AZ® BARLi® -II is a bottom antireflective layer coating for use on highly reflective surfaces in the semiconductor industry. It is designed to work with positive photoresists and is optimized for i-line exposure tools. Upon completion of the lithographic process, AZ® BARLi® -II is patterned in a dry-etch process.

AZ® BARLi® -II coating material is formulated in photoresist-compatible solvents to simplify the EBR process and to be both environmental and user friendly. We recommend AZ® EBR 70/30 for best performance.

AZ® BARLi® -II is tailor-made to yield the near-optimum values for refractive indices (n and k) for i-line lithography, which ensures minimum reflectivity and maximum swing reduction for photoresist layers.

Composed of highly absorptive polymer-bound dyes, this material provides excellent coating uniformity and step coverage.
Reflectivity Reduction vs. AZ® BARLi®-II Film

Film Stack:
- Resist ($n=1.704-0.024i$) on (at 365nm)
- AZ® BARLi® II ($n=1.63-0.31i$) on Si ($n=6.55-2.07i$)

<table>
<thead>
<tr>
<th>BARLi® II Thickness (µm)</th>
<th>Swing Amplitude</th>
<th>Reflectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>minimum reflectivity : 0.013%</td>
<td>minimum swing amplitude : 1.80%</td>
</tr>
</tbody>
</table>

Two grades to meet individual customer requirements:

**AZ® BARLi® II 200:**
Approx. 200 nm Film Thickness for maximum suppression of reflectivity, additional planarisation and low sensitivity to Film Thickness variation

**AZ® BARLi® II 90:**
Approx. 90 nm Film Thickness to facilitate dry etching
Swing Curve with AZ® BARLi-II
(Photoresist: AZ 7908, i-line exposure)

Typical Process Cycle
Pre-Treatment: no HMDS recommended

Spin
Target Thickness: 910 Å for AZ® BARLi® -II 90
1970 Å for AZ® BARLi® -II 200
Apply: approx. 4 ml; static or dynamic at 500 –1000 rpm
Spin: approx. 3000 rpm

EBR
AZ® EBR 70/30 recommended; also compatible to many other EBR for positive photoresists

Bake
Hotplate, 180°C to 220°C (200°C recommended), 60 seconds

Apply, expose, develop
i-line Photoresist

Etch AZ® BARLi®-II
Dry-etch with CHF$_3$/C$_2$F$_6$/O$_2$ or HBr/ O$_2$ etc.

Film Thickness

<table>
<thead>
<tr>
<th>Film Thickness</th>
<th>2000 rpm</th>
<th>2500 rpm</th>
<th>3000 rpm</th>
<th>3500 rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ® BARLi® -II 90</td>
<td>1130 Å</td>
<td>1010 Å</td>
<td>930 Å</td>
<td>860 Å</td>
</tr>
<tr>
<td>AZ® BARLi® -II 200</td>
<td>2350 Å</td>
<td>2160 Å</td>
<td>2010 Å</td>
<td>1860 Å</td>
</tr>
</tbody>
</table>

Film Thickness Measurement
AZ® BARLi® -II film thickness can be measured with standard optical measurement equipment using following Cauchy coefficients:

$$N_1 = 1.6097 \quad N_2 = 0.0083014 \, \mu m^2 \quad N_3 = 0.006187 \, \mu m^4$$

where $$N = N_1 + N_2/\lambda^2 + N_3/\lambda^4$$ (λ in μm)
Solvent Safety
AZ® BARLI®-II is formulated with a mixture of ethyl lactate and PGME both of which are safer solvent products.

Equipment Compatibility
AZ® BARLi®-II is compatible with all commercial available wafer processing equipment. Recommended materials of construction include stainless steel, glass, ceramic, PTFE, polypropylene and high-density polyethylene.

Storage
Keep in sealed original containers away from oxidants, sparks and open flames. Must be kept refrigerated. The preferred temperature is between 0°C and 15°C. Empty containers may contain harmful residue and vapors.

Handling Precautions

First Aid
Refer to current Material Safety data Sheet (MSDS) for detailed information prior to handling.

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(*) Front page SEMs courtesy of J. Johnson, ST Microelectronics, Phoenix AZ

(Clariant BU EM WW adresses)