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Dentistry — Dental furnace —

Part 2: Test method for evaluation of furnace programme via firing glaze

Médecine bucco-dentaire — Four dentaire —

Partie 2: Méthode d'essay pour l'evaluation des programmes des fours dentaires avec le degrè de calcination

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 106, *Dentistry*, Subcommittee SC 2, *Prosthodontic materials*.

A list of all parts in the ISO 13078 series can be found on the ISO website.

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Introduction

Dental furnaces are suitable for the manufacturing of metal-ceramic and partly also all-ceramic restorations for use in dentistry. Dental furnaces are particularly used for firing or sintering, respectively, of dental opaques, dentine and enamel materials to the respective compatible substructure materials. According to the current state of the art, the temperature of this process lies between 600 °C and 1 000 °C.

The different calibration processes applied by the manufacturers of dental furnaces as well as the varying construction types of the dental furnaces currently on the market influence the firing result.

Despite the fact that different dental furnaces can have identical digital external displays, different results regarding the degree of firing can be identified when processing the same ceramics under otherwise similar conditions.

A different degree of firing not only causes differences that can be judged directly by the human eye (e.g. colour and transparency), but also deviations that cannot be detected by the eye. These are, for instance, the linear coefficient of thermal expansion, the bonding strength, the strength values and the acid solubility. Such changes may result in clinical failures (e.g. fractures) as well as changed aesthetics of the dental ceramic restoration.

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Dentistry — Dental furnace —

Part 2: Test method for evaluation of furnace programme via firing glaze

1 Scope

This document determines a degree of firing to be implemented by the user. It represents a test method for adapting the firing program of a dental furnace by determining the degree of firing of fired test specimens for a dental ceramic.

The test method is suitable for powdered dental ceramics according to ISO 6872, Type I.

The test method enables monitoring of the temperature control in the dental furnace by evaluating the firing degree of a dental ceramic. The test method is also suitable for evaluating the reproducibility of the firings in a dental furnace or for comparing several dental furnaces.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 13078, *Dentistry — Dental furnace — Test method for temperature measurement with separate thermocouple*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942, ISO 6872, ISO 9693-1 and ISO 13078 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
degree of firing
surface or edge state of a dental ceramic, which has been treated thermally (i.e. fired, sintered) according to definite firing instructions and which enables statements concerning the physical properties to be evaluated with the eye, such as transparency, colour, surface quality (roughness or smoothness) as well as shrinkage and edge stability of the test specimen

Note 1 to entry: The degree of firing of dental ceramics is differentiated into under-fired, correctly fired and over-fired.

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3.2
under-fired dental ceramic
dental ceramic with significant porosities, observable inadequate translucence and still indistinct colour, whose appearance is milky and grey-white opaque and with a surface that is rough and without lustre

Note 1 to entry: No transparency or inadequate colour impression can, however, also result in smooth surfaces as a result of residual porosities inside the specimen.

Note 2 to entry: The best evaluation of under-fired dental ceramics is possible in the case of very transparent colour-intensive dental ceramics.

Note 3 to entry: Although test specimens that are heated too quickly up to the maximum firing temperature exhibit a highly lustrous surface, the inside is milky opaque. These specimens are also under-fired inside.

3.3
correctly fired dental ceramic
dental ceramic without porosities, whose surface does not exhibit any opaqueness, and with slightly rounded edges

Note 1 to entry: Colour and transparency correspond to a standard specimen or the reference sample of the relevant manufacturer.

3.4
over-fired dental ceramic
dental ceramic without porosities, whose surface exhibits a high lustre and whose edges are significantly rounded

3.5
reference sample
correctly fired comparison sample of a dental ceramic (provided by manufacturer of veneering ceramic)

4 Test method

4.1 Materials

4.1.1 **Dental ceramic material**, powdered, transparent and possibly coloured (e.g. blue), from the existing range for visual comparison with a specimen specified as standard or a reference sample.

4.1.2 **Liquid,** e.g. alcohol, water according to ISO 3696, grade 3, mixing liquid.

4.1.3 **Firing tray**.

4.1.4 **Firing pins** about 12 mm long.

4.1.5 **Firing underlay**, e.g. **firing cotton** about 20 mm × 20 mm × 3 mm or **platinum foil** about 20 mm × 20 mm × 0,03 mm or similar firing underlay.

4.1.6 Only when using the platinum foil in 4.1.5: For the coating of the platinum foil: **Aluminium oxide powder (Al_2O_3 powder)**, e.g. Bikorit.[1)]

4.1.7 Reference sample (provided by the manufacturer of veneering ceramic).

1) Bikorit is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

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