SLOVENSKI STANDARD
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Barve in laki - Omočljivost - 1. del: Terminologija in splošna načela (ISO 19403-1:2017)

Paints and varnishes - Wettability - Part 1: Terminology and general principles (ISO 19403-1:2017)

Beschichtungsstoffe - Benetzbarkeit - Teil 1: Begriffe und allgemeine Grundlagen (ISO 19403-1:2017)

Peintures et vernis - Mouillabilité - Partie 1: Terminologie et principes généraux (ISO 19403-1:2017)

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INTERNATIONAL STANDARD

ISO 19403-1

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Paints and varnishes — Wettability —

Part 1: Terminology and general principles

Peintures et vernis — Mouillabilité —

Partie 1: Terminologie et principes généraux

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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).

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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.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

A list of all parts in the ISO 19403 series can be found on the ISO website.

Paints and varnishes — Wettability —

Part 1: Terminology and general principles

1 Scope

The ISO 19403 series specifies optical test methods

— for the measurement of the contact angle,

— for the determination of the free surface energy of a solid surface, including the polar and dispersive fractions,

— for the determination of the surface tension of liquids, including the polar and dispersive fractions, and

— for the checking of the measurement arrangement with reference materials.

It can be applied for the characterization of substrates, coatings and coating materials.

The applicability can be restricted for liquids with non-Newtonian rheology[1)].

This document specifies terms and definitions and defines the general principles.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4618, *Paints and varnishes — Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Determination of the surface free energy

3.1.1
chemical homogeneity
chemically homogeneous composition of a surface to be examined

Note 1 to entry: The definition regards a purely qualitative assessment of the surface. Regarding the measurement of the contact angle, a surface is considered chemically and topologically sufficiently homogeneous if no significant differences of the contact angles can be determined when measuring on several areas on the surface. The significance limits can be specified by the user in accordance with standard laboratory methods.

1) This term is defined in DIN 1342-1.

3.1.2
topological homogeneity
uniformity of the macroscopic surface, including evenness and smoothness

Note 1 to entry: The definition regards a purely qualitative assessment of the surface. Regarding the measurement of the contact angle, a surface is considered chemically and topologically sufficiently homogeneous if no significant differences of the contact angles can be determined when measuring on several areas on the surface. The significance limits can be specified by the user in accordance with standard laboratory methods.

3.1.3
interfacial free energy
interfacial tension
σ
energy or tension resulting from intermolecular forces on interfaces

Note 1 to entry: The term interfacial energy pertains to the interaction with solid surfaces and is indicated as free energy in relation to the surface (unit mJ/m^2). The term interfacial tension pertains to the interaction with liquids and is indicated as force per length unit (mN/m). The respective indices "l" for "liquid" and "s" for "solid" indicate the phases involved.

3.1.4
surface free energy
free energy of the surface
σ_s
interfacial free energy (3.1.3) of a solid surface

3.1.5
surface tension
σ_l
interfacial tension of a liquid surface in equilibrium with its vapour phase

Note 1 to entry: The surface tension is indicated as force per length unit (mN/m). Its numerical value corresponds to the free energy of the interface or surface.

Note 2 to entry: The surface tension corresponds to the work which shall be done in order to enlarge a given surface by a specific value.

3.1.6
interfacial energy
σ_{sl}
<solid/liquid interface> energy on the phase interface between a solid and a liquid phase

3.1.7
three-phase point
point at which solid phase, liquid phase and vapour phase are in contact with each other

Note 1 to entry: See Figure 1.

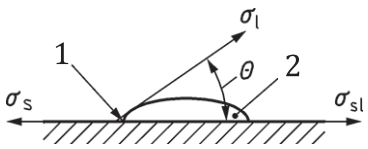
3.1.8
base line
<for flat test specimens> straight line through both *three-phase points* (3.1.7)

Note 1 to entry: See Figure 1.

3.1.9
contact angle
θ
angle to the *base line* (3.1.8) within the drop, formed by means of a tangent on the drop contour through one of the *three-phase points* (3.1.7)

Note 1 to entry: See Figure 1.

Note 2 to entry: The contact angle is preferably indicated in degrees (°). 1° = (π/180)°. If the system is in thermodynamic equilibrium, this contact angle is also referred to as thermodynamic equilibrium contact angle.



Key

1 three-phase point
2 liquid
σ_l surface tension of the liquid
σ_s surface free energy of the solid surface
σ_{sl} interfacial energy between solid surface and liquid
θ contact angle

Figure 1 — Wetting

3.1.10
top-view angle
angle to the plane of the sample surface under which the drop is being observed

3.1.11
wetting
adhesive contact between solid and liquid

3.1.12
wettability
degree of *wetting* (3.1.11)

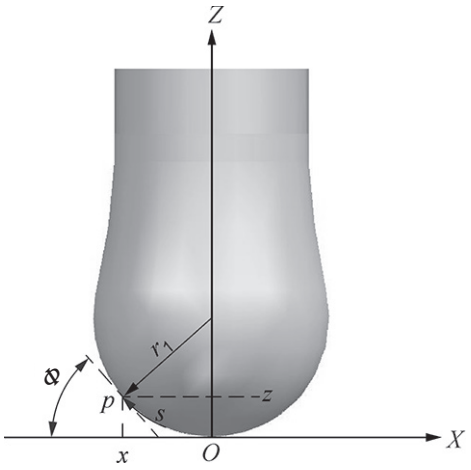
Note 1 to entry: Contact angle $\theta = 0°$ indicates fully wetted and $\theta = 180°$ indicates not wetted.

3.2 Determination of the surface tension of liquids

3.2.1
pendant drop
drop hanging on a hollow needle

Note 1 to entry: The curvature of the contour of a pendant drop is generally determined by its own mass and its surface tension. The surface tension can be calculated from the shape and size of a pendant drop by means of drop contour analysis, provided that the drop is large enough (see ISO 19403-3) so that its shape significantly differs from a spherical shape due to its own mass.

Note 2 to entry: See Figure 2.



Key

r_1	main curvature radius
X, Z	axes of coordinates
x, z	Cartesian coordinates of a drop contour point
s	arc length from the origin to the drop contour coordinate point
p	drop contour coordinate point
Φ	tangent angle in p to the X-axis

Figure 2 — Pendant drop

3.2.2
Young-Laplace equation
equation which describes the pressure difference, Δp, above and below a curved surface in dependence on the *surface tension* (3.1.5) or interfacial tension, σ, and the main curvature radiuses of the surface (r_1 and r_2)

$$\Delta p = \sigma\left(\frac{1}{r_1}+\frac{1}{r_2}\right)$$

3.2.3
shape parameter
B
non-dimensional and numerically obtained parameter, describing the shape of the drop contour when analysing the drop

$$B = \frac{1}{a \cdot k_{\text{apex}}}$$

where

k_{apex} is the main curvature radius in the apex of the drop;

a is the capillary constant.