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Vitreous and porcelain enamels — Corrosion tests in closed systems

Émaux vitrifiés — Essais de corrosion en milieux fermés



Foreword

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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.

International Standard ISO 13806 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Vitreous and porcelain enamels — Corrosion tests in closed systems

1 Scope

This International Standard specifies a test method for the determination of the resistance of enamels used in chemical process technology to acid and neutral materials, as well as to actual process mixtures in closed systems at temperatures above their boiling point.

It is also applicable to the determination of resistance to mildly alkaline fluids provided that the material of the test equipment be suitable for such a test (see 4.1.2).

This International Standard specifies the basic parameters for corrosion tests to ensure adequate repeatability and reproducibility of results. The corrosion rate is calculated from the loss in mass per unit area per unit time, determined according to this test method.

NOTE See ISO 2743 and ISO 2744 for testing of enamels for resistance to boiling acids and neutral liquids in open systems, and ISO 2745 for resistance to alkalis.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative document indicated below. For undated references, the latest edition of normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2743, *Vitreous and porcelain enamels — Determination of resistance to condensing hydrochloric acid.*

ISO 2744, *Vitreous and porcelain enamels — Determination of resistance to boiling water and water vapour.*

ISO 2745, *Vitreous and porcelain enamels — Determination of resistance to hot sodium hydroxide.*

3 Designation

The corrosion tests of enamels in closed systems according to this International Standard are designated as follows:

Test ISO 13806

4 Apparatus

4.1 Test vessel

4.1.1 Design

The ratio between the volume, V , of the test solution, in cubic centimetres, at 20 °C, and the exposed area (A) of enamel, in square centimetres, shall be $V/A = 40 \text{ cm} \pm 2 \text{ cm}$. The vessel shall be filled so that, when closed at an ambient temperature of 18 °C to 28 °C, at least 20 % of its volume remains available as a vapour head space. To meet this requirement, the size of the test apparatus shall be selected corresponding to that of one of the test specimens. Several enamelled specimens may be placed simultaneously in the same test vessel.

The test vessel may be a pressure vessel therefore the national safety instructions shall be observed.

4.1.2 Material

The test vessel shall be made of a material resistant to the test solution and not releasing any substances that might influence the corrosion of the enamel. In particular, glass or ceramic flasks and fluorinated plastics for coating or fitting shall be avoided. Polytetra-fluorethylene (PTFE) shall only be used as a component of seals.

NOTE Vessels with tantalum fittings, with electrolytically deposited tantalum coatings, or vessels made of solid tantalum meet these requirements for acid and neutral solutions over a wide range of applications.

4.1.3 Fittings

The test vessel may be provided with a protective rod for the temperature probe plus a specimen holder and other fittings, e.g., agitator and gas supply hose.

4.1.4 Heating device

The type of heating device and its power shall be selected such that the test temperature is reached within 1 h and is controllable to 1 °C, where the test temperature is defined as the temperature of the test solution at the interface between the enamelled surface and the test solution.

The temperature of the test solution may be assumed to be locally constant during the exposure period if the test is carried out in the liquid phase.

4.2 Other required equipment

4.2.1 Analytical balance, with an accuracy of 0,001 g.

4.2.2 Oven, capable of maintaining a temperature of at least 120 °C.

4.2.3 Desiccator.

4.2.4 Sponge.

5 Test solution

5.1 Artificial test solution

Artificial test solutions shall be made from demineralized water containing less than 0,1 mg/l of silicon dioxide, using reagents of analytical grade.

5.2 Process fluids

When carrying out the test using process fluids, it shall be noted that even small quantities of their constituents can inhibit or accelerate the corrosion rate.

NOTE The inhibitory effect of silicon dioxide and materials releasing silicon dioxide, for example, are well-known.