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STN P	**Nanotechnológie Slovník Časť 11: Nanovrstva, nanofilm a príbuzné termíny (ISO/TS 80004-11: 2017)**	**STN P CEN ISO/TS 80004-11** 60 3030

Nanotechnologies - Vocabulary - Part 11: Nanolayer, nanocoating, nanofilm, and related terms (ISO/TS 80004-11:2017)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 11/20

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English Version

Nanotechnologies - Vocabulary - Part 11: Nanolayer, nanocoating, nanofilm, and related terms (ISO/TS 80004-11:2017)

Nanotechnologies - Vocabulaire - Partie 11: Nanocouche, nanorevêtement, nanofilm et termes associés (ISO/TS 80004-11:2017)

Nanotechnologien - Fachwörterverzeichnis - Teil 11: Nanoschicht, Nanobeschichtung, Nanofilm und verwandte Begriffe (ISO/TS 80004-11:2017)

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European foreword

The text of ISO/TS 80004-11:2017 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 80004-11:2020 by Technical Committee CEN/TC 352 "Nanotechnologies" the secretariat of which is held by AFNOR.

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Endorsement notice

The text of ISO/TS 80004-11:2017 has been approved by CEN as CEN ISO/TS 80004-11:2020 without any modification.

TECHNICAL SPECIFICATION

ISO/TS 80004-11

First edition

Nanotechnologies — Vocabulary —

Part 11: Nanolayer, nanocoating, nanofilm, and related terms

Nanotechnologies — Vocabulaire —

Partie 11: Nano-couche, nano-revêtement, nano-film et termes associés

PROOF/ÉPREUVE

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Foreword

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This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*, in collaboration with IEC/TC 113, *Nanotechnology for electrotechnical products and systems*.

A list of all parts in the ISO/TS 80004 series can be found on the ISO website.

Introduction

Nanotechnologies are used in many application areas providing specific functionalities. Ordered structures are beginning to be used increasingly in applications such as layered coatings for protection of surfaces from wear, in which there can be multiple layers with individual layer thicknesses of just a few nanometres. Nanotextured surfaces are being developed where a patterned texture on the surface of a component can have a major influence on the properties of the component.

When discussing these applications of nanotechnologies, a common frame of reference for certain general terms is desirable. In general, a coating is applied to a substrate and is not discrete. In this regard, there is general agreement that a coating which is nanoscale in thickness should not be considered a nanoplate due to the integral relationship of the coating to the substrate. A film is freestanding or applied to a substrate, a layer can be internal or external and be single or multi-layer, a membrane is a film separating two phases.

Many different industries employ terms presented in this document. There are a number of relevant standards committees. In particular, the work of the following ISO committees is acknowledged:

— ISO/TC 35, Paints and varnishes;

NOTE Specific terms and definitions for paints and varnishes in the field of nanotechnologies are given in ISO 4618.

— ISO/TC 164/SC 3, Hardness testing (e.g. nano-indentation);

— ISO/TC 172/SC 3, Optical materials and components;

— ISO/TC 201, Surface chemical analysis;

— ISO/TC 202, Microbeam analysis;

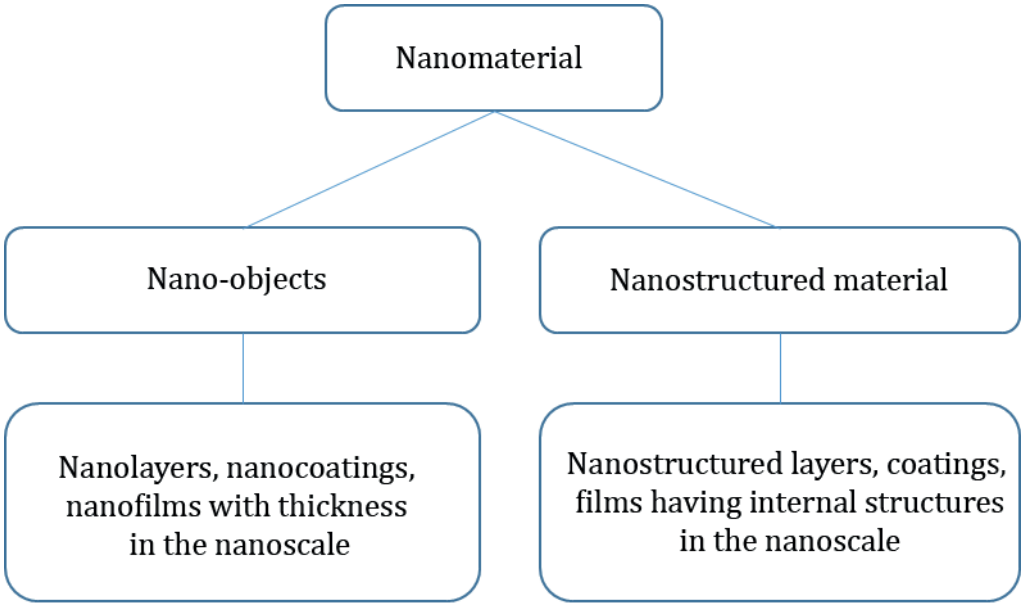
— ISO/TC 256, Pigments, dyestuffs and extenders.

The terms “coating”, “layer”, “film” and other related terms can be grouped by distinguishing between coatings, layers and films having a thickness in the nanoscale (i.e. external dimension in the nanoscale) and those having internal structures in the nanoscale (e.g. nanostructured coatings, nanocomposite coatings, dispersion coatings with dispersed nano-objects, etc.). For the purposes of classification, following the hierarchy established in ISO/TS 80004-1 (which describes nanomaterial by the two categories “nano-objects” and “nanostructured material”),

— the terms “nanolayer”, “nanocoating”, and “nanofilm” are assigned to “nano-objects”, and

— the terms “nanostructured layers”, “coatings”, and “films” are assigned to nanostructured material.

See Figure 1 for details.



NOTE Assigning the terms "nanolayer", "nanocoating", and "nanofilm" to "nano-objects" and the terms "nanostructured layers", "coatings", and "films' to "nanostructured material" following the hierarchy of nanomaterial terms in ISO/TS 80004-1.

Figure 1 — Hierarchy of nanomaterial terms

The usage of many terms defined in this document depends on specific sectors. Therefore, there is a specific usage with respect to the deposition techniques used, e.g. coating, ECD (electrochemical deposition), spin coating, PVD (physical vapour deposition), CVD (chemical vapour deposition), sol-gel deposition, ALD (atomic layer deposition), LBL (layer-by-layer deposition), and Langmuir-Blodgett deposition.

Another example is the polymer sector where the terms "film", "sheet", or "foil" are often used to describe the same element (i.e. "a thin, flexible, transparent sheet, as of plastic, used in wrapping or packaging"[9]). In this respect, the terms "foil" or "sheet" might be best suited for freestanding films.

In other areas, the term "film" is used to refer to a foil which might cover the surface of an object. The electroplating and the paint sector uses the terms "coating" and "layer".

The terms "film", "coating", and "layer" are often used synonymously. For instance, the vacuum deposition sector uses the terms "thin film" (since ~1960), "film", "layer", "multilayer", but also "coating", even using the combined term "thin film coating". Even academic textbooks use these terms synonymously, without any specific definitions[8]. Nearly all PVD/CVD coatings are nanostructured (i.e. have a structure in the nanoscale).

Some combined terms predominantly use one specific term out of "film", "coating", and "layer":

— "multilayer" ("multi-film" not used);

— "layer-stack" ("film-stack" or "coating-stack" not used);

— "conversion coating" and "diffusion coating" ("conversion film", "diffusion film" not used);

— "conversion layer" and "layer" ("conversion film", "diffusion film" not used);

— "boundary layer" ("boundary film" and "boundary coating" not used).

Existing definitions often use self-referencing (or circular referencing), thus film is defined by using coating and layer, layer is defined by using film and coating, and coating is defined by using layer and film.

The following characteristic properties might be helpful to distinguish between the terms “coating” and “film”:

— a coating is applied to “protect” a substrate (e.g. against corrosion, wear) or to change the surface properties (optical, colour, decorative, etc.);

— a film is applied on a substrate to confine the lateral dimensions of the growing film during deposition. The specific film properties (e.g. optical band filter, magnetic storage capacity) are a function of the deposited material and the thickness and structure of the film produced.

The terminology used in the above-mentioned different sectors is already well-established, which sometimes causes inconsistencies and overlaps. This is taken into consideration in this document.

Since the development of nanotechnologies started, terms like “nanocoating”, “nanofilm”, “nanolayer”, etc. are increasingly used but had not yet been defined.

TECHNICAL SPECIFICATION **ISO/TS 80004-11:2017(E)**

Nanotechnologies — Vocabulary —

Part 11:
Nanolayer, nanocoating, nanofilm, and related terms

1 Scope

This document lists terms and definitions, and specifies an extensible taxonomic terminology framework for nanolayers, nanocoatings, nanofilms, and related terms in the field of nanotechnologies.

2 Normative references

There are no normative references in this document.