

SEMI D10-95 (Reapproved 0703) TEST METHOD FOR CHEMICAL DURABILITY OF FLAT PANEL DISPLAY GLASS SUBSTRATES

This Standard was technically approved by the Flat Panel Display Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on April 28, 2003. Available at www.semi.org in July 2003; originally published in 1995.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Purpose

1.1 This test procedure evaluates quantitatively the durability of flat panel display (FPD) glass substrates using reagents employed in FPD production processes.

2 Scope

2.1 This Standard may be used by vendors and/or buyers of glass substrates for FPD.

2.2 This Standard defines three methods for testing chemical durability of various flat panel display substrates: (Method A) Weight Loss, (Method B) Step Measurement Using Profilometry, and (Method C) Surface Haze. Each method provides a measure of the amount of material that is removed from a substrate during a controlled chemical reaction sequence. This sequence is nominally identical for each method.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 These tests are not applicable to calculating variations in chemical durability in local areas within a substrate.

3.2 The calculations assume that all edges are nominally straight. They do not include adjustments for corner cuts.

3.3 The chemicals used in these practices are potentially harmful and should be handled in a fume hood with the utmost care at all times. **Warning:** Hydro-fluoric acid solutions are particularly hazardous. **Precaution:** They should not be used by anyone who is not familiar with the specific preventive measures and first aid treatments given in the appropriate Material Safety Data Sheet.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI D5 — Standard Size for Flat Panel Display Substrates

4.2 ASTM Standard¹

ASTM C729 — Test Method for Density of Glass by Sink Float Comparator

4.3 ISO Standard²

ISO 3274 — Instruments for the Measurement of Surface Roughness by the Profile Method Contact (Stylus) Instruments of Consecutive Profile Transformation Contact Profile Meters, System M

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>

² International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland; Telephone: +41.22.749.01.11, <http://www.iso.org>

4.4 JIS Standards³

JIS B 0651 — Instruments for the Measurement of Surface Roughness by the Stylus Method

JIS B 7507 — Vernier, Dial, and Digital Calipers

JIS B 7601 — Trip Balances

JIS K 7105 — Testing Methods for Optical Properties of Plastics

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Definitions

5.1.1 *haze* — a method to measure the degree of haze created on the FPD glass substrate surface by a chemical etch sequence.

5.1.2 *step measurement using profilometry* — a method to measure depths of etching by comparing the differences in heights between etched and non-etched parts of a specimen measured by profilometry or an equivalent method.

5.1.3 *weight loss method* — a method to calculate depths of etching by comparing differences in specimen weights before and after the etch sequence.

6 Apparatus

6.1 For all chemical reactions, the following apparatus shall be used.

6.1.1 Reaction Vessel

6.1.1.1 *Material* — Teflon or other suitably etch-resistant material.

6.1.1.2 *Shape and Capacity* — Cylindrical wide-mouthed sealable vessel, suitable for the size and quantity of samples to be tested.

6.1.2 Thermostatically Controlled Shaker Bath or Equipment

6.1.2.1 *Shaking Stroke* — 10 to 60 mm.

6.1.2.2 *Shaking Frequency* — 30 to 90/min., controllable to ± 10 /min.

6.1.2.3 *Operating Temperature Range* — 20 to 150°C, controllable to $\pm 1^\circ\text{C}$.

6.1.3 *Oven* — Controllable to $\pm 10^\circ$ over an operating range of 50 to 200°C.

6.1.4 *Desiccator* — Room temperature, with sufficient capacity and size for all samples to be tested.

6.1.5 *Caliper* — Per JIS B 7507, or equivalent.

6.2 For the measurements, one of the following shall be used.

6.2.1 *Method A* — Balance per JIS B 7601, or equivalent.

6.2.2 *Method B* — Profilometer per ISO 3274, JIS B 0651, or equivalent.

6.2.3 *Method C* — Haze measurement equipment with integrating sphere per JIS K 7105, or equivalent.

NOTE 1: It is ideal to use haze measurement equipment which automatically measures total transmittance, diffuse transmittance, and haze values.

7 Reagents and Materials

7.1 No specific requirement is defined for the reagents and materials. As long as the test conditions are reported with the result, any combination of chemical reagents with any concentration can be used for the test. The test conditions

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