

SEMI C18-0714

SPECIFICATION FOR ACETIC ACID

This Standard was technically approved by the Chemicals Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 12, 2014. Available at www.semiviews.org and www.semi.org in July 2014; originally published in 1978; previously published July 2008.

1 Purpose

1.1 The purpose of this Document is to standardize requirements for acetic acid used in the semiconductor industry and testing procedures to support those specifications. Test methods have been shown to give statistically valid results. Alternative methods may be used as long as they comply with SEMI C1 requirements for method validation.

2 Scope

2.1 The scope of this Document is one grade of acetic acid used in the semiconductor industry.

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 None.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI C1 — Guide for the Analysis of Liquid Chemicals

SEMI C27 — Specifications and Guides for Hydrochloric Acid

SEMI C35 — Specifications and Guides for Nitric Acid

SEMI C44 — Specifications and Guides for Sulfuric Acid

4.2 *ASTM Standard*¹

ASTM D5127 — Standard Guide for Ultra Pure Water Used in the Electronics and Semiconductor Industry

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

5 Terminology

5.1 None.

6 Properties

Table 1 Properties of Acetic Acid

Chemical Formula	CH ₃ COOH
CAS Number	64-19-7
Density at 25°C	1.05 g/mL

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: 610.832.9585, Fax: 610.832.9555, <http://www.astm.org>

7 Requirements

7.1 The requirements for acetic acid for Grade 1 are listed in Table 2.

8 Grade 1 Procedures

NOTE 1: Alternative methods may be used as long as they comply with SEMI C1 requirements for method validation.

8.1 *Assay* — Place 15 mL (15.8 g) of sample in a 20 × 150 mm test tube in which is centered an accurate thermometer. The sample tube is centered by one or more stoppers in an outer tube about 38 × 20 mm. Cool the entire apparatus, without stirring, in a bath of shaved or crushed ice and sufficient water to immerse the outer tube above the level of the acetic acid. When the thermometer temperature is about 13°C stir to induce freezing and read the thermometer every half minute. The temperature that remains constant for 1 to 2 minutes is the freezing point and shall not be below 16°C, indicating not less than 99.7% as CH₃COOH.

8.2 *Color* — Dilute 2.0 mL of platinum-cobalt stock solution (APHA No. 500, see SEMI C1) to 100 mL with water. Compare this standard (APHA No. 10) with 100 mL of sample in Nessler tubes. View vertically over a white background. The sample must be no darker than the standard.

8.3 *Residue After Evaporation* — Evaporate 95 mL (100 g) of sample in a tared porcelain or silica dish to dryness on a steam bath in a hood. Dry at 105°C for 30 minutes, cool in a desiccator, and weigh (see SEMI C1, Determination of Residue After Evaporation).

8.4 *Solubility in Water* — Mix 10 mL of sample with 30 mL of water. Allow to stand 1 hour. The solution shall be as clear as an equal volume of water.

8.5 Chloride

8.5.1 *Special Reagents* — Nitric Acid (SEMI C35, Grade 2)

8.5.2 Dilute 9.5 mL (10 g) of sample with 10 mL of water. Add 1 mL of silver nitrate reagent solution (see SEMI C1) and evaporate to dryness on a steam bath in a hood. Dissolve the residue in 0.5 mL of ammonium hydroxide, dilute with 20 mL of water and add 1.5 mL of nitric acid (see ¶ 8.5.1). Any turbidity produced shall be no greater than that produced when 0.01 mg of chloride ion (Cl) (see SEMI C1) is treated as the sample.

8.6 Phosphate

8.6.1 *Special Reagents*

8.6.1.1 *Sulfuric Acid* (SEMI C44, Grade 2)

8.6.1.2 *0.5 N Sulfuric Acid* — Dilute 14 g of sulfuric acid (see ¶ 8.6.1.1) to 1 L.

8.6.2 Evaporate 9.5 mL (10 g) of sample to dryness on a steam bath in a hood. Dissolve the residue, warming if necessary, in 25 mL of 0.5 N sulfuric acid (see ¶ 8.6.1.2). Add 1 mL of ammonium molybdate reagent solution (see SEMI C1) and 1 mL of p-(methylamino)phenol sulfate reagent solution (see SEMI C1). Allow to stand at room temperature for 2 hours. Any blue color shall be no greater than that produced when 0.01 mg of phosphate ion (PO₄) (see SEMI C1) is treated as the sample.

8.7 Substances Reducing Dichromate

8.7.1 *Special Reagents* — Sulfuric Acid (SEMI C44, Grade 2)

8.7.2 To 10 mL (10.5 g) of sample, add 1.0 mL of 0.1 N (0.017 M) potassium dichromate solution and cautiously add 10 mL of sulfuric acid (see ¶ 8.7.1). Cool the solution to room temperature and allow to stand for 30 minutes. Add 50 mL of water slowly and cautiously with continual swirling, allow to cool, and then add 1 mL of freshly prepared potassium iodide reagent solution (see SEMI C1). Titrate the liberated iodine with 0.1 N (0.1 M) thiosulfate solution using starch as the indicator. Compare the volume of thiosulfate solution required with that for a 10 mL water blank prepared in parallel with the sample. The difference between the titrations for sample and blank shall be no greater than 0.40 mL.

8.8 *Substances Reducing Permanganate* — Dilute 40 mL (42 g) of sample with 10 mL of water. Cool to 15°C, add 0.30 mL of 0.1 N (0.020 M) potassium permanganate, and allow to stand at 15°C for 10 minutes. The pink color shall not be entirely discharged.