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Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing

Peintures et vernis — Détermination du délai maximal d'utilisation après mélange des systèmes de revêtement multicomposants — Préparation et conditionnement des échantillons et lignes directrices pour les essais

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9514 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This second edition cancels and replaces the first edition (ISO 9514:1992). In this new edition, a conditioning chamber is used instead of a block of polystyrene. The latter can be used as an option for determining the pot life under near-adiabatic conditions. The table in Annex B detailing liquid systems and the possible tests that can be used to determine pot life has been expanded.

Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing

1 Scope

This International Standard describes a method, carried out under standard conditions, for preparing and storing a sample of a multicomponent coating system and subsequently assessing its pot life by measuring a particular property/ies.

Reactive systems curing within a short period of time, e.g. 3 h, will have the end of their pot life so near to the gel point that they will need to be tested for that particular property in accordance with ISO 2535.

Special “low temperature” grade systems will need to be tested at a lower specified temperature to reflect the conditions under which they will be used in practice. Additionally, it can be a requirement to determine pot life at a specified temperature or temperatures in order to cover a range of practical conditions under which a paint will be used.

The method can be carried out either as a pass/fail test by determining the particular property/ies after a specified period of time, or as determination of the pot life by repeating determinations at convenient intervals of time.

This International Standard is not intended for *in situ* control of products during their application. It is intended to determine “pot life” in the laboratory.

NOTE The value obtained from this test method can be subject to modification by suppliers for practical reasons (e.g. starting temperature) when giving advice to users and should then be called the “practical pot life”.

2 Normative references

The following referenced documents are indispensable for the application 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 1513, *Paints and varnishes — Examination and preparation of samples for testing*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
pot life
maximum time during which a coating material supplied as separate components should be used after they have been mixed together

[ISO 4618-1:1998]

NOTE It is important that, in this definition, the words “should be used” are understood to refer to the application properties of the reactive system under test as well as the properties of the dried film.

4 Principle

The components of the liquid system are conditioned separately and then mixed; the blend is allowed to stand for specified period(s) of time under nearly adiabatic conditions (see Note 1). Subsequently, a sample is withdrawn from the blend and a particular property/ies (see Note 2) is measured to check compliance with the requirement for that property for the product under test.

NOTE 1 This International Standard specifies the conditions for preparing and storing a sample in order to assess the pot life; these conditions should be near to adiabatic so that they bear a close relationship to those which exist in practice, e.g. mixing fairly large volumes of liquid reactive systems for use.

NOTE 2 The pot life is dependent on a variety of properties, depending on the reactive system involved; because of this variety, the pot life can only be specified with reference to a particular property. Guidance on the property/ies to be tested for various liquid systems is given in Annex B.

5 Required supplementary information

For any particular application, the test method specified in this International Standard needs to be completed by supplementary information. The items of supplementary information are given in Annex A.

6 Apparatus

Ordinary laboratory apparatus and glassware, together with the following.

6.1 Containers, of volume approximately 500 ml, made of any suitable material and with dimensions such that the height is 1 to 1,5 times the diameter.

6.2 Conditioning chamber.

In certain instances, the sample needs to be held in near-adiabatic conditions to determine the pot life of the material accurately, i.e. the least possible heat loss from the sample should be allowed in order to simulate a reaction in a large volume of liquid. A block of polystyrene, polyurethane or glass foam, with one or more holes to hold the container, has been found suitable to maintain such conditions. Each hole should be surrounded with at least 20 mm of foam, and the insulating value of the foam should typically be not more than 25 W/(m·K). The depth of the hole(s) should be equal to the height of the container.

6.3 Thermometer, capable of measuring to the nearest 0,2 °C.

6.4 Measuring apparatus, in accordance with the standard giving the relevant test method for measuring the particular property/ies specified, e.g. viscometer, gloss meter, adhesion tester.

7 Sampling

Take a representative sample of each component of the product to be tested, as described in ISO 15528. Take sufficient quantities to test in duplicate.

Examine and prepare each sample for testing, as described in ISO 1513.

8 Procedure

Carry out the test in duplicate.

Condition the components of the liquid system separately in accordance with ISO 3270. After conditioning at the specified temperature, the difference in temperature between the components shall not be greater than 1 °C.

Special “low temperature” systems are tested at a lower specified temperature, so that it is possible to investigate particular properties, as required. Similarly, testing may be carried out over a range of temperatures to reflect conditions under which a paint system will be used in practice.

Note the time, and mix the components in accordance with the instructions given for the particular system and to give a convenient quantity of blend for testing. Report the proportions of the components in the mixture in accordance with Annex A.

Put (300 $\pm$ 3) ml of the blend into a container. Close the container, if applicable, and put it into the conditioning chamber.

If application properties are to be assessed, it is necessary to prepare a volume of blend approximately equal to the volume in which the paint will be supplied for use. For example, for airless spraying, the minimum volume shall be 5 l.

NOTE Refer to Annex B for guidance on the properties that can be measured.

If a pass/fail test is to be carried out, allow the blend to stand for the specified pot life time and subsequently measure the particular property/ies under investigation.

If the pot life itself is to be determined, allow the blend to stand for the periods of time chosen for the determination. After each period of time, i.e. at defined intervals, withdraw a sample from the container and measure the particular property/ies under investigation.

The pot life is exceeded when the value of the property/ies under investigation, e.g. gloss, no longer complies with the requirements of the product standard or the working document.

9 Expression of results

For a pass/fail test, report the result of the duplicate determination as “fail” if, in one or both of the determinations, the requirements for the measured property/ies were not met after the specified time.

For the determination of the pot life, report the longest period of time for which the specific property/ies still met the requirements.

10 Precision

Repeatability and reproducibility data are normally given in the test method(s) for the property/ies under investigation.

In the case of the determination of the pot life, the periods of time chosen for the test (see Clause 8), i.e. the frequency of measurement of the property/ies concerned, determines to a large extent the “precision” of the method.

11 Test report

The test report shall contain at least the following information:

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

b) a reference to this International Standard (ISO 9514:2005);

c) the items of supplementary information referred to in Annex A;

d) a reference to the international or national standard, product specification or other document supplying the information referred to in c);

e) the results of the duplicate determinations as required by the documents referred to in d), and the results of the test, as indicated in Clause 9;

f) the test temperature;

g) any deviations from the procedure specified;

h) any unusual features (anomalies) observed during the test;

i) the date of the test.

Annex A
(normative)

Required supplementary information

The items of supplementary information listed in this annex shall be supplied as appropriate to enable the method to be carried out.

The information required should preferably be agreed between the interested parties and may be derived, in part or totally, from an international or national standard or other document related to the product under test.

a) The proportions in which the components of the system are to be mixed.

b) The instructions for mixing the reactive system, the quantity of the blend to be used and the volume of the container.

c) The conditions of temperature and relative humidity under which the test is to be carried out (if different from standard conditions).

d) The particular property/ies to be measured to determine the pot life of the reactive system.

e) The instructions for modifying the product for the required application (brushing, spraying, dipping, etc.).

f) Information about the conditioning chamber.

Annex B
(informative)

Guide to testing of liquid systems

This annex is intended as a guide to the testing of various reactive systems, giving the properties to be measured and the limits which will ensure acceptable performance under standard conditions (see ISO 3270). The guide is based on practical information from ISO member bodies. For the full titles of the ISO standards referred to, see the Bibliography.

Reactive system	Property measured	End of pot life	Test method
Unsaturated polyester (catalysed)	Viscosity	Gel point	ISO 2535
Epoxy resins (water-borne)	Gloss (film formation)	50 % of original value (or as otherwise agreed)	ISO 2813
Epoxy resins [solvent-borne, solvent-free and modified (e.g. tar)] Pitch urethanes	Viscosity	Percentage increase or set limit (as agreed)	ISO 2884-1
	Application	a) Limit of acceptable application by specified method b) Presence of defects in film (assessed visually)	
Silicone elastomers	Viscosity	Percentage increase or set limit (as agreed)	ISO 2884-1
	Application	a) Limit of acceptable application by specified method b) Presence of defects in film (assessed visually)	
Polyurethanes (solvent-borne, solvent-free, moisture-curing)	Adhesion	Difference compared with "fresh" blend	ISO 4624 ISO 2409
	Viscosity	a) Percentage increase or set limit (as agreed)	ISO 2884-1
		b) Gel point	ISO 2431 ISO 2884-1 (near-Newtonian flow)
	Homogeneity	Skin/gel formation	ISO 1513
Poly(vinyl butyrate)	Adhesion to non-ferrous substrates	Decrease compared with "fresh" blend	ISO 2409
Alkyd melamines (acid-catalysed)	Clarity	a) Turbidity b) Haze	ISO 15715 ISO 13803
Silicates	1 Homogeneity	Skin/crust formation	ISO 1513
	2 Solvent resistance	Difference compared with "fresh" blend	ISO 2812-1

Bibliography

[1] ISO 2409, *Paints and varnishes — Cross-cut test*

[2] ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups*

[3] ISO 2535, *Plastics — Unsaturated-polyester resins — Measurement of gel time at ambient temperature*

[4] ISO 2812-1, *Paints and varnishes — Determination of resistance to liquids — Part 1: General methods*

[5] ISO 2812-2, *Paints and varnishes — Determination of resistance to liquids — Part 2: Water immersion method*

[6] ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85°*

[7] ISO 2884-1, *Paints and varnishes — Determination of viscosity using rotary viscometers — Part 1: Cone-and-plate viscometer operated at a high rate of shear*

[8] ISO 4618-1:1998, *Paints and varnishes — Terms and definitions for coating materials — Part 1: General terms*

[9] ISO 4624, *Paints and varnishes — Pull-off test for adhesion*

[10] ISO 13803, *Paints and varnishes — Determination of reflection haze on paint films at 20°*

[11] ISO 15715, *Binders for paints and varnishes — Determination of turbidity*

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