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Dental materials — Determination of colour stability

Produits dentaires — Détermination de la stabilité de couleur

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 7491 was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 2, *Prosthetic materials*.

This second edition cancels and replaces the first edition (ISO 7491:1985), which has been technically revised.

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Introduction

Colour stability is an important characteristic of dental materials and it is expected that the test methods in this International Standard will be referred to in the International Standards specifying such materials.

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Dental materials — Determination of colour stability

1 Scope

This International Standard specifies a method for the determination of the colour stability of dental materials after exposure to light and water.

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 documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources*.

CIE Publication 15.2, *Colorimetry*.

3 Test methods

3.1 Apparatus

3.1.1 Radiation source

Xenon medium-pressure lamp with a colour temperature of 5 000 K to 10 000 K and with an illuminance at the specimen of 150 000 lx. Any deviation of the illuminance from the mean value at any given moment shall not exceed $\pm 10\%$ over the entire area occupied by the test specimen, measured in accordance with ISO 4892-2.

Other radiation sources of performance equivalent to the xenon lamp are also suitable.

The xenon lamp and the ultraviolet filter (3.1.2) should normally be replaced after 1 500 h use because of the change in radiation intensity due to ageing. The illuminance should be measured with a suitable illumination meter and the illuminance adjusted accordingly.

3.1.2 Ultraviolet filter, of borosilicate glass, with transmittance of less than 1 % below 300 nm and greater than 90 % above 370 nm.

3.1.3 Test chamber

The test chamber comprises the following components.

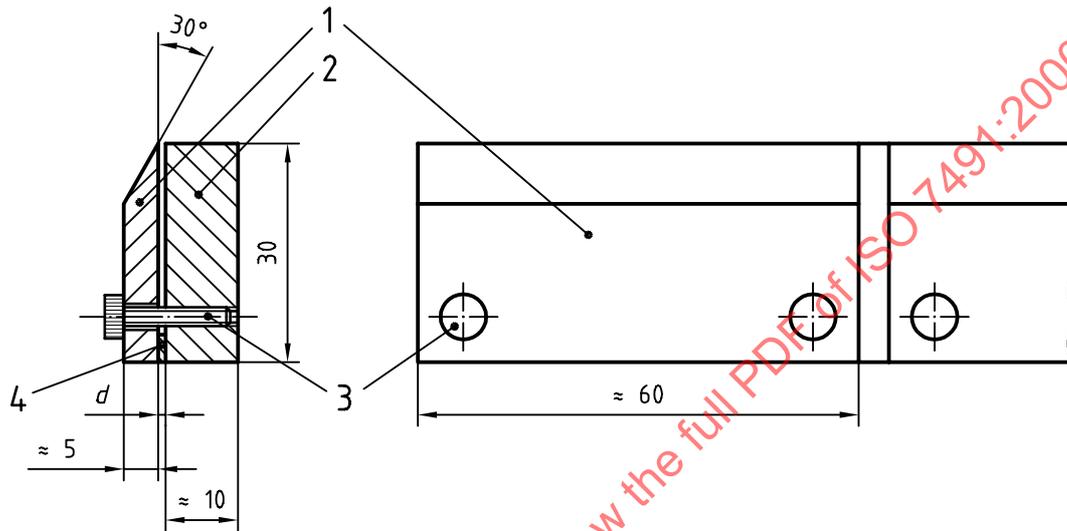
3.1.3.1 Circulating water bath

The water, complying with grade 2 of ISO 3696, shall be maintained at $(37 \pm 5) ^\circ\text{C}$ and at a depth of (10 ± 5) mm above the specimens, which are held parallel to the bottom of the chamber.

3.1.3.2 Specimen holder, of an opaque material, preferably metal, for specimen discs up to 50 mm diameter.

A suitable holder is shown in Figure 1.

Dimensions in millimetres



Key

- 1 Clamping plate
- 2 Base plate
- 3 Screw
- 4 Spacer, of dimension d adjusted to the thickness of the specimen

NOTE The holder may be designed for one or several specimens.

Figure 1 — Holder for specimen discs up to 50 mm diameter

3.2 Procedure

3.2.1 Specimen preparation

Individual dental material standards specify specimen size, method of preparation and conditioning as well as the method of preparing a reference specimen. Such standards shall be used in conjunction with this International Standard.

3.2.2 Radiation test

Either clamp one-half of the specimen in the holder, as shown in Figure 1, or cover one-half of the specimen with tin or aluminium foil. For specimen teeth, cover half of the vestibular surface with tin or aluminium foil parallel to the long axis of the tooth.

With the ultraviolet filter (3.1.2) in position, place the test specimens in the water bath and expose them to the radiation of the xenon lamp (3.1.1) for (24 ± 1) h. Take care to avoid casting shadows on the specimens.

3.2.3 Colour comparison

Use three people with normal colour vision to compare by visual inspection the exposed and unexposed halves of each of the specimens and the unirradiated specimen for any colour differences. The normal colour vision of the observers shall be verified by a medical practitioner or other appropriately trained person. Corrective untinted lenses may be worn.

Make the comparison in bright diffuse daylight under an overcast "northern/southern" sky or, alternatively, under a xenon or equivalent lamp corresponding to D65, in accordance with CIE Publication 15.2, without any significant coloured reflection and using an illuminance of 1 000 lx to 2 000 lx.

For disc-shaped specimens, place a diffuse white background of reflectance about 90 % (white bondpaper is suitable) behind the samples. Limit the background to the size of the disc and surround it by a diffuse grey background with a reflectance of (30 ± 5) %.

For tooth-shaped specimens, use a diffuse grey background with a reflectance of (30 ± 5) %.

Allow the three observers to view the specimens at a distance of 200 mm to 300 mm for a period of not longer than 2 s.

Record the independent comparisons of the three observers. In the event of disagreement between the observers, the majority view shall be reported.

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Bibliography

- [1] ISO 4582:1998, *Plastics — Determination of changes in colour and variations in properties after exposure to daylight under glass, natural weathering or laboratory light sources.*
- [2] ISO 4892-1:1994, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance.*

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