SEMI F40-0621
PRACTICE FOR PREPARING LIQUID CHEMICAL DISTRIBUTION COMPONENTS AND NEAT POLYMERS FOR CHEMICAL TESTING

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NOTICE: The section symbol (§) is used to reference a numbered section, paragraph, or header and all subordinate paragraphs, headers, and embedded material (i.e., EXCEPTIONs, lists) therein. The paragraph symbol (¶) is used to reference a particular numbered paragraph and embedded material therein. When duplicated (i.e., §§ and ¶¶) the symbols are used to reference more than one section or paragraph, respectively.

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1 Purpose

1.1 This Practice defines preparation and pretreatment procedures for chemical test methods used to evaluate liquid chemical distribution system components and neat polymer used in their manufacture.

2 Scope

2.1 This Practice includes preparation procedures that can be applied to components such as tubing, piping, valves, regulators, fittings, gaskets, O-rings, and filter housings as well as to neat polymers.

2.2 This Practice defines and specifies all of the pretreatment and analysis preparation procedures for liquid chemical distribution system components and neat polymers common to SEMI F48 and SEMI F57. Each type of component or neat polymer sample shall be pretreated and prepared according to the procedures of this Practice before it can be tested using the identified chemical test methods.

2.3 This Practice is intended for use with 49% hydrofluoric acid (HF), 30% hydrogen peroxide (H_2O_2), 29% ammonium hydroxide (NH_4OH), isopropyl alcohol (IPA) and ultrapure water (UPW). This Practice defines the purity of chemicals that can be used for extracting and rinsing liquid chemical distribution system components. Other chemicals may be used as well.

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 Although ozonated water is commonly used in UPW systems, no provisions are made in this Practice for evaluations using ozonated water. Therefore, some of the procedures may not be directly applicable to ozonated water.

3.2 The preparation procedures described in this Practice primarily involve static testing with intermittent agitation. Dynamic testing (i.e., continuous flow), may alter the chemical test results. Static component preparation procedures are not directly applicable to dynamic testing.

3.3 This preparation procedure applies to ambient temperature only with the exception of UPW which may be tested at ambient temperature or 85°C.

3.4 Filter cartridges are not covered in this Practice due to the requirement for dynamic testing.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

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

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Full document details: SEMI F40-0621

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 *FEP* — fluorinated ethylene-propylene

5.1.2 *HP* — high purity

5.1.3 *IPA* — isopropyl alcohol

5.1.4 *PFA* — perfluoroalkoxy

5.1.5 *TOC* — total organic carbon

5.1.6 *UPW* — ultrapure water

5.2 *Definitions*

5.2.1 *procedure blank extraction* — a container of test fluid which does not see the component under test. It follows the entire procedure and is handled in the same manner in order to show the background of the test procedure including materials and laboratory environment.

6 Summary of Practice

6.1 This Practice describes two different preparation procedures (see Figure 1):

1. procedure for preparing components and neat polymer pellets and collecting a sample for surface extraction analyses.
2. procedure for pretreating or preparing components and neat polymers for bulk polymer analysis.

6.2 Table 1 specifies the flush time, soak time, and container material for extracting contaminants.

6.3 This Practice shall be performed before analysis by industry standard extraction and bulk test methods used to evaluate liquid chemical distribution components and neat polymers. Available industry standard test methods are listed in the Related Documents section.

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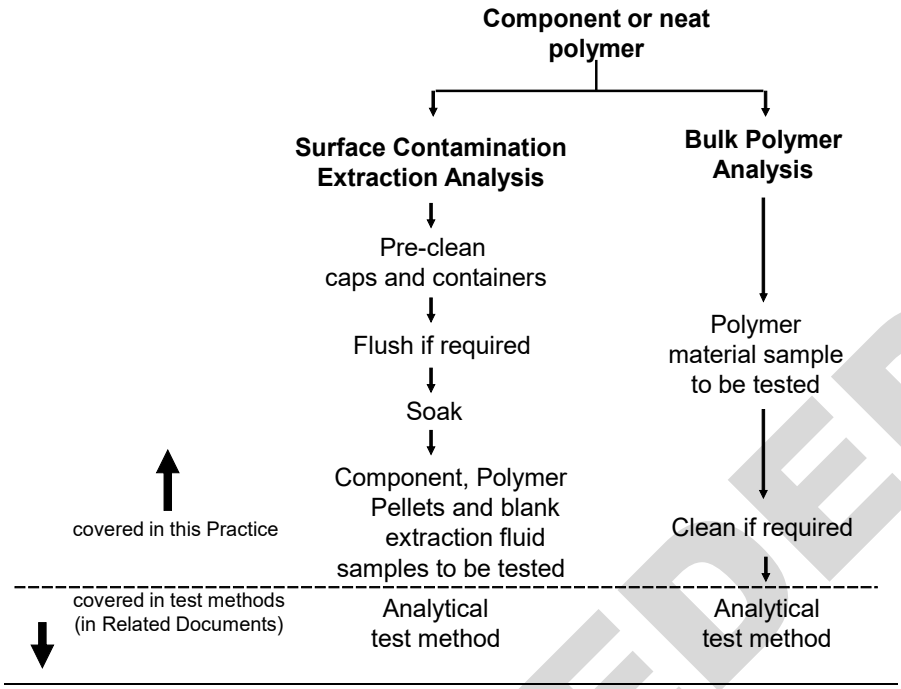

Figure 1
Summary of Practice

7 Apparatus and Materials

7.1 *Containers* — As required in Table 1.

7.1.1 All containers and container caps used in component and neat polymer pellets and blank extraction shall be thoroughly cleaned. A typical recommended cleaning procedure is outlined below. However, any cleaning procedure is acceptable as long as the subsequent blank extraction yields impurity concentrations that do not exceed 10% of the specification as stated in SEMI F57 for the material being tested. For example, if a given impurity is specified for a maximum of 1.0 µg/m^2, the blank extraction concentration shall not exceed 0.1 µg/m^2. This contribution includes both extraction containers and analysis containers.

7.1.1.1 Fill the container with ultrapure IPA. Agitate the container in ultrapure IPA for 2 minutes. Drain the IPA from the material and replenish with ultrapure IPA. Allow the material to soak for 30 minutes.

7.1.1.2 Drain the IPA from the container and replace with UPW. Agitate the container for 2 minutes.

7.1.1.3 Drain the UPW from the container and replace with 1:1 ultrapure 69% nitric acid: UPW for 2 to 4 hours.

7.1.1.4 Drain the nitric acid from the material container and replace with UPW. Agitate the container for 2 minutes.

7.1.1.5 Drain the UPW from the container and replace with 1:1 ultrapure HCl: UPW for 2 to 4 hours.

7.1.1.6 Drain the HCl from the container and replace with the UPW. Agitate the container for 2 minutes. Drain the container.

NOTE 1: In situations where the detection limit is greater than 10% of the specification for the polymer material, the detection limit of the instrument converted into µg/m^2 will suffice, provided it does not exceed the specification for the material being tested.

7.2 *Test Fluids*

7.2.1 For purposes of this Practice, references to water shall be understood to mean UPW as defined by maximum individual metal and anion impurity levels of 0.1 parts per billion by weight 1×10^{-10} (ppbw) or less, total organic carbon (TOC) levels of 10 ppbw or less, nonvolatile residue (NVR) levels of 0.1 parts per million by weight 1×10^{-7} (ppmw) or less, resistivity of 18 megohm-cm or greater, and reactive silica impurity of less than 1.0 ppbw.

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