INTERNATIONAL STANDARD

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Binders for paints and varnishes — Determination of glass transition temperature

Liants pour peintures et vernis — Détermination de la température de transition vitreuse

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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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 16805 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 10, *Test methods for binders for paints and varnishes*.

Introduction

The determination of the glass transition temperature (T_g) is a very accurate and reproducible way of characterizing polymers. However, there are a number of factors which have to be considered if a standard for the determination of the T_g is to be developed. The T_g of a polymer is dependent on the heating rate, the moisture content of the sample and also on the amount of sample used. Since sample preparation is a very important part of the procedure (and a special method may be necessary for binders for paints and varnishes), this International Standard specifies only the procedure for sample preparation. The measurement procedure itself is already specified in another International Standard.

Binders for paints and varnishes — Determination of glass transition temperature

1 Scope

This International Standard specifies the procedure to be used for sample preparation for the determination of the glass transition temperature of binders for paints and varnishes, including coating powders, by differential scanning calorimetry (DSC). The method to be used for determining the glass transition temperature is specified in ISO 11357-2.

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

ISO 11357-1, *Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles*

ISO 11357-2:1999, *Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature*

3 Terms and definitions

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

3.1
glass transition
reversible change in an amorphous polymer or in amorphous regions of a partially crystalline polymer from (or to) a viscous rubbery condition to (or from) a hard and brittle one

NOTE It is the temperature at which the rotational degrees of freedom of a polymer are excited.

[Adapted from ISO 11357-2:1999]

3.2
glass transition temperature
approximate midpoint of the temperature range over which the glass transition takes place

NOTE 1 The assigned glass transition temperature (T_g) may vary, depending on the specific property and on the method and conditions selected to measure it.

NOTE 2 The so-called onset temperature (see ISO 11357-2), which can also be used, is often more accurately defined.

NOTE 3 To avoid interference or inaccurate measurements due to relaxation or evaporation of solvent/water residues, it can be better to carry out the measurement twice with the same sample and report the second result.

[Adapted from ISO 11357-2:1999]

4 Sampling and sample preparation

Take a representative sample of the binder to be tested, as described in ISO 15528.

Using a film applicator with a gap 40 µm to 50 µm high, apply the binder at a suitable wet-film thickness [arbitrarily 20 µm to 25 µm (= 0,8 to 1,0 mills/thous), alternatively as specified by the user] to a suitable flat, inert and non-porous substrate which will permit easy removal of the film when dried. Substrates like glass, polytetrafluoroethylene (PTFE) or ethylene/propylene diene terpolymer (EPDM) are possible candidates if inert to the binder concerned.

Store the wet film under suitable atmospheric conditions and for a sufficient length of time to permit full drying. If systems are to be compared, the same times and conditions shall be used for each system.

NOTE The length of time necessary varies depending on the composition, e.g. the solvent/water content.

Elevated temperatures may be used, although consideration should be given when selecting the temperature to factors such as the thermal decomposition of the binder and also the presence of any thermally reactive binder components, e.g. crosslinking agents, as these will influence the value of the glass transition temperature.

After drying, place a specimen of known mass of the film in a DSC pan, ensuring good contact between the film and the pan, as specified in ISO 11357-2:1999, Subclause 9.2.

5 Procedure

Carry out the determination as specified in ISO 11357-2.

6 Expression of results

See ISO 11357-2.

7 Precision

See ISO 11357-2.

8 Test report

The test report shall contain at least the following information:

a) a reference to this International Standard (ISO 16805);

b) all details necessary for complete identification of the product tested (manufacturer, trade name, batch number, etc.);

c) all details concerning sample preparation, such as the substrate, application method and drying conditions used, as well as the test temperature (room temperature or higher temperature, if used) and pressure (under a vacuum or at ambient pressure);

d) the result of the test and the test parameters, as indicated in ISO 11357-1 and ISO 11357-2;

e) whether the result was based on the onset or midpoint temperature and whether the first or second measurement was used;

f) any deviation from the test method specified;

g) the date of the test.

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