International Standard

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Paints and varnishes — Wettability —

Part 6: Measurement of dynamic advancing and receding angle by changing the volume of a drop

Peintures et vernis — Mouillabilité —

Partie 6: Mesurage des angles d'avancée et de recul dynamiques en changeant le volume d'une goutte

Reference number
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Foreword

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This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 19403-6:2017), which has been technically revised.

The main changes are as follows:

— the part title has been changed to: Measurement of dynamic advancing and receding angle by changing the volume of a drop;

— the term 3.2 “advancing angle” has been replaced by “dynamic advancing contact angle” and the definition has been reworded;

— the term 3.3 “receding angle” has been replaced by “dynamic receding contact angle” and the definition has been reworded;

— normative references have been updated.

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

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Dynamic contact angles describe the processes on the interface liquid or solid during volume increase (dynamic advancing contact angle) or volume decrease (dynamic receding contact angle) of a drop. As an alternative to the static method (see ISO 19403-2), the dynamic advancing or dynamic receding methods measure the contact angle while the three-phase contact line is moving. The contact angle for the dynamic advancing contact angle is measured while wetting a previously unwetted surface. For the dynamic receding contact angle, the contact angle is observed during dewetting. By determining the difference between the dynamic advancing contact angle and the receding contact angle, information on chemical homogeneity and roughness can be concluded. The dynamic receding contact angle is not recommended for the determination of the surface energy.

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Paints and varnishes — Wettability —

Part 6: Measurement of dynamic advancing and receding angle by changing the volume of a drop

1 Scope

This document specifies a method to measure the dynamic contact angle with an optical method. The dynamic advancing and the dynamic receding contact angles are determined.

By using the measurement specified in this document, the wetting and dewetting properties can be characterized. The morphological and chemical homogeneity of interfaces can also be determined.

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 — Vocabulary*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

ISO 19403-1:2022, *Paints and varnishes — Wettability — Part 1: Vocabulary and general principles*

ISO 19403-2:2024, *Paints and varnishes — Wettability — Part 2: Determination of the surface free energy of solid surfaces by measuring the contact angle*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618, ISO 19403-1 and the following apply.

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

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

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

3.1
dynamic contact angle
contact angle, which is measured during advancing or receding of the three-phase point

Note 1 to entry: For the definition of “contact angle”, see ISO 19403-1:2022, 3.1.9.

Note 2 to entry: The advancing or receding of the three-phase point can be achieved by changing the volume of the liquid drop to be measured, by relative movement (immersing and pulling out) of a solid body to an interface, or by moving the drop over the interface (e.g. rolling off). This document only describes the determination of the dynamic contact angle by changing the volume of a drop.

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3.2
dynamic advancing contact angle
dynamic advancing angle
θ_a
contact angle measured at the three-phase line during advancing the liquid phase

Note 1 to entry: The values depend on the method.

3.3
dynamic receding contact angle
dynamic receding angle
θ_r
contact angle measured at the three-phase line during receding the liquid phase

Note 1 to entry: The values depend on the method.

3.4
contact angle hysteresis
θ_{ar}
difference between the *dynamic advancing contact angle* (3.2) and the *dynamic receding contact angle* (3.3)

4 Principle

A drop of the respective test liquids is dosed onto the flat surface of a test specimen. The volume of the respective drop is continuously increased (dynamic advancing contact angle) or decreased (dynamic receding contact angle). The procedure is repeated with at least two drops. The contact angle is preferably determined by means of the polynomial method, synchronously with the dosing. If the polar and dispersive fraction of the surface free energy is determined according to ISO 19403-2, the dynamic advancing contact angle shall be used.

5 Apparatus and materials

Ordinary laboratory apparatus, together with the following shall be used.

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