SEMI P5-0416 (Reapproved 1221)
SPECIFICATION FOR PELLICLES

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 August 12, 2021. Available at www.semiviews.org and www.semi.org in December 2021; originally published in 1986; previously published April 2016.

1 Purpose

1.1 This Specification covers the general requirements for pellicles used on photomasks or reticles in photolithographic exposure systems.

2 Scope

2.1 This Specification covers pellicles for use in either broadband, polychromatic or monochromatic exposure systems.

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.

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

4 Terminology

4.1 Additional terms are listed for information only in the glossary, SEMI International Standards: Compilation of Terms.

4.2 *Selected Definitions*

4.2.1 *adhesive stringer* — any detectable protrusion from the edge of the adhesive.

4.2.2 *film adhesive* — adhesive between frame and film.

4.2.3 *film defects* — inconsistencies in the integrity and planarity of the film, including particles, pinholes, scratches, dirt, and a minute quantity of solid.

4.2.3.1 *dirt* — fingerprint; mark left behind after operator handling; stain from liquid.

4.2.3.2 *particle* — materials that can be distinguished from the film whether on the film surface or embedded in the film.

4.2.3.3 *pinhole* — a small opening completely through a polymer film.

4.2.3.4 *scratch* — long, narrow, shallow groove or cut below the established plane of the surface.

4.2.4 *frame adhesive* — adhesive between frame and photomask.

4.2.5 *light resistance* — minimum cumulative exposure energy a pellicle can withstand without (or within specified) change in performance.

4.2.6 *mechanical strength* — the physical condition a pellicle must meet to withstand a specified force from a blow-off gun without suffering any damage to the film due to stretching or breakage.

4.2.7 *pellicle* — a thin, optically transparent film, typically of a polymer, attached to and supported by a frame, and attached to a photomask (or reticle). Its purpose is to seal out contaminants and reduce printed defects caused by contamination in the image plane of an optical exposure system with a minimum decrease in the quality of optical transmission.

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5 Ordering Information

5.1 Purchase orders of pellicles furnished to this Specification shall include the following:

5.1.1 *Shape, Size, and Standoff of Pellicle* — The information relating to the shape, size, and standoff of a pellicle may be combined into a single frame part number, or must be provided separately. For any given model of stepper or mask aligner the manufacturer will specify a recommended shape, size and standoff. The user for interoperability reasons may specify alternative values.

5.1.1.1 *Shape* — This is determined by agreement between the user and the supplier.

5.1.1.2 *Size* — This is determined by agreement between the user and the supplier. Any expression of tolerance is as follows:

- Outer edge tolerance: +0, −x
- Inner edge tolerance: +x, −0

5.1.1.3 *Standoff* — This is determined by agreement between the user and the supplier. Any expression of tolerance is +0, −x.

5.1.2 *Film Characteristics*

5.1.2.1 *Type* — An anti-reflective (AR) coating may be applied to either the inside or outside surfaces of the polymer film. Which surfaces, if any, require the presence of an AR-coating is determined by agreement between the user and the supplier.

5.1.2.2 *Exposure Range or Wavelength* — The wavelength(s) of the exposure system(s) must be specified. Table 1 shows the typical exposure wavelengths.

Table 1 Typical Exposure Wavelengths

Terminology	*Exposure Wavelength(s)*
Broadband	360–440 nm
g-line	436 nm
h-line	405 nm
i-line	365 nm
DUV	248 nm
DUV 193	193 nm
EUV	13.5 nm

5.1.2.3 *Optical Transmission*

5.1.2.3.1 For non-EUV wavelengths, there are two types of optical transmission depending on the film type. These are measured at an incident angle of 90° from the surface of the pellicle at the specified wavelength(s). The acceptable values are specified in Tables 2 and 3. The minimum transmission given in Table 3 apply to all wavelengths the film is specified for.

5.1.2.3.2 For EUV wavelengths, the transmission and transmission uniformity is determined by agreement between the user and the supplier.

Table 2 Transmission for Broadband Exposure Systems

Type	*Average*	*Minimum*
AR Coated	≥98%	96%
Non-AR Coated	≥91%	82%

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