

SEMI C90-1015

TEST METHOD AND SPECIFICATION FOR TESTING PERFLUOROALKOXY (PFA) MATERIALS USED IN LIQUID CHEMICAL DISTRIBUTION SYSTEMS

This Standard was technically approved by the Liquid Chemicals Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on August 31, 2015. Available at www.semiviews.org and www.semi.org in October 2015.

1 Purpose

1.1 This Document defines perfluoroalkoxy (PFA) resin and component preparation and pretreatment procedures for chemical test methods used to evaluate liquid chemical distribution system components and resin.

2 Scope

2.1 This Document includes preparation and testing procedures that can be applied to PFA resin pellets, tubing and other components used in liquid chemical distribution systems.

2.2 This Document defines preparation and pretreatment procedures used for the evaluation of liquid chemical distribution system sample materials in test fluids. This Document defines the purity of chemicals that can be used for leaching and rinsing these samples.

2.3 This procedure applies to sample leaching at 70°C and ambient temperature for the analysis of iron levels.

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 methods in this Document use nitric acid (HNO₃) and apply to the applications as defined by the end user. Where less demanding applications may apply then SEMI F57 or other documentation should be consulted.

3.2 This Document does not apply to using PFA for ultrapure water (UPW) delivery or any other applications which are not related to chemical delivery systems.

3.3 The preparation procedures described in this practice primarily involve static testing including agitation. Dynamic testing; that is, continuous flow, may alter the chemical test results. Static component preparation procedures are not directly applicable to dynamic testing.

3.4 For final product testing (valves, fittings and tubing), only the inner surface of the part is to be tested.

NOTE 1: The end user has the option to specify special testing requirements for outer surface testing if desired.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI C35 — Specifications and Guideline for Nitric Acid

SEMI C69 — Test Method for the Determination of Surface Areas of Polymer Pellets

SEMI F48 — Test Method for Determining Trace Metals in Polymer Materials

SEMI F57 — Specification for Polymer Materials and Components Used in Ultrapure Water and Liquid Chemical Distribution Systems

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *HNO₃* — nitric acid

5.1.2 *PFA* — perfluoroalkoxy

5.1.3 *PP* — polypropylene

5.1.4 *PVDF* — polyvinylidene fluoride

5.1.5 *UPW* — ultrapure water

5.2 Definitions

5.2.1 *blank* — extraction fluid which does not see the sample to be tested. It follows the entire procedure and is handled in the same manner in order to show the background of the lab or test area.

6 Summary of Test Method

6.1 This Test Method consists of submerging PFA resin pellets, valves and tubing into a leaching acid for the purpose of extracting iron from the material for analysis.

6.2 This Test Method utilizes various leaching temperatures and durations depending on the type of sample being tested due to the physical size, construction and mechanical limitations for each type of sample.

7 Apparatus and Materials

7.1 *Containers* — As defined in Table 1.

Table 1 Sample Handling for Extraction and Blank Test Preparation Sample

<i>Type^{#1}</i>	<i>Extraction Duration</i>	<i>Extraction Temperature</i>	<i>Sample Containment</i>	<i>Container Material^{#2}</i>
Valve	24 hrs.	Ambient	Cap or Plug	PFA
Tubing	24 hrs.	Ambient	Cap or Plug	PFA
PFA Resin	4 hrs.	70°C	Container	PFA
Blank (Valve or Tubing)	24 hrs.	Ambient	Container	PFA
Blank (Resin)	4 hrs.	70°C	Container	PFA

#1 When transferring samples to the laboratory for analysis, use the same packing material that would be used to ship the finished product to the end user.

#2 The container that is used to seal or contain the sample should be made of the same grade of resin that the sample is made from or better with respect to the contaminant specifications listed in this procedure.

7.2 All containers and equipment used for this procedure shall be thoroughly cleaned with UPW just prior to use. The cleaning procedure is considered acceptable when the subsequent blank extraction yields impurity concentrations that do not exceed 10% of the specification for the material being tested as defined in Table 2.

Table 2 Contamination Limits

<i>Parameter</i>	<i>Sample Limit</i>	<i>Blank and Extracting Liquid Limit</i>
Iron (Fe)	<5.0 µg/m2	<0.5 ppb