SLOVENSKI STANDARD
oSIST prEN ISO 20274:2016

01-oktober-2016

Steklasti in keramični emajli - Priprava vzorcev in določanje koeficienta toplotne razteznosti (ISO/DIS 20274:2016)

Vitreous and porcelain enamels - Preparation of samples and determination of thermal expansion coefficient (ISO/DIS 20274:2016)

Emails und Emaillierungen - Herstellung von Proben und Bestimmung des thermischen Ausdehnungskoeffizienten (ISO/DIS 20274:2016)

Emaux vitrifiés - Préparation d'échantillons émaillés et détermination du coefficient de la dilatation thermique (ISO/DIS 20274:2016)

Ta slovenski standard je istoveten z: **prEN ISO 20274**

ICS:

25.220.50	Emajlne prevleke	Enamels

oSIST prEN ISO 20274:2016 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 20274

ISO/TC **107**

Secretariat: **KATS**

Voting begins on:
2016-07-02

Voting terminates on:
2016-09-24

Vitreous and Porcelain enamels — Preparation of samples and determination of thermal expansion coefficient

Emaux vitrifiés — Préparation d'échantillons émaillés et détermination du coefficient de la dilatation thermique

ICS: 25.220.50

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 20274:2016(E)

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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.

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ISO was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC , .

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

The thermal expansion coefficient of enamel and the relevant substrate is an important material characteristic, as it provides information on the stress ratios in the composite material.

Vitreous and Porcelain enamels — Preparation of samples and determination of thermal expansion coefficient

1 Scope

This standard specifies the procedures for the preparation of enamel samples for measurement of the thermal length change and calculation of the thermal expansion coefficient.

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 7991, Glass – Determination of coefficient of mean linear thermal expansion

3 Apparatus

3.1 Standard laboratory instruments, instruments according to ISO 7991 and 3.2 to 3.4.

Note: An optical dilatometer may be used as an alternative to a pushrod dilatometer.

3.2 Casting mould made from ceramic, e.g. boat made from corundum, porcelain, or casting mould made from metal, e.g. tool steel (see Annex A).

3.3 Melting crucible made from non-contaminating material, e.g. corundum, porcelain, with a height of about 55 mm and a diameter of approximately 40 mm.

3.4 Laboratory furnace, in the temperature range from 800 °C to 1 100 °C controllable to ± 5 °C

4 Requirements for the test specimen

The test specimen shall be rod shaped and straight with either approximately circular cross section with a diameter constant to ± 1mm over its length or approximately square cross section with an edge length constant to ± 1mm over its length. The diameter or edge length of the test specimen shall correspond ± 1mm to the diameter or edge length of the reference sample.

The faces shall be plane-parallel and vertical to the longitudinal axis of the specimen to maximum ± 3°. The initial length shall be ± 0.5 mm equal to the initial length of the reference sample.

The dimensions shall correspond to the requirements of the dilatometer used and the reference sample.

5 Preparation of the test specimens

5.1 General

The test specimen shall be sufficiently stress-free by tempering so that no dip occurs in the measuring diagram when measuring the expansion coefficient.

NOTE An absence of stress can e.g. be attained by heating the test specimen to approximately 30 °C above the transformation temperature, followed by slow cooling in the furnace at approximately 2 °C /min to approximately 150 °C below the transformation temperature and then to the room temperature in draught-free air.

The production process for a test specimen prepared according to this standard shall be denoted as follows:

G production by casting;

Z production by drawing;

S production by sintering;

5.2 Production by casting

The enamel frit shall be melted in the melting crucible (3.3) in the laboratory furnace (3.4). To prevent evaporation losses, melting temperatures and holding times which are appropriate to allow for pouring out into the mould should be used as excessive melting temperatures and holding times will distort results. The melting stock shall be filled into the casting mould (3.2) while avoiding air inclusions.

If using a casting mould made from ceramic, this shall be coated beforehand with a release agent, e.g. kaolin, and preheated to approximately 500 °C. The test specimen in the casting mould shall then be cooled down sufficiently slowly so that it solidifies without cracks (see also 5.1). The test specimen shall be free of release agent and cut and polished to the required dimensions, ensuring the ends are parallel to each other.

If using a casting mould made from metal, the specimen in the mould shall be cooled in air until solidification. A suitable ceramic plate shall be placed in the mould and this lifted and supported with the mould so that the specimen remains on the ceramic plate. The plate with the specimen shall then be placed immediately in the laboratory furnace (3.4) heated to approximately 30 °C above the transformation temperature and cooled down crack-free (see also 5.1). The test specimen shall be cut to the required length and ground plane-parallel.

5.3 Production by drawing out of the melt

The frit shall be melted in the crucible (3.3) in the laboratory furnace (3.4) at a temperature between 900 °C and 980 °C adapted to the hardness of the enamel.

NOTE 1 Too high a heating is disadvantageous as it seriously impedes the subsequent drawing of the rod for the test specimen production. In general, the temperature is reached if a smooth enamel surface has resulted in the melting crucible.

After the frit has reached the firing temperature, additional frit is added to the melting crucible and melted a second time, as the drawing is difficult if the amount of liquid enamel is inadequate. The melting crucible may not be filled more than three times maximum. After preparing the melt, the melting crucible (3.3) shall be removed from the laboratory furnace (3.4) within 15 s. The melting crucible shall be held with crucible tongs and now a glass or metal rod is immersed slightly in to the liquid enamel and is rotated until the glass fuses around the rod d (see Figures B.1 a) and B.1 b)). In this way, air inclusions can be prevented. The direction of turning may not be changed. It is necessary to wait until a small melt ball has resulted, this indicating the end of the fusion (see Figure B.1 c)). The rod

