



SLOVENSKI STANDARD
oSIST prEN ISO 6872:2023
01-julij-2023

Zobozdravstvo - Keramični materiali (ISO/DIS 6872:2023)

Dentistry - Ceramic materials (ISO/DIS 6872:2023)

Zahnheilkunde - Keramische Werkstoffe (ISO/DIS 6872:2023)

Médecine bucco-dentaire - Matériaux céramiques (ISO/DIS 6872:2023)

Ta slovenski standard je istoveten z: prEN ISO 6872

<https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023>

ICS:

11.060.10 Zobotehnični materiali Dental materials

oSIST prEN ISO 6872:2023

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 6872

ISO/TC 106/SC 2

Secretariat: ANSI

Voting begins on:
2023-05-16

Voting terminates on:
2023-08-08

Dentistry — Ceramic materials

Médecine bucco-dentaire — Matériaux céramiques

ICS: 11.060.10

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN ISO 6872:2023](https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023)

<https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023>

This document is circulated as received from the committee secretariat.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ISO/CEN PARALLEL PROCESSING



Reference number
ISO/DIS 6872:2023(E)

© ISO 2023

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN ISO 6872:2023](https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023)

<https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
3.1 Material.....	1
3.2 Processing.....	3
3.3 Properties.....	4
4 Types, classes, and their identification.....	4
5 Requirements.....	5
5.1 Uniformity.....	5
5.2 Freedom from extraneous materials.....	6
5.3 Mixing and condensation properties of type I ceramics.....	6
5.4 Physical and chemical properties.....	6
5.5 Biocompatibility.....	6
5.6 Shrinkage factor.....	6
6 Sampling.....	6
6.1 Type I ceramics.....	6
6.2 Type II ceramics.....	6
7 Test methods.....	7
7.1 Preparation of test specimens.....	7
7.1.1 Components of test specimens (type I ceramics).....	7
7.1.2 Apparatus for mixing.....	7
7.1.3 Method of mixing.....	7
7.1.4 Procedure for specimen fabrication.....	7
7.1.5 Firing.....	7
7.2 Radioactivity of dental ceramic.....	8
7.2.1 Preparation of samples.....	8
7.2.2 Counting procedure.....	8
7.2.3 Assessment of results.....	8
7.3 Flexural strength.....	8
7.3.1 Three-point and four-point bending tests.....	8
7.3.2 Biaxial flexure test (piston-on-three-ball test).....	12
7.4 Linear thermal expansion coefficient.....	14
7.4.1 Apparatus.....	14
7.4.2 Preparing of test specimens (type I and type II ceramics).....	14
7.4.3 Dilatometric measurement.....	14
7.4.4 Assessment of results.....	14
7.5 Glass transition temperature.....	14
7.5.1 Operating procedure.....	14
7.5.2 Assessment of results.....	15
7.6 Chemical solubility.....	15
7.6.1 Reagent.....	15
7.6.2 Apparatus.....	15
7.6.3 Preparation of test specimens.....	16
7.6.4 Procedure.....	16
7.6.5 Calculation and assessment of results.....	16
8 Information and instructions.....	16
8.1 Information.....	16
8.1.1 General.....	16
8.1.2 Type I Ceramics.....	16

ISO/DIS 6872:2023(E)

8.1.3	Type II ceramics.....	16
8.2	Instructions for use.....	17
9	Packaging, marking, and labelling.....	17
9.1	Packaging.....	17
9.2	Marking and labelling.....	17
Annex A	(informative) Fracture toughness.....	19
Annex B	(informative) Weibull statistics.....	26
Annex C	(informative) Protocol to assess the hydrothermal stability of yttria-stabilized tetragonal zirconia (Y-TZP).....	28
Bibliography	32

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN ISO 6872:2023](https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023)

<https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023>

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

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

This fifth edition cancels and replaces the fourth edition (ISO 6872:2015), which has been technically revised with the following changes:

- incorporation of ISO 6872:2015/Amd 1:2018
- addition of informative annex on protocol to assess the hydrothermal stability of yttria-stabilized tetragonal zirconia (Y-TZP)

Introduction

Specific qualitative and quantitative requirements for freedom from biological hazard are not included in this International Standard, but it is recommended that in assessing possible biological or toxicological hazards, reference be made to ISO 10993-1 and ISO 7405.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN ISO 6872:2023](https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023)

<https://standards.iteh.ai/catalog/standards/sist/5f1dfbb1-9316-4ef3-bc50-02fcb1937834/osist-pren-iso-6872-2023>

Dentistry — Ceramic materials

1 Scope

This International Standard specifies the requirements and the corresponding test methods for dental ceramic materials for fixed all-ceramic and metal-ceramic restorations and prostheses.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 1942, *Dentistry — Vocabulary*

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 and the following apply.

3.1 Material

3.1.1

addition ceramic

add-on ceramic

correction ceramic

dental ceramic material which is fired at a reduced temperature and is normally applied to restore contact areas on a dental restoration or prosthesis

3.1.2

aesthetic ceramic

dental porcelain (3.1.5) or *glass ceramic* (3.1.10) having appropriate translucency and colour used to mimic the optical properties of natural teeth

3.1.3

chromatic dentin ceramic

dentine ceramic having a high strength or saturation of the hue (color)

3.1.4

dental ceramic

inorganic, non-metallic material which is specifically formulated for use when processed according to the manufacturers' instructions to form the whole or part of a dental restoration or prosthesis

3.1.5

dental porcelain

predominantly, glassy *dental ceramic* (3.1.4) material used mainly for aesthetics in a dental restoration or prosthesis

ISO/DIS 6872:2023(E)

3.1.6

dentine ceramic

dental ceramic (3.1.4) material used to form the overall shape and basic colour of a dental restoration or prosthesis simulating the natural tooth dentine

3.1.7

enamel ceramic

dental ceramic (3.1.4) material used to overlay, either partially or wholly, the *dentine ceramic* (3.1.6) and also, to form the more translucent incisal third of a dental restoration or prosthesis simulating the natural tooth enamel

3.1.8

flame-sprayed dental ceramic

dental ceramic core or substructure layer formed via the technique of flame-spraying

3.1.9

fluorescent ceramic

dental ceramic (3.1.4) material that absorbs radiant energy and emits it in the form of radiant energy of a different wavelength band all or most of whose wavelengths exceed that of the absorbed energy

EXAMPLE Absorption of ultraviolet light with emission of blue light.

3.1.10

glass ceramic (dental)

dental ceramic (3.1.4) material formed by the action of heat treatment on a glass in order to cause initiation and growth of a wholly or predominantly crystalline microstructure

3.1.11

glass-infiltrated dental ceramic

dental ceramic core or substructure layer which is porous and is subsequently densified by the infiltration of specialised glass at elevated temperature

3.1.12

glaze ceramic

dental ceramic (3.1.4) material which is overlaid and fired at a lower temperature compared to *dentine ceramic* (3.1.6) or *enamel ceramic* (3.1.7) to produce a thin coherent sealed surface, the level of gloss being determined by the firing conditions

3.1.13

liner

dental ceramic (3.1.4) material used on all ceramic substructure forming a layer that provides a background colour upon which dentine or opaceous dentine can be applied to achieve overall aesthetics

3.1.14

modelling fluid

liquid with which a dental ceramic powder is mixed in order to shape or model it into its required form prior to firing

3.1.15

modifying enamel ceramic

enamel ceramic (3.1.7) used to modify the surface contour of a restoration, for example, add a contact, often fired at a lower temperature than the enamel ceramic or dentine ceramic

3.1.16

monolithic ceramic

dental ceramic (3.1.4) that is substantially made of a single uniform material

Note 1 to entry: A thin layer of *glaze* (3.3.4) (staining technique) can be applied.

3.1.17**opaceous dentine ceramic**

dental ceramic (3.1.4) material having a higher opacity than a *dentine ceramic* (3.1.6) material, but which can still be used to contribute to the overall shape and basic colour of a dental restoration or prosthesis simulating the natural tooth dentine

3.1.18**opalescent enamel ceramic**

enamel ceramic (3.1.7) material that scatters shorter wavelengths of light (e.g. blue) and transmits longer wavelengths of light (e.g. red)

3.1.19**opaque dental ceramic**

dental ceramic (3.1.4) material which when applied to a metallic substructure, according to the manufacturer's instructions, acts to bond to the metal surface forming a layer that provides a background colour and interface upon which other dental ceramic materials can be applied to achieve overall aesthetics

3.1.20**shoulder ceramic****margin ceramic**

dental ceramic (3.1.4) material used to form shape and colour at the marginal area of the dental restoration or prosthesis simulating natural tooth dentine in this area

3.1.21**stain ceramic**

dental ceramic powder or paste which is normally intensely coloured and which is formulated to be used either internally or externally during the build-up of a dental restoration or prosthesis to simulate details within or on the surface as are found in natural teeth

3.1.22**substructure (core) dental ceramic**

predominantly, polycrystalline dental ceramic material that forms a supporting substructure upon which one or more layers of *dental ceramic* (3.1.4) or dental polymer material are applied, either partially or totally, to form a dental restoration or prosthesis

3.2 Processing**3.2.1****air firing dental ceramic**

firing of *dental ceramics* (3.1.4) under ambient atmospheric pressure

3.2.2**dental CAD/CAM**

computer-aided design/computer-aided manufacture (CAD/CAM) procedures to manufacture a dental restoration or prosthesis normally including the following stages: a) a digital scanning procedure of the model, wax-up, or intra-orally to produce a 3D data set; b) software manipulation of the 3D data set to design the prosthesis; c) a computer-directed machine tool that performs the manufacturing process

3.2.3**condensation of dental ceramic**

powder process whereby a slurry of dental ceramic powder is vibrated to compact the powder prior to sintering

3.2.4**injectable, castable, or pressable dental ceramic**

dental ceramic (3.1.4) material, normally in the form of a pellet or ingot (often pre-sintered), designed for use in a specialised furnace which enables the ingot to be injected/cast/pressed into a mould prepared through the lost wax technique

ISO/DIS 6872:2023(E)

3.2.5

sintering of a dental ceramic

process whereby heat and potentially other process parameters, for example, mechanical or gas pressure, are applied to a ceramic powder or powder compact in order to densify the ceramic into its required form

Note 1 to entry: "Firing" and "sintering" are used interchangeably in this International Standard ("firing" connoting the application of heat to drive sintering).

3.2.6

vacuum firing dental ceramic

firing of *dental ceramics* (3.1.4) at reduced pressure (i.e. under vacuum) to yield the required density and associated aesthetics especially the degree of translucency

Note 1 to entry: Dental ceramics for vacuum firing have a specific particle size distribution to reduce the entrapment of porosity.

3.3 Properties

3.3.1

class of dental ceramic

classification of a *dental ceramic* (3.1.4) material according to its intended function

3.3.2

fracture toughness

conventional fracture mechanics parameter indicating the resistance of a material to crack extension (propagation)

3.3.3

glass transition temperature

approximate midpoint of the temperature range over which a glass transforms between elastic and viscoelastic behaviour characterized by the onset of a rapid change in its coefficient of thermal expansion

3.3.4

glaze

surface appearance obtained when the gloss is clinically and aesthetically acceptable

4 Types, classes, and their identification

For the purposes of this International Standard, dental ceramics are designated into two types.

- Type I: Ceramic products that are provided as powders, pastes, or aerosols.
- Type II: All other forms of ceramic products.

Ceramics are divided into five classes according to their intended clinical use and according to the descriptions in [Table 1](#). If colour is added to a ceramic powder for identification purposes, the colour coding given in [Table 2](#) is recommended.

Table 1 — Classification of ceramics for fixed prostheses by intended clinical use with required mechanical and chemical properties

Class	Recommended clinical indications	Mechanical and chemical properties	
		Flexural strength [MPa] minimum value for mean (see 7.3.1.4)	Chemical solubility [$\mu\text{g}/\text{cm}^2$]

Table 1 (continued)

Class	Recommended clinical indications	Mechanical and chemical properties	
1	a) Monolithic ceramic for single-unit anterior prostheses, veneers, inlays, or onlays adhesively cemented.	50	<100
	b) Ceramic for coverage of a metal framework or a ceramic substructure.	50	<100
2	a) Monolithic ceramic for single-unit anterior or posterior prostheses adhesively cemented.	100	<100
	b) Partially or fully covered substructure ceramic for single-unit anterior or posterior prostheses adhesively cemented.	100	<2 000
3	a) Monolithic ceramic for single-unit anterior or posterior prostheses and for three-unit prostheses not involving molar restoration adhesively or non-adhesively cemented.	300	<100
	b) Partially or fully covered substructure for single-unit anterior or posterior prostheses and for three-unit prostheses not involving molar restoration adhesively or non-adhesively cemented.	300	<2 000
4	a) Monolithic ceramic for three-unit prostheses involving molar restoration.	500	<100
	b) Partially or fully covered substructure for three-unit prostheses involving molar restoration.	500	<2 000
5	Monolithic ceramic for prostheses involving partially or fully covered substructure for four or more units or fully covered substructure for prostheses involving four or more units.	800	<100

Table 2 — Recommended colour coding for the identification of type I dental ceramic powders

Material	Colour coding
Dentine ceramic	Pink
Enamel ceramic	Blue
Fluorescent ceramic	Yellow
Highly chromatic dentine ceramic	Orange
Opalescent enamel ceramic	Blue-green
Modifying enamel ceramic (e.g. translucent, clear)	Purple

5 Requirements

5.1 Uniformity

The inorganic pigment(s) used to produce the colour of a fired dental ceramic and any organic colorants (for colour coding) shall be uniformly dispersed throughout the dental ceramic material and in powdered ceramic products, no segregation of the pigment(s) shall take place when the powder is mixed as in 7.1.3. Check by visual inspection.