

SEMI PV11-1115

SPECIFICATION FOR HYDROFLUORIC ACID, USED IN PHOTOVOLTAIC APPLICATIONS

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1 Purpose

1.1 This Document standardizes requirements for hydrofluoric acid used in the photovoltaic industry and testing procedures to support those standards. Test methods have been shown to give statistically valid results.

2 Scope

2.1 The scope of this Document is grades of hydrofluoric acid used in the photovoltaic 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 This is an incoming specification for fresh, as supplied material. For recycled material the user should be aware that a variety of contaminants that are not considered within this Document, such as silicon, may be present.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI C1 — Guide for the Analysis of Liquid Chemicals

SEMI C28 — Specifications for Hydrofluoric Acid

4.2 ASTM Standard¹

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

4.3 Other Document

Dionex Technical Note 45 — Determination of Trace Anions in Concentrated Hydrofluoric Acid

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

5 Terminology

5.1 None.

6 Properties of Hydrofluoric Acid

**Table 1 Properties of Hydrofluoric Acid
(for information only)**

CAS Number	7664-39-3
Molecular Formula	HF
Molecular Weight	20.01
Density at 25°C at 49% w/w	1.15 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 hydrofluoric acid for PV Grades 1a, 1b, 2a, 2b, 3a and 3b are listed in Table 2.

Table 2 Impurity Limits and Other Requirements for Hydrofluoric Acid

	<i>PV Grade 1a (Specification)</i>	<i>PV Grade 1b (Specification)</i>	<i>PV Grade 2a (Specification)</i>	<i>PV Grade 2b (Specification)</i>	<i>PV Grade 3a (Specification)</i>	<i>PV Grade 3b (Specification)</i>
Assay (HF)	48.8%–49.2%	49.0%–51.0%	48.8%–49.2%	49.0%–51.0%	48.8%–49.2%	49.0%–51.0%
Appearance	Clear and colorless	Clear and colorless	Clear and colorless	Clear and colorless	Clear and colorless	Clear and colorless
Chloride (Cl)	5 ppm max.	5 ppm max.	5 ppm max.	5 ppm max.	5 ppm max.	5 ppm max.
Nitrate (NO ₃)	3 ppm max.	3 ppm max.	3 ppm max.	3 ppm max.	3 ppm max.	3 ppm max.
Phosphate (PO ₄)	10 ppm max.	10 ppm max.	1 ppm max.	1 ppm max.	500 ppb max.	500 ppb max.
Sulfate (SO ₄)	15 ppm max.	15 ppm max.	5 ppm max.	5 ppm max.	500 ppb max.	500 ppb max.
Aluminum (Al)	50 ppb max.	50 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Antimony (Sb)	--	--	20 ppb max.	20 ppb max.	15 ppb max.	15 ppb max.
Arsenic (As)	3000 ppb max.	3000 ppb max.	50 ppb max.	50 ppb max.	15 ppb max.	15 ppb max.
Barium (Ba)	--	--	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Boron (B)	--	--	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Cadmium (Cd)	--	--	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Calcium (Ca)	500 ppb max.	500 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Chromium (Cr)	50 ppb max.	50 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Copper (Cu)	50 ppb max.	50 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Iron (Fe)	500 ppb max.	500 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Lead (Pb)	100 ppb max.	100 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Lithium (Li)	--	--	10 ppb max.	10 ppb max.	5 ppb max.	5 ppb max.
Magnesium (Mg)	200 ppb max.	200 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Manganese (Mn)	200 ppb max.	200 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Nickel (Ni)	100 ppb max.	100 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Potassium (K)	300 ppb max.	300 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Sodium (Na)	300 ppb max.	300 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Tin (Sn)	300 ppb max.	300 ppb max.	20 ppb max.	20 ppb max.	10 ppb max.	10 ppb max.
Titanium (Ti)	300 ppb max.	300 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Vanadium (V)	--	--	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.
Zinc (Zn)	300 ppb max.	300 ppb max.	50 ppb max.	50 ppb max.	10 ppb max.	10 ppb max.

NOTE 1: PV Grades 1a, 2a and 3a are common in US and Asia mainly for reasons of transportation/environmental regulations while PV Grades 1b, 2b and 3b are common in Europe.

8 PV Grade 1a and 1b Procedures

NOTE 2: Each laboratory is responsible for verifying the validity of the method within its own operation.

8.1 Assay

8.1.1 Accurately weigh 1.4 to 1.5 mL of sample in polyethylene weighing bottle, sample, stopper immediately, and reweigh. To 50 mL of water in a plastic vessel, add the sample (loosen the stopper of the polyethylene bottle, and add both the container and the stopper with the sample). Add 0.1 mL of phenolphthalein indicator solution, and titrate with standardized 1 N sodium hydroxide to a slight, pink color.