International Workshop Agreement

IWA 8

Tableware, giftware, jewellery, luminaries — Glass clarity — Classification and test method

Verrerie, objets de décoration, bijouterie, luminaires — Clarté du verre — Classification et méthode d'essai

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Foreword

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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.

International Workshop Agreement IWA 8 was drafted at a workshop held in Paris, France, in October 2009. The workshop, which was proposed by the Institut du Verre and mandated by the International Crystal Federation (ICF) and its European arm European Domestic Glass (EDG), was organized jointly by the Institut du Verre and the Association Française de Normalisation (AFNOR).

This corrected version of IWA 8:2009 incorporates the following correction:

— an error in Equation (A.1) has been corrected.

Introduction

This International Workshop Agreement is intended to provide a generic definition and classification of glass clarity to permit a global understanding of consumer quality requirements, with a corresponding method to measure glass clarity.

For glass clarity, spectrophotometric measurement is performed in accordance with CIE 15:2004 with a predefined choice of illuminate and observer. Measurement on the sample at two different thicknesses permits calculation of internal transmission for a defined intermediate thickness and indicates glass clarity irrespective of the refractive index value. The same methodology applies for all mineral glasses.

This method has been verified in accordance with visual inspection with a light cabinet. In addition, preliminary collaborative studies have confirmed the results of these measurements as being coherent with both consumer perception and quality recognition.

As it is well known that iron is by far the main contaminant of glass raw materials affecting the transparency and colorimetric purity of the glass, the iron content has been considered as an additional criterion.

Tableware, giftware, jewellery, luminaries — Glass clarity — Classification and test method

1 Scope

This International Workshop Agreement establishes requirements for the use of the glass designations “clear glass” and “ultra-clear glass” for non-coloured glass items according to their clarity and iron content. This International Workshop Agreement specifies a procedure for measuring the clarity of glass items by means of a spectrophotometer.

This International Workshop Agreement is applicable to

— mineral glasses, and

— glass items where a part is not covered by coating or decoration, and is therefore available for sampling.

This International Workshop Agreement is applicable to the use of glass as tableware, giftware, jewellery and luminaries.

This International Workshop Agreement is not applicable to the use of glass in the context of building, containers, medicine and laboratories, and to other technical uses of glass.

2 Specifications

2.1 General

The classification of the samples of glass in terms of clarity is based on three criteria:

— lightness, L^*;

— chroma, C^*;

— iron content of the material.

The iron content is a main contaminant influencing the transparency and colour of the glass; the value is expressed in iron oxide (Fe_2O_3) in mg/kg.

NOTE The best classification of clarity is obtained for the maximum value of lightness L^* at 100 and the minimum value of chroma C^* at zero.

2.2 Specifications for ultra-clear glass

Ultra-clear glass shall have:

— lightness $L^* \geqslant 98{,}8$;

— chroma $C^* \leqslant 0{,}5$;

— iron oxide content $\leqslant$ 140 mg/kg.

If one or more of these criteria are not reached, the glass cannot be classified as ultra-clear glass.

2.3 Specifications for clear glass

Clear glass shall have:

— lightness $L^* \geqslant 98{,}0$;

— chroma $C^* \leqslant 0{,}5$;

— iron oxide content $\leqslant$ 200 mg/kg.

If one or more of these criteria are not reached, the glass cannot be classified as clear glass.

3 Test methods

3.1 General

The sample shall be prepared in accordance with 3.3 and 3.4. The same sample shall be used to characterize the three criteria, in accordance with the following two determination methods:

— Annex A shall apply for the determination of lightness L^* and chroma C^*;

— Annex B shall apply for the determination of the iron oxide content.

3.2 Apparatus

3.2.1 Double-beam spectrophotometer, preferably with integrating sphere.

3.2.2 X-ray fluorescence spectrometer, with wavelength dispersion.

3.2.3 Non-metallic hammer.

3.2.4 Non-metallic plate.

3.2.5 Platinum crucible, compatible with the final dimensions of the sample(s).

3.2.6 Electric oven, capable of maintaining a temperature of 1 300 °C for a duration of 16 h.

3.2.7 Polishing device.

3.2.8 Manual grinding device, with silicium carbide (SiC) abrasive.

3.2.9 Automatic grinding machine.

3.2.10 Automatic polishing device.

3.3 Sampling

3.3.1 General

The sampling is carried out to prepare two pieces of glass:

— the first with a minimum dimension of 30 mm for one face;

— the second with a minimum dimension of 10 mm for one face.

The two other dimensions shall be greater than the slide dimensions of the **spectrophotometer** (3.2.1) for the two pieces.

3.3.2 Cutting

Cut a glass block from the glass item (e.g. tumblers with a thick bottom).

For glass items covered with coating or decoration, or for glass items of which the minimum dimensions of the sample cannot be reached,

— melt a sufficient quantity of glass not covered with coating or decoration, approximately 200 g;

— crush with a **non-metallic hammer** (3.2.3) on a **non-metallic plate** (3.2.4);

— melt in a **platinum crucible** (3.2.5) in an **electric oven** (3.2.6) for a duration of at least 8 h at 1 300 °C, in order to obtain a good quality of glass;

— check for the absence of seeds or bubbles;

— after solidification of the glass, put the crucible outside the furnace in a cold water stream to separate the glass from the crucible.

The resulting sample is annealed to avoid residual stresses.

3.4 Sample preparation

3.4.1 General

For the internal transmission measurements, prepare one sample with at least one face providing 10 mm thickness for measurement and the other sample with at least one face providing 30 mm thickness for measurement (see 3.3.1). The sample thicknesses where the light travels are (10 ± 0,05) mm and (30 ± 0,05) mm respectively.

The dimensions of the samples (cubes) should fit the sample holder of the spectrophotometer that is used.

The preparation of the cubes of glass samples are carried out in accordance with the usual procedures of the laboratories, applying a **polishing device** (3.2.7) on the two faces in the optical way of transmission (light path).