SEMI C96-0618
TEST METHOD FOR DETERMINING DENSITY OF CHEMICAL MECHANICAL POLISH (CMP) SLURRIES

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1 Purpose

1.1 The purpose of this Document is to provide a standardized test method for measuring the density of slurries, defining the sample temperature for the density measurement and specifying the number of significant figures to which the resulting measurement should be measured by the user and reported in the corresponding Certificate of Analysis (CoA) from the supplier.

2 Scope

2.1 This Document describes the conditions and procedures for measuring the density of single or multi-component slurries with offline (benchtop) metrology instrumentation.

2.2 This Document provides a common basis for communication between slurry manufacturers and users.

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 The measurement will be obtained at a temperature of 25.0°C ±0.1°C.

3.2 Although many slurries are diluted with water or blended with other chemicals after purchase, this Test Method is limited to density measurements of slurries in the state as purchased from the vendor.

3.3 This Document does not pertain to specific gravity measurement of slurries.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI C1 — Guide for the Analysis of Liquid Chemicals

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

5 Terminology

5.1 *Abbreviations and Acronyms*

5.1.1 *CoA* — Certificate of Analysis

5.1.2 *COLIWASA* — composite liquid waste sampler

5.1.3 *SDS* — Safety Data Sheet

5.1.4 *SUT* — sample under test

5.1.5 *TOC* — total organic carbon

5.1.6 *UPW* — ultra pure water

5.2 *Definitions*

5.2.1 *Certificate of Analysis* — document describing the physical and chemical characteristics and specifications of a product delivered to the user.

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5.2.2 *composite liquid waste sampler* — specifically a hand-held device which allows the discrete sampling of stratified liquids from a vessel at different depths (a.k.a. Drum Thief or Drum Sampler).

5.2.3 *homogenization* — the process of rendering the bulk material to be of uniform or similar composition throughout.

5.2.4 *density* — a measure of the compactness of a substance, expressed as its mass per unit volume.

5.2.5 *sample under test* — the slurry or chemical component to be tested. This incoming liquid generally arrives with a separate CoA from the vendor.

5.2.6 *specific gravity of a liquid* — the relative density of a solid or liquid, usually when measured at a temperature of 20°C, compared with the maximum density of water (at 4°C).

6 Summary of Test Method

6.1 This Document provides instructions for preparing slurry in source vessels for sampling, sample vessel for receiving slurry, and samples.

6.2 The Document also describes the general procedures for preparing the apparatus for measurement, calibration of the density measurement device, obtaining the measurement and reporting.

7 Reagents and Materials

7.1 *Reagents* — Most density measurement techniques do not require the use of reagents, save those liquids or gases required for sensor calibration.

7.2 *Cleaning Liquids* — Some measurement devices require intermittent or frequent cleaning of the measurement cells or sensor window. Follow the device manufacturer's recommendations for the procedure, and the slurry manufacturer's recommendations for the cleaning solution to be used.

8 Safety Precautions

8.1 *Calibration Reagents* — Consult the metrology manufacturers and chemical Safety Data Sheet (SDS) recommendations for safe handling.

8.2 *Cleaning Liquids* — Consult the slurry manufacturer's and/or chemical SDS' recommendations for safe handling.

9 Test Specimens

9.1 *Test Specimen Retention* — Samples must be measured within the manufacturer's specified shelf life when handled and stored under conditions recommended by same.

10 Preparation of Apparatus

10.1 *Density Check* — Perform a water check with the densitometer before taking the slurry measurement. If the measurement result exceeds ±0.00005 g/mL deviation from the expected value, perform an ultra pure water (UPW) calibration on the instrument. If run-to-run measurements create a trend in the sample measurement that exceeds the measurement accuracy limit, then an action to calibrate or clean the sensor chamber should be employed to maintain the accuracy of the results.

10.1.1 *Choice of Cleaning Chemical* — Contact the slurry supplier for recommendations on type of chemical or abrasive to be employed.

10.2 *Pre-Sample Temperature Adjustment* — Most density measurement devices provide *in situ* temperature control of sample prior to measurement. If available, it must be employed. If not a provided feature of the measuring instrument, then the sample temperature of the sample should be adjusted to 25°C ±0.1°C or the operating temperature of the slurry if known.

11 Calibration and Standardization

11.1 *Sensor Calibration* — Some density metering devices require multipoint calibrations with multiple fluids or gases. Care should be taken to calibrate the devices with fluids that bound the range of expected densities for the sample under test (SUT).

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