 nm

Note 1 to entry: Properties that are not extrapolations from larger sizes are predominately exhibited in this length range.

[SOURCE: ISO/TS 80004-1:2015, 2.1]

#### 3.1.2

##### **nanomaterial**

material with any external dimension in the *nanoscale* ([3.1.1](#)) or having internal structure or surface structure in the nanoscale

Note 1 to entry: This generic term is inclusive of *nano-object* ([3.1.3](#)) and *nanostructured material* ([3.1.5](#)).

Note 2 to entry: See also definitions of engineered nanomaterial, manufactured nanomaterial and incidental nanomaterial in ISO/TS 80004-1:2015.

[SOURCE: ISO/TS 80004-1:2015, 2.4]

#### 3.1.3

##### **nano-object**

discrete piece of material with one, two or three external dimensions in the *nanoscale* ([3.1.1](#))

Note 1 to entry: The second and third external dimensions are orthogonal to the first dimension and to each other.

[SOURCE: ISO/TS 80004-1:2015, 2.5]