# Table of Contents

- **MLI, the Company** ........................................ 3
- **Introduction of MLI** ...................................... 4
- **Why MLI** .................................................. 4
- **MLI Test Equipments** .................................... 5
- **Pellicle Introduction** .................................... 6
- **Pellicle Film Transmission** .............................. 8
- **Pellicle Mounting Tool** ................................. 15
- **MLI Quality System** ..................................... 18
Founded in 1981, MLI is an innovator in the pellicle manufacturing industry and is the leading supplier of pellicles in the world. With three technologically advanced production facilities strategically located in the US and Asia, MLI can supply global demand for pellicles six times over. MLI’s high end facilities are equipped with modern CAD/CAM equipment for the production of frames and engineering parts, automatic anodizing lines, and chemical labs for research and development efforts. With nearly two decades of innovation and customer support experience, MLI can respond quickly to a variety of customer needs in addition to changing requirements in micro lithographic technology. To this day, MLI remains committed to the following:

- Highest Quality
- On-Time Delivery
- Strong Technical Support
- Wide Range of Products
- First Rate Customer Service

Because customer needs may vary, MLI works closely with each customer to ensure that pellicles are developed according to their required specifications. This strong emphasis on customer support and ongoing service has allowed MLI to become the primary supplier of pellicles to some of the world's leading corporations.
Introduction of MLI

- Established since 1981
- ISO-9001 certified (USA-1994 and Taiwan-1999)
- More than 7 Million Pellicles produced
- Current manufacturing capacity: 40,000 Pellicles per Month
- One manufacturing facility in USA
- One manufacturing facility in Taiwan
- More than 250 employees worldwide

Why MLI

MLI’s major historical achievements

- MLI holds several Patents for the development of materials, processes, packages and tooling relating to the manufacturing and use of Pellicles.
- First in the industry to produce Organic Fluorocarbon AR (Anti-Reflecting) coated Pellicle film.
- First in the industry to produce Fluoro Polymer DUV-248nm (1991) Pellicle.
- MLI’s ArF-193nm Pellicle (Film 703) is the ONLY Pellicle available in the industry that offers minimum 99% on multiple wavelengths 193nm, 248nm and 365nm.
- Advanced ArF-193nm pellicle (Film 801) for High NA Technology 32nm & 22nm nodes.
MLI’s In-House Test Equipments

- Ion chromatography
- Gas chromatograph
- High pressure liquid chromatography (HPLC)
- Thermal gravimetric analyzer (TGA)
- Scanning electron microscope (SEM)
- Fourier transfer infrared spectrometer (FTIR)
- Excimer lasers at 193nm, 248nm
- UV/visible spectrophotometers
- Surface particle detector, 0.3 micron
- Adhesive width and flatness measuring
- Adhesive peeling strength machine
Pellicle Introduction

- What Pellicles do
- Cross-section of MLI’s Pellicle
- Pellicle Films
Cross–section of MLI’s Pellicle

What Pellicle Film Does

Film in a pellicle provides a physical barrier to prevent outside contamination, i.e., particles or vapor outgassing, from contaminating the photomask surface. At the same time, because it is thin it provides an optical path with minimum focus and transmission distortion.
The film material must have the proper uniformity, mechanical strength, optical transmission, and cleanliness to allow continuous replication of the photomask image onto the wafer surface. Specifically, a few necessary characteristics are as follows:

**Transmission Uniformity** - Since most film is generated from spin-coating, uniformity is from the center of the pellicle film to the edge.

**Mechanical Strength** - The film and glue adhesion must be able to withstand certain air pressure from a nitrogen or air blow-off gun with a 2mm or larger opening at all angles. For fluoropolymers used for Deep-UV film or anti-reflective coating, it is very difficult to find a suitable glue to bond the film to frame due to the film's low surface energy. Therefore, the glue developed for this purpose can sometimes show only a marginal strength and limited life time of adhesion strength. Adhesion strength, i.e. adhesion of glue on the frame, should be checked with each vendor's pellicle.

**Usage Life** - The pellicle lifetime can vary greatly, depending on pellicle materials and the light source of the wafer stepper or wafer aligner, i.e. light source wavelength, intensity, light filter used. All material components in a pellicle are subject to UV light degradation, oxidation degradation, and outgassing; and should be considered as having a limited lifetime.
MLI’s Film types

- Film 801: For high NA 32nm and 22nm immersion technology
- Film 703: For Multiple wavelengths with 99% @ ArF-193nm, KrF-248nm and I-Line-365nm
- Film 602: For KrF-248nm, I-Line-365nm
- Film 201: For I-Line-365nm, G-Line-436nm (with Broadband down to Mid-UV)
- Film 122: For I-Line-365nm, G-Line-436nm

Pellicle Film Transmission

Peçliche film for high NA 32nm and 22nm immersion technology
Pellicle film for multiple ArF-193nm, 248nm, 365nm wavelengths

Pellicle film for high NA 32nm and 22nm immersion technology
Pellicle film for multiple KrF-248nm and 365nm (i-line) wavelengths

Pellicle film for g/i-lines wavelengths (Down to Mid-UV Broadband)
Pellicle film for g/i-lines wavelengths
### MLI’s Pellicle Adhesive

<table>
<thead>
<tr>
<th>Adhesive</th>
<th>Thickness (mm)</th>
<th>Carrier</th>
<th>Adhesive</th>
<th>Adhesion (oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>0.1</td>
<td>Polyester</td>
<td>Acrylic</td>
<td>56</td>
</tr>
<tr>
<td>#2</td>
<td>0.25</td>
<td>Vinyl Foam</td>
<td>Rubber</td>
<td>45</td>
</tr>
<tr>
<td>#10</td>
<td>0.80</td>
<td>High Density Urethane Foam</td>
<td>Acrylic</td>
<td>30 (on High side) &amp; 5 (on Low side)</td>
</tr>
<tr>
<td>#17*</td>
<td>0.25</td>
<td>None</td>
<td>Acrylic</td>
<td>64</td>
</tr>
</tbody>
</table>

* #17 Adhesive is MLI’s own adhesive material, a single layer non-carrier adhesive gasket*
Pellicle Mounting Tool

- 8000 Series
- MLI’s Pellicle Adhesive
- MLI’s Liquid Coating
8000 Series Pellicle Mounter

General
- Cutting edge technology
- High mounting accuracy
- User friendly machine
- Fast delivery
- Affordable price

Features
- Compatible with MLI’s #4 Tray Package
- Cleaner
  - Washable components
  - Vertical mounting
  - Smooth moving
- Better Sealing
  - Mounting force distributes evenly on mask
  - Mounting forces and/or speeds controllable by user
  - No film “bulging”
MLI’s #17 vs. Carrier Adhesive

Non-carrier adhesive (MLI’s #17)  
Carrier adhesive (3M-701)

Advantage of MLI’s #17 non-carrier adhesive
- Easy to mount and remove
- Years of field testing
- Acrylic material
- UV resistant
MLI’s Liquid Coating (LC)

Advantage of MLI’s Liquid Coating for inner Frame
- Continuous, smooth application
- High tackiness Acrylic
- Minimum Outgassing
- UV resistant

Ours

Theirs

2,500x

250x
MLI Quality System

- Quality System
- Quality Policy
- Basic Beliefs
Our Quality System

ISO 9001-2008 certified quality system
Documented quality system for management and control, with good traceability.

Extensive product testing
Chemical analysis and life-time testing of all new pellicle components, including all films, glues, mounting adhesives, liquid coatings and filters.

Continuous process improvement
Commitment to the principle of quality through process, not through inspection.

Our Quality Policy

Basic Beliefs
Customer Satisfaction
Improvement
Quality Through Process

Product Quality
Cleanliness
High Transmission
Long Useful Life
Easy To Use

Cleanliness
Born Clean
Shipped Clean
Stays Clean
Our Basic Beliefs

**Customer Satisfaction**
Provide Quality Product to Customer
Delivery Product on Schedule
Provide Timely Feedback

**Product Quality**
Box Design Change
BSC Change
Package Change

**Quality Through Process**
Fully or Semi-automation equipments
Hand-Free Process and Hand-Free Tool