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National Standard
of the People's Republic of China

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GB/T 6739-2006 / ISO 15184:1998

Replacing GB/T 6739-1996

Paints and varnishes –
Determination of film hardness by pencil test

色漆和清漆 铅笔法测定漆膜硬度

(ISO 15184:1998, IDT)

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Foreword

This Standard equivalently adopts the international standard ISO 15184:1998 "Paints and varnishes - Determination of film hardness by pencil test" (English version).

For ease of use, the following editorial changes are made to ISO 15184:1998:

- a) Add the content to introduce the domestic brand of pencils;
- b) Add the content that the panel's surface, after the test, may be cleaned by drawing eraser;
- c) For the determination of standard test panel and paint thickness, it cites the national standards that equivalently adopt the corresponding international standards.

This Standard replaces GB/T 6739-1996 "Determination of film hardness by pencil test".

Compared with the previous version GB/T 6739-1996, the main technical differences of this Standard are as follows:

- The previous version equivalently adopted JIS K 5400-90-8.4;
- Expand the applicable scope of the substrate;
- For the applied load, it is changed from (1000±50) g to (750±10) g;
- For pencil hardness, its designation is expanded from 9H ~ 6B to 9H ~ 9B;
- The exposed length of pencil lead is changed from 3 mm to 5 mm ~ 6 mm;
- Add the method to use a soft cloth or swab of cotton wool to clean the panel;
- Add the provision of observation time and the provision that can use a magnifying glass to observe;
- Add a defect-type, namely, plastic deformation;
- Change the evaluation method of results.

Annex A of this Standard is normative.

This Standard was proposed by China Petroleum and Chemical Industry Association.

This Standard shall be under the jurisdiction of the National Paints and Pigments Standardization Technical Committee.

Drafting organizations of this Standard: China National Chemical Construction Corporation, Changzhou Coating Chemical Research Institute AND Shanghai Modern Environmental Engineering Technology Co., Ltd.

The main drafter of this Standard: Zheng Guojuan.

This Standard was first issued in 1986, first revision in 1996. This is the second revision.

Paints and varnishes –

Determination of film hardness by pencil test

1 Scope

1.1 This Standard is one of series-standards of sampling and test that are related to paints, varnishes and related products.

This Standard specifies a method for determining the film hardness by pushing pencils of known hardness over the film.

This test can be performed on a single coating of a paint, varnish or related product, or on the upper layer of a multi-coat system.

1.2 This rapid and economic test method is effective in comparing the pencil hardness of different coatings.

It is more effective in providing relative ratings for a series of coated panels exhibiting significant differences in pencil hardness.

This method is applicable only to smooth surfaces.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 3186 Paints, varnishes and raw materials for paints and varnishes sampling (GB/T 3186-2006, ISO 15528:2000, IDT)

GB/T 9271 Paints and varnishes - Standard panels for testing (GB/T 9271-1988, eqv, ISO 1514:1984)

GB/T 13452.2 Paints and varnishes - Determination of film thickness (GB/T 13452.2-1992, eqv, ISO 2808:1974)

GB/T 20777 Paints and varnishes - Inspection and preparation of the sample (GB/T 20777-2006, ISO 1513:1992, IDT)

3 Terms and definitions

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

Pencil hardness: resistance of the surface of a paint film to marking, or the formation of some other defect, as a result of the action of a pencil, with a lead of specified dimensions, shape and hardness, which is pushed across the surface.

Marking by pencil leads covers a range of defects in the surface of the paint film. These defects are defined as follows:

- a) Plastic deformation: a permanent indentation in the paint surface without cohesive fracture.
- b) Cohesive fracture: the presence of a visible scratch or rupture in the surface of the paint film.
- c) Combinations of the above.

These defects can occur simultaneously.

4 Principle

The products or series under test are applied, in a uniform thickness, on a panel with consistent surface structure.

After the paint is dried / solidified, place the panel in a horizontal position; by pushing a pencil, of which the hardness gradually increases, on the paint to determine the pencil hardness of paint.

A pencil lead with a defined geometry is pushed over the paint surface at an angle of 45°, exerting a force of 750g on the surface.

The hardness of the pencil lead is increased in steps until the surface of the coating is marked by the various defects specified in Clause 3.

5 Additional information required

For any particular application, the test methods specified in this Standard need to be improved with additional information. Content of the additional information contents is listed in Annex A.

Annex A

(informative)

Additional information required

In order to normally carry out this method, it should be appropriate to provide additional information as listed in this Annex.

The information required is better to be agreed by the relevant parties; it may be partly or completely taken from the international standards, national standards or other documents that are relevant to the product under test.

- a) the material and surface preparation of the substrate;
- b) the method of application of the test coating to the substrate;
- c) the duration and conditions of drying (or stoving) of the coating, and the conditions of ageing, if applicable, before testing;
- d) the thickness, in micrometres, of the dry coating and the method of measurement used from GB/T 13452.2, and whether it is a single coating or a multi-coat system;
- e) the temperature and relative humidity of the test, if different from those specified in 9.1.

END

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