SLOVENSKI STANDARD
SIST EN 828:1998

01-februar-1998

Lepila - Omočljivost - Ugotavljanje z merjenjem omočilnega kota in kritične površinske napetosti trdne površine

Adhesives - Wettability - Determination by measurement of contact angle and critical surface tension of solid surface

Klebstoffe - Benetzbarkeit - Bestimmung durch Messung des Kontaktwinkels und der kritischen Oberflächenspannung fester Oberflächen

Adhésifs - Mouillabilité - Détermination par mesurage de l'angle de contact et de la tension superficielle critique de la surface solide

Ta slovenski standard je istoveten z: **EN 828:1997**

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83.180	Lepila	Adhesives

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ICS 83.180

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English version

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 193 "Adhesives", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1998, and conflicting national standards shall be withdrawn at the latest by April 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the determination of the ability of an adhesive to "wet" a solid surface by measuring the contact angle and determining the critical surface tension of wettability. It allows the prediction of what adhesive will wet which adherend. It may be used to characterize surfaces after priming, coating and bonding.

NOTE 1: In general the contact angle takes, in dependence on the proceeding motion of the borderline of the liquid (i.e. on the mode of application), a value between two borderline values,the advancing angle (e.g. after an extension of a drop) and the receding angle (e.g. after a reduction of a drop). Only if this difference between both, termed hysteresis of contact angle, is negligible, the contact angle expresses the critical surface tension defined in thermodynamics as a substrate-specific characteristic value. Normally, the hysteresis will not be negligible when the rugosities are above 0,5 μm and when the heterogeneous phase is not smaller than 0,1 μm. The shape of the rugosity is essential for the hysteresis.

NOTE 2: For a comparison of wetting behaviour, the advancing angle should always be measured here.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 923 Adhesives - Terms and definitions

3 Definitions

For the purposes of this European Standard, the definitions in accordance with EN 923 and the following definitions apply:

3.1 wettability: Interface tensions of the components assuming a thermodynamic equilibrium and a negligible hysteresis of the contact angle. This is based on the adsorption theory.

3.2 surface tension: The numeric value of **surface tension** is equal to the specific energy of the interfaces or surfaces, respectively.

3.3 contact angle: When a liquid comes into contact with a solid surface, the liquid shows a typical drop shape. This characteristic feature of the drop is the angle the edge makes as it meets the surface. This angle is known as "**contact angle**".

If the contact angle by advancing and receding of the borderline of the liquid changes (hysteresis of the contact angle) the measurable angle after an extension of a drop is termed advancing angle and is used in the following instead of (thermodynamic equilibrium) contact angle.

3.4 critical surface tension of wettability: The surface tension formally to be determined for $\theta = 0$ from the advancing angle is termed **critical surface tension of wettability** γ_c.

When the angle θ is zero, the maximum work of adhesion occurs and we get a complete wettability. (see the figure 1 for parameters definition).

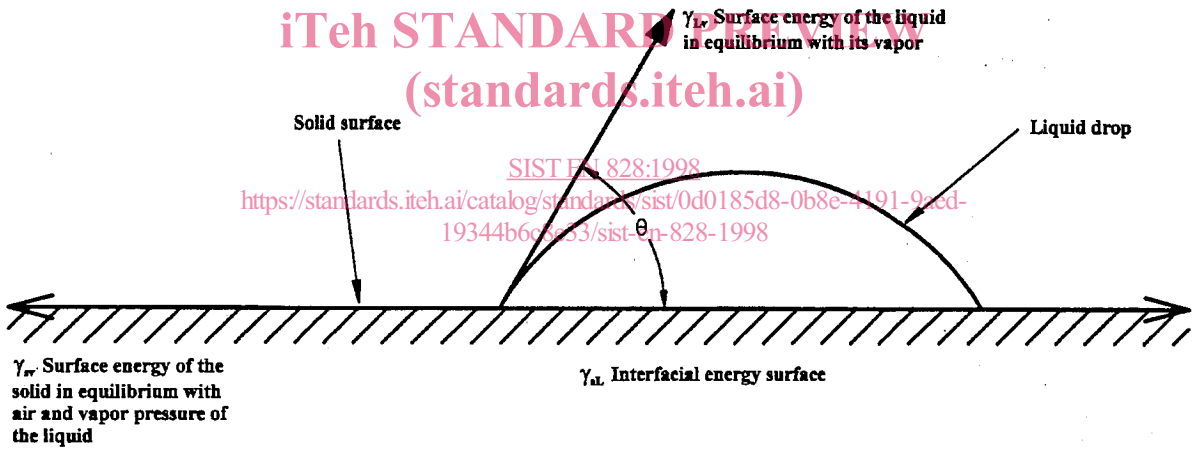


Figure 1: Thermodynamic wettability

At balance these forces are known under the Young equation:

$$\gamma_{Lv}^{\cos\theta} = \gamma_{sv} - \gamma_{sL} \quad \ldots (1)$$

and the work of adhesion is defined by the Dupré-Young equation:

$$W_{A\ real} = \gamma_{Lv} + \gamma_{Lv}^{\cos\theta} = \gamma_{Lv}^{(1+\cos\theta)} \quad \ldots (2)$$

So when $\theta = 0$ the liquid "wets" completely the solid then $\gamma_{Lv} = \gamma_c$ = critical surface tension.

4 Principle

A drop of four well known chemical liquid products is placed on a flat, regular solid surface. Then the four different contact angles are determined using a Goniometer.

Then the critical surface tension of wettability γ_c is determined from a graph of the cosine of the contact angle against the surface tension as an extrapolation to $\theta = 0$ (at which $\cos \theta = 1$).

5 Safety

Persons using this standard shall be familiar with normal laboratory practice.

This standard does not purport to address all the safety problems, if any, associated with its use.

It is the responsibility of the user to establish safety and health practices and to ensure compliance with any European and national regulatory conditions.

6 Materials required

6.1 Surface to be evaluated: Substrate, with primed or unprimed surface.

6.2 Contact Angle Goniometer: Any goniometer which enables the angle to be measured. Figure 2 illustrates an example of contact angle goniometer.

6.3 Reagent laboratory grade

a) Glycerol;

b) Formamide;

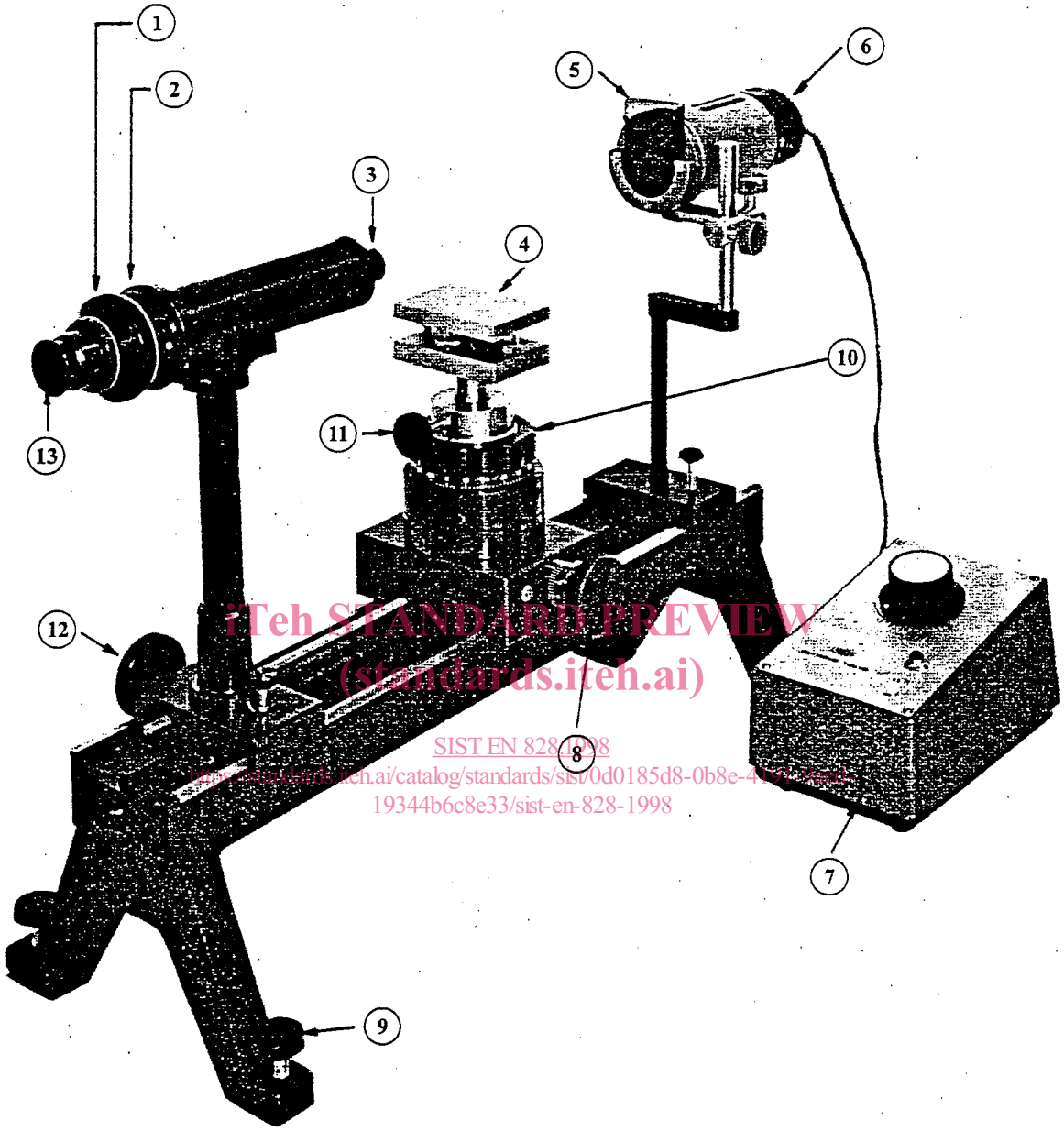
c) Diiodomethane;

d) Dimethylsulfoxide (D.M.S.O.)

WARNING: These reagents are chemicals. Please carefully read the safety advice of the labels and the material safety data sheets.

6.4 Eye-dropper or a micro pipette: four micro pipettes (or suitable syringes with micro graduation) which can be fastened by a suitable holder above the specimen stage or the surface to be tested, respectively.

6.5 Four sample tubes, minimum capacity 1 cm^3.



1	"Base-Line"	9	Optical bench - Levelling screws (4)
2	"Measuring" Dial	10	Vertical fine adjustment knob
3	Objective lens	11	Vertical coarse positioning thumb screw
4	Specimen stage	12	Image focus knob
5	Green filter	13	Eyepiece
6	Illuminator		
7	Illuminator control		
8	Cross-travel dial		

Figure 2: Example of contact angle goniometer