SEMI G59-94 (Reapproved 0302)
TEST METHOD FOR MEASUREMENT OF IONIC CONTAMINATION ON LEADFRAME INTERLEAFING AND THE CONTAMINATION TRANSFERRED FROM THE INTERLEAFING TO THE LEADFRAMES

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1 Purpose

1.1 This Test Method describes a procedure to determine the ionic contamination on leadframe interleafing and the contamination transferred from the interleafing to the leadframes using a water extraction method.

2 Scope

2.1 This Test Method is sensitive to the following ionic species: Na^+, NH_4^+, K^+, Cl^-, NO_3^-, Br^-, SO_4^{2-}, PO_4^{3-}.

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 Referenced Standards and Documents

3.1 *ASTM Standards*[1]

ASTM D4327 — Anions in Water by Ion Chromatography

ASTM D1193 — Specification for Reagent Water

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

4 Terminology

4.1 *eluent* — the solvent used to carry the extracted ions through the ion exchange chromatograph.

4.2 *interleaf (for semiconductor leadframes)* — a paper or plastic film which is placed between layers of semiconductor leadframes strips to prevent tangling.

4.3 *regenerant* — a chemical solution containing the ions originally present in the chromatograph column prior to a test run, used to prepare the column for a new test.

4.4 *retention time* — the time required for a particular ion type to pass from the injection port to the detector. Retention time is characteristically different for each ion type.

4.5 *standard solution* — a solution containing a known concentration of the ion to be measured and used to calibrate the chromatograph.

5 Summary of Method

5.1 Ionic contamination is extracted in water at >95°C for 30 ± 2 minutes. The contamination is quantitatively analyzed by ion type using ion chromatography, and the result is presented as nanograms/unit area.

6 Significance

6.1 Contamination on the interleaf may contribute to semiconductor device reliability problems by transference of the contamination to the leadframes.

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6.2 The method may be used by leadframe manufacturers for the incoming inspection of the interleafing material, or by users at incoming inspection of the leadframes.

6.3 Correlation of device reliability results with interleaf contamination level measurements may lead to improved interleaf materials.

7 Interferences

7.1 The interleaf material and the leadframes must only be touched with cleaned tweezers or while wearing double-layer gloves with polyethylene outer gloves in order to avoid additional contamination.

8 Equipment

8.1 *Ion Chromatograph for Anion and Cation Analysis* — This equipment is to consist of a concentration pump, guard column, separator column, and a detector module.

8.2 The minimum sensitivity of the chromatograph for each ion type is defined in Table 1.

Table 1 Sensitivity of Ion Chromatograph

Ion		*Sensitivity(ng/mL)*
Cation	Na^+	0.2
	NH_4^+	0.5
	K^+	1.0
Anion	Cl^-	0.3
	PO_4^{3-}	2.0
	Br^-	1.0
	NO_3^-	1.0
	SO_4^{2-}	1.0

8.3 *Chart Recorder*

8.4 *Ion Extraction Vessels* — Polypropylene or polytetrafluoroethylene containers with sealing caps.

NOTE 1: The contamination level of these vessels must be less than 1/5 of the expected contamination level on the interleaf of leadframes when measured in a control test.

8.5 *Water Bath* — 300 mm L × 300 mmW × 200 mmH, filled with DI water, and capable of holding 95°C.

8.6 *Constant Temperature and Humidity Chamber*

8.7 *Volumetric Dispenser* — (e.g., Pipettes — 10 mL and 100 mL capacity).

8.8 *Quartz Flasks and Pipettes for Cation Standard Solutions* — 100, 250, 500, and 1000 mL capacity (flasks); 1, 10, and 25 mL capacity (pipettes).

8.9 *Borosilicate Glass Flasks and Pipettes for Anion Standard Solutions* — 100, 250, 500, and 1000 mL capacity (flasks); 1, 10, and 25 mL capacity (pipettes).

8.10 *Chemical Balance, Weighing Chemicals*

8.11 *Scissors, Tweezers, Spatula*

9 Reagents and Materials

9.1 Deionized (DI) water, resistivity ≥15 megohm centimeters at 25°C per ASTM D1193.

9.2 Eluents and regenerants for specific chromatograph columns prepared per chromatograph equipment manufacturer's recommendations so that the water peak can be separated from the ionic peaks.

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