

SEMI P31-0304 (Reapproved 0611) PRACTICE FOR CATALOG PUBLICATION FOR CHEMICAL AMPLIFIED (CA) PHOTORESIST PARAMETER

This Standard was technically approved by the Micropatterning Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 13, 2011. Available at www.semiviews.org and www.semi.org in June 2011; originally published September 1997; previously published March 2004.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

NOTICE: This Document was reapproved with minor editorial changes.

1 Purpose

1.1 The purpose of this Document is to provide a baseline for publication of chemical amplified (CA) photoresist parameters.

2 Scope

2.1 This Document applies to CA photoresist used for semiconductor manufacturing.

2.2 This Document is used as the guide to evaluate photoresist process parameters.

2.3 This Document is not applicable for quality assurance.

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 Referenced Standards and Documents

3.1 None.

4 Terminology

4.1 *Abbreviations and Acronyms*

4.1.1 *PEB* — post exposure bake

5 Description

NOTE 1: The following parameters for CA photoresist publication and test conditions should be described in the catalog.

5.1 Resist, overcoat and developer commercial name.

5.2 Temperature and humidity.

5.3 Environmental conditions (see § 6).

5.4 Ammonia concentration measurement method (see § 7).

5.5 Delay time dependency (see § 8).

5.6 PEB temperature dependency (see § 9).

5.7 PEB time dependency (see § 10).

5.8 Substrate dependency (see § 11).

5.9 *Measurement Conditions*

5.9.1 *Resist Coating and Development*

5.9.1.1 Resist baking method (contact baking or proximity baking).

5.9.1.2 Resist pre-baking temperature and time.

5.9.1.3 Resist PEB temperature and time.

5.9.1.4 Development time.

5.9.1.5 Resist thickness.

5.9.2 *Exposure*

5.9.2.1 Illumination conditions (NA, σ , etc.).

5.10 *Equipment Name*

5.10.1 Exposure equipment.

5.10.2 SEM equipment.

5.10.3 Ammonia concentration measurement equipment.

6 Environmental Conditions

6.1 *Ammonia Concentration* — It is recommended to measure all CA photoresist parameters under the condition that the ammonia concentration is less than $10 \mu\text{g}/\text{m}^3$.

NOTE 2: CA photoresist is sensitive to the atmosphere, especially to ammonia. Acid from photoacid generator upon exposure is neutralized by the basic material in atmosphere like ammonia.

7 Ammonia Concentration Measurement Method

7.1 The ammonia concentration is measured by ion chromatography or another method which is capable to determine the ammonia concentration quantitatively less than $10 \mu\text{g}/\text{m}^3$. The measurement equipment is calibrated with a standard ammonia solution.

8 Delay Time Dependency

NOTE 3: This section defines process conditions and procedures to obtain the delay time dependency.

8.1 *Resist Coating and Pre-Baking* — Resist should be coated on a substrate. Suppliers should be notified of the kind of substrate and underlying film. After pre-baking, the resist thickness should be chosen the bottom of swing curve between 0.3 to 0.5 μm . Thickness could be changed in accordance with exposure wavelength. The actual thickness should be notified.

8.2 *Delay Time* — Delay time between resist coating and exposure, exposure and PEB, and PEB and development used for obtaining delay time dependency parameters are defined in Table 1.

Table 1 Delay Time Condition

<i>Resist Coating to Exposure Delay Time</i>						
0 min.			1 hour		6 hour	24 hour
NOTE: Normal sequential procedure without intentional delay between exposure and PEB as well as PEB and development.						
<i>Exposure to PEB Delay Time</i>						
0 min.	10 min.	30 min.	1 hour	2 hour		24 hour
NOTE: Normal sequential procedure without intentional delay between resist coating and exposure as well as PEB and development.						
<i>PEB to Development Delay Time</i>						
0 min.	10 min.	30 min.	1 hour			24 hour
NOTE: Normal sequential procedure without intentional delay between resist coating and exposure time as well as exposure and PEB.						

#1 Zero minutes (0 min.) is defined as normal sequential procedure without intentional delay.