NIST outgas testing update

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IEUVI Resist technical working group
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Modifications to improve site-to-site comparability

1) Use a filter with more EUV transmission.
2) Stabilize the chamber at a higher temperature.
3) Decrease the pumping speed.

<table>
<thead>
<tr>
<th></th>
<th>old</th>
<th>new</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUV filter</td>
<td>Zr</td>
<td>Si</td>
</tr>
<tr>
<td>temperature</td>
<td>22 °C</td>
<td>30 °C</td>
</tr>
<tr>
<td>pumping speed</td>
<td>281 L/s</td>
<td>135 L/s</td>
</tr>
</tbody>
</table>

- $E_0$ not affected by different EUV filter and higher temperature.
- ($E_0$ for CSR-019 was revised from 7.77 to 5.52 mJ/cm$^2$ after re-examination of data for resist thickness vs. $E$.)

- New conditions caused 4 times more CG for all resists except CSR-042.
- (CG for CSR-019 was decreased from 1.77 to 1.22 in proportion to revised $E_0$.)
CLR not achieved for two of the five EIDEC model resists

Conditions to attain saturation still not entirely clear – R&D ongoing
Changing the EUV filter

- Silicon transmits more EUV than zirconium in 13 – 50 nm.
- Copper mesh keeps the silicon membrane cool.

These data were taken at $T = 22 \, ^\circ \text{C}$, 281 L/s.

The silicon filter transmits more EUV, and it may have a longer life.

Changing the filter (but not $T$ or PS) increased CG.
Correlating RGA data with carbon thickness

Overall correlation with RGA data seems OK for both filters.
EUV filter

temperature

pumping speed

CSR-003

Zr
22 °C
281 L/s

Set FWHM
2.05 mm

2.0495 mm

@264 mA

CSR-012

Si
22 °C
281 L/s

Set FWHM
2.07 mm

2.0655 mm

@270 mA

CSR-019

Si
30 °C (with baffle)
135 L/s

Set FWHM
2.065 mm

2.0655 mm

@270 mA

CSR-042

Set FWHM
2.072 mm

2.07225 mm

@274 mA

CSR-044

Set FWHM
2.08 mm

2.075 mm

@274 mA