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International Standard 8022

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Surface active agents — Determination of wetting power by immersion

Agents de surface — Détermination du pouvoir mouillant par immersion

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Surface active agents — Determination of wetting power by immersion

0 Introduction

In many textile applications, for example ennobling or washing textiles, as well as the rinsing or the cleaning of rigid surfaces — in short in all processes in which a phase (air, oil or soil) has to be replaced by a liquid phase (aqueous or organic) — it is useful to know the wetting power of the wetting agents used. It is also important to know after how long complete wetting is obtained.

1 Scope and field of application

This International Standard specifies a method of determination of the wetting power of a surface active agent in solution by immersion of a disc of raw cotton cloth. The method is applicable to all surface active agents, whatever their ionic character, used as wetting agents in neutral, slightly acid or slightly basic baths for textile applications. The method is not applicable to mercerizing assistants (baths highly basic) or to carbonizing assistants (baths highly acid).

2 References

ISO 139, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 607, *Surface active agents and detergents — Methods of sample division.*

ISO 2456, *Surface active agents — Water used as a solvent for tests.* [1]

ISO 3801, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area.*

ISO 3819, *Laboratory glassware — Beakers.*

ISO 7211/2, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 2 : Determination of number of threads per unit length.*

3 Definition

For the purpose of this International Standard, the following definition applies.

wetting power (by immersion) : Degree of ability of a solution of surface active agent to displace the air trapped in a cloth when the cloth is steeped in the solution.

The wetting power of a surface active agent can be evaluated by examination of plots of wetting time of discs of raw cotton immersed in solutions of surface active agents or of standard wetting agents of known concentration, against concentration.

4 Principle

Immersion, while held in a grip, of a cotton disc of known nature and characteristics, in a solution of surface active agent of known concentration; maintenance of complete submersion in the solution, by means of the specially designed grip, of the cotton disc which tends to float to the surface due to air trapped in the cloth. After displacement of air and penetration of the solution into the cloth, the cotton disc starts to sink. Determination of the wetting time by measuring the interval between the moment of immersion of the cotton disc and the moment when it begins to sink.

Determination of the wetting time of two standard solutions and for each at five different concentrations and then of the surface active agent solution under test for five different concentrations.

After plotting the three curves "wetting time/concentration", determination of wetting power by comparison of the position of its curve with the two standard curves.

5 Reagents and products

5.1 Distilled water, or water of equivalent purity, complying with the specifications of ISO 2456.

5.2 Sodium di-*n*-hexylsulfosuccinate, standard of recognized analytical grade.[2]

5.3 Sodium di-*n*-heptylsulfosuccinate, standard of recognized analytical grade.[2]

1) In preparation.

2) Details may be obtained from the Secretariat of Technical Committee ISO/TC 91 (AFNOR) or the ISO Central Secretariat.

5.4 Raw cotton control cloth, of known nature and characteristics, conditioned in the standard temperate atmosphere specified in ISO 139, i.e. a relative humidity of 65 % and a temperature of 20 °C. (Various types of commercial standard control cloths are described in the annex.)

6 Apparatus

Ordinary laboratory apparatus, and in particular :

6.1 Beaker, low form, of capacity 1 000 ml, complying with the specifications of ISO 3819.

6.2 Grip for immersion, made of stainless steel of about 2 mm diameter and whose dimensions are given in figure 1 (see also the photo, figure 2, which gives a typical grip for immersion with non-sliding coplanar trihedral arms).

6.3 Punch, of diameter 30 mm, carefully degreased by means of a volatile solvent (for example dichloromethane).

6.4 Chronometer, accurate to 0,1 s.

Dimensions in millimetres

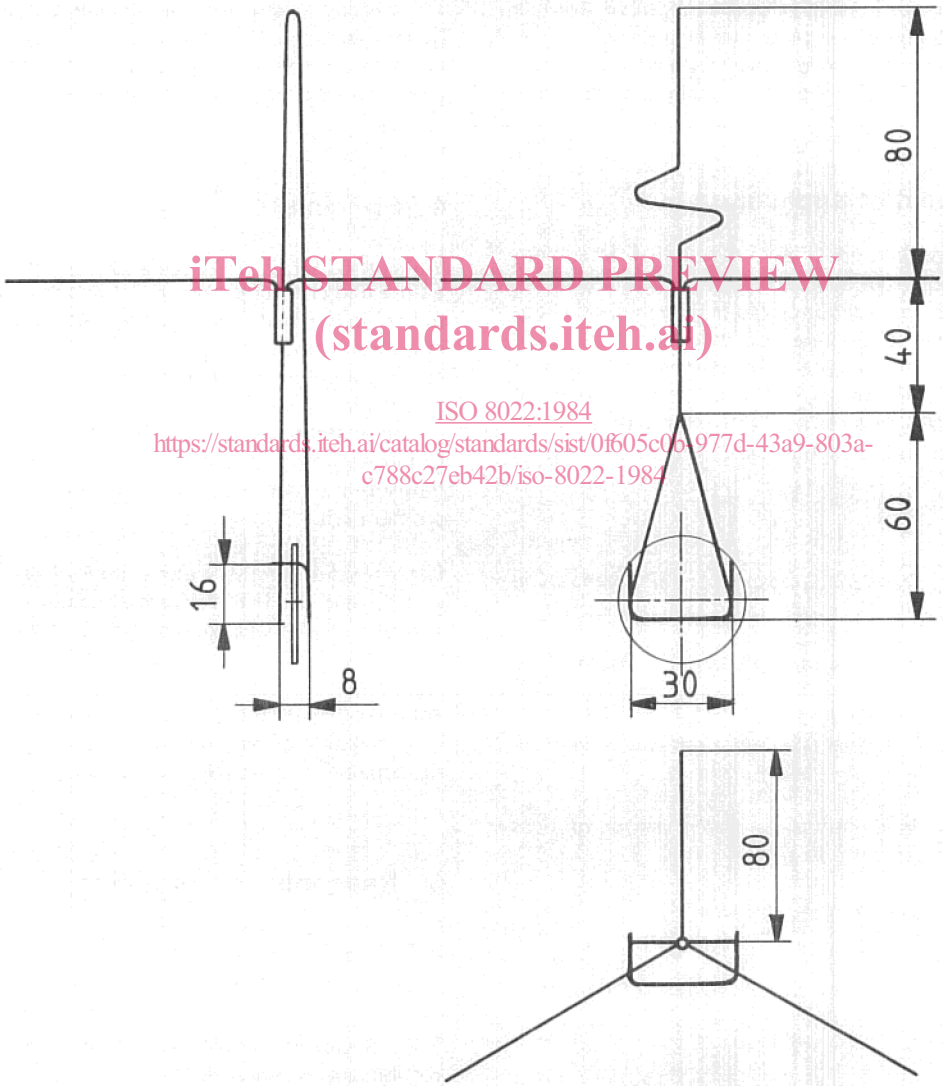

Figure 1 — Grip immersion

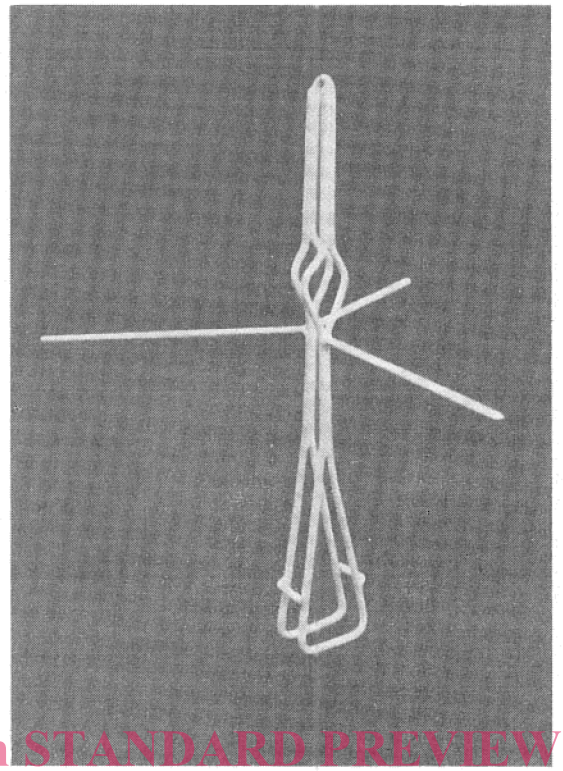

Figure 2 — Scheme showing example of grip for immersion

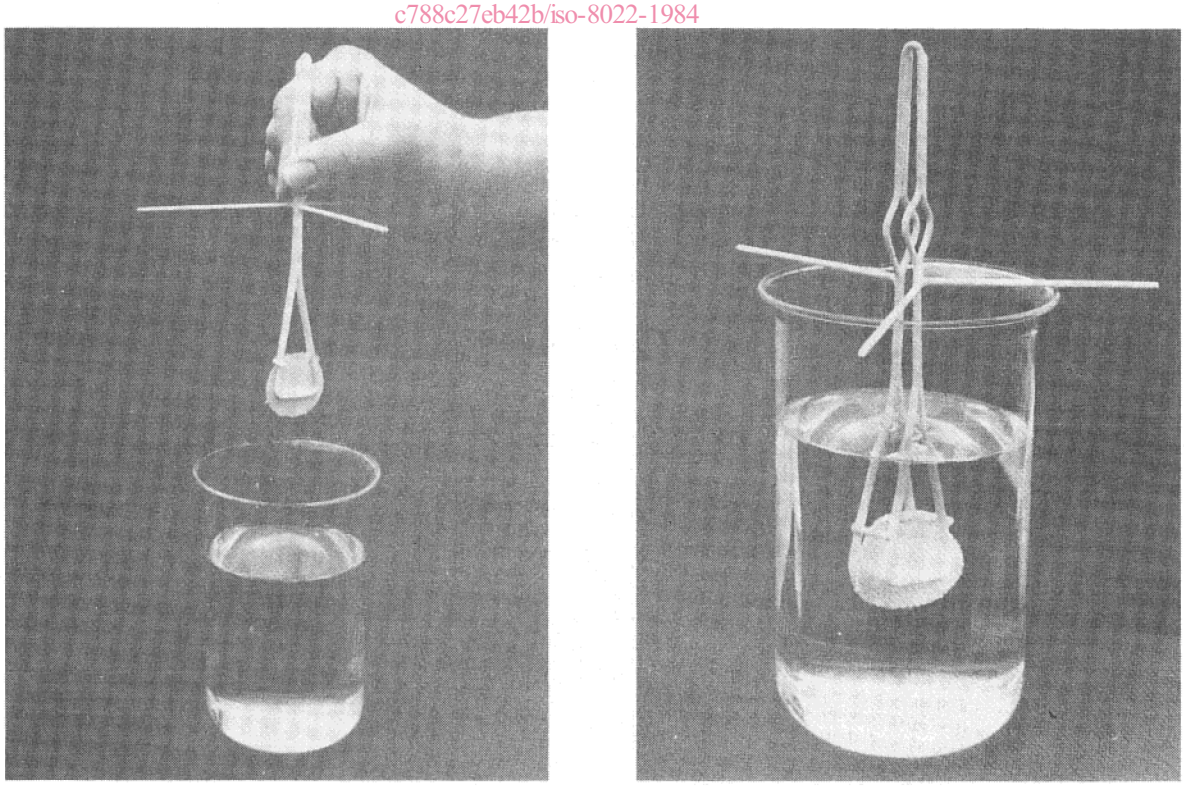

Figure 3 — Illustration of procedure

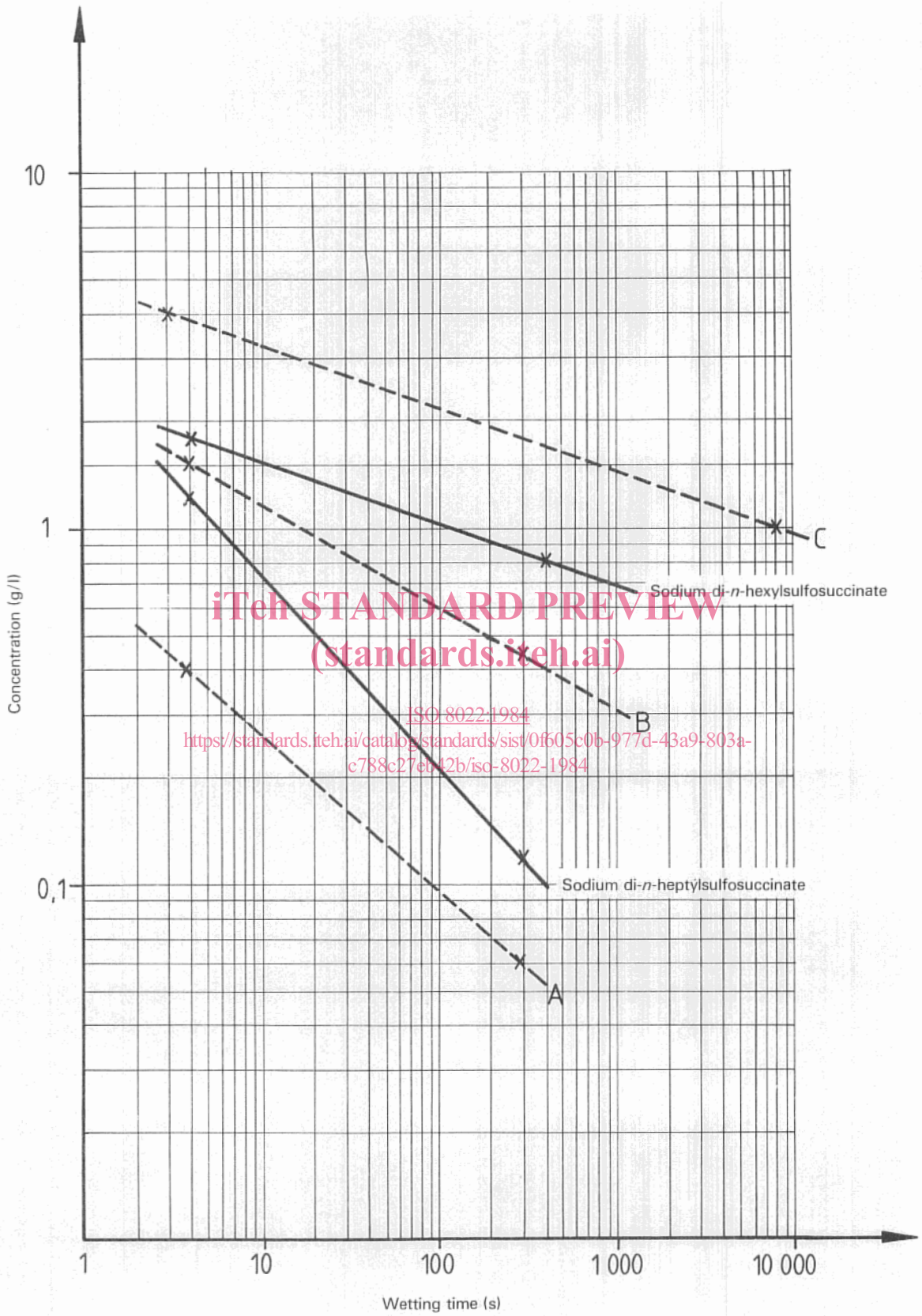

Figure 4 — Curves "wetting time/concentration" for the surface active agents A, B, C in relation to standard curves.

7 Sampling

The surface active agent laboratory sample shall be prepared and stored in accordance with ISO 607.

8 Procedure

8.1 Test portion

Weigh, to the nearest 0,1 g, the mass of laboratory sample required to prepare 5 solutions of 1 litre respectively at the desired concentration, into a 100 ml beaker.

The first concentration to be examined shall be 1 g/l. The wetting time obtained will determine the other concentrations to be examined (see the last two paragraphs of 8.7).

8.2 Preparation of the surface active agent solution

Dissolve the test portion (8.1) in water, possibly after first making a paste of the surface active agent with water warmed to 40 °C, then diluting with water at about 20 °C. Transfer quantitatively into a 1 000 ml volumetric flask, make up to the mark with water and mix.

Take 200 ml of the solution thus obtained, transfer into a 1 000 ml volumetric flask, make up to the mark with water and mix.

If the Krafft temperature of the surface active agent is higher than 40 °C, make the paste and the dissolution at a temperature at least equal to the Krafft temperature.

Store the solution at 20 ± 2 °C until the beginning of the test.

Prepare the solution not less than 15 min, but not more than 2 h, before the measurement.

Other conditions than those fixed in the preceding (hardness or pH of water, temperature, possible assistants), may be chosen provided that they are noted in the test report.

8.3 Preparation of the discs of cotton control cloth

By means of the punch (6.3), cut out discs of 30 mm diameter from the raw cotton cloth (5.4). It is very important to avoid contact with the fingers in order not to affect the measurements by the presence of fatty materials or perspiration on the surface of the cloth.

8.4 Cleaning the apparatus

The perfect cleanness of the apparatus used determines, to a certain extent, the success of the test.

Before the tests, and if possible overnight, leave a sulfochromic mixture[1], prepared by gently stirring sulfuric acid (ϱ_{20} 1,84 g/ml) into an equal volume of a saturated solution of potassium dichromate, to stand in the beaker (6.1). Then rinse the glassware with water (5.1) until any trace of acid disappears, and finish the rinsing with a small quantity of the solution under test.

Clean the immersion grip (6.2) for 30 min in an azeotropic mixture of ethanol and trichlorethylene, dry, then rinse with a small quantity of the solution under test.

For the same product, the apparatus is only rinsed between measurements with the solution at the new concentration.

8.5 Setting up the apparatus

Adjust the position of the sliding support, consisting of coplanar trihedral arms, on the stem of the immersion grip (6.2) so that the raw cotton disc (5.4) will be about 40 mm below the surface of the solution. This grip shall only open to about 6 mm, in order that the cotton disc remains in a nearly vertical position.

8.6 Filling of the measurement beaker

By means of a measuring cylinder, introduce 700 ml of the test solution (8.2) into the measurement beaker (6.1).

During these operations, in order to avoid the formation of undesirable foam, it is recommended that the test solution be allowed to flow down the internal walls of the vessels.

If necessary, remove any foam formed on the surface of the solution in the measurement beaker by means of a filter paper.

8.7 Determination (see figure 3)

Measure, to the nearest 1 °C, the temperature of the solution.

Clamp a raw cotton disc (8.3) in the immersion grip (6.2). Switch on the chronometer at the moment when the lower part of the disc touches the solution, rest the planar trihedral support on the rim of the beaker and allow the grip to open.

Stop the chronometer when the disc begins to sink of its own accord.

NOTE — In the case of solutions at high temperatures, it is important to carry out the measurements at least 15 min after stabilization of the temperature.

Repeat the measurement nine times consecutively, using the same solution and taking the precaution of throwing away, after each measurement, the cotton disc used.

The arithmetic mean of the 10 measurements gives the wetting time for the concentration examined.

The measurements shall be carried out at five different concentrations increasing the concentration each time. The solution of lowest concentration shall have a wetting time of about 300 s; the solution of highest concentration shall have a wetting time of 5 ± 1 s.

1) Other cleaning solutions may be used provided that they are noted in the test report.

Should the occasion arise, the saturated solution will be used to determine the shortest wetting time.

8.8 Calibration of the cloth

Determine, as indicated in 8.7 and at the same temperature as for the measurements with the surface active agent, the wetting times for five solutions of the two di-*n*-alkylsulfosuccinate standard solutions (5.2 and 5.3) .

The first concentration to test with the sodium di-*n*-heptylsulfosuccinate (5.3) shall be 0,2 g/l. The first concentration to test with the sodium di-*n*-hexylsulfosuccinate (5.2) shall be 1,3 g/l.

The calibration of cloth is imperative only if a new lot of cotton control cloth is used, or if it is desired to compare the results obtained from two different control cloths.

9 Expression of results

On log-log paper, plot wetting time against concentration for the surface active agent under test and for the two di-*n*-alkylsulfosuccinates standard solutions (see, for example, figure 4).

The comparison of the positions of the three curves gives an acceptable evaluation of the wetting power of the surface active agent.

10 Test report

The test report shall contain the following information :

a) all information necessary for complete identification of the sample;

b) the nature and the characteristics of the raw cotton cloth from which the discs were cut out (see the annex);

c) the reference of the method used;

d) the nature of the water used and, if appropriate, the assistants used;

e) the exact temperature of the determination;

f) the results, and the method of expression used (for example : graphic);

g) any operating details not specified in this International Standard, or regarded as optional, as well as any incidents which may have influenced the results.