



EUV Optics Lifetime/Contamination Workshop

Saturday, February 22

Agenda

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|--------------|---|---|
| 08:00 | Welcome - ISMT & VNL | Kevin Kemp, ISMT &
John Goldsmith, VNL |
| 08:15 | Fab Floor Experience with Optics
Contamination | Jeff Schefske, AMD |
| 08:30 | Review of Known Contamination Sources | Mike Malinowski, VNL |
| 09:00 | VNL Capping Layers & Contamination
Testing Program | Sasa Bajt, VNL |
| 09:30 | Global Cooperation in Optics
Lifetime Testing | Kevin Kemp, ISMT |
| 09:45 | BREAK | |



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|--------------|--|--------------------------|
| 10:00 | ASML/Zeiss Optics Contamination Work | Markus Weiss, Carl Zeiss |
| 10:20 | ASET Tool Environment Work | Iwao Nishiyama, ASET |
| 10:40 | CEA/LETI Tool Environment Work | Serge Tedesco, CEA/LETI |
| 11:00 | VNL Studies of Erosion from LPPs & Discharges | Bill Ballard, VNL |
| 11:20 | Contamination from Cymer Discharge Sources | Igor Fomenkov, Cymer |
| 11:40 | Global Cooperation in Condenser Erosion Mitigation | Vivek Bakshi, ISMT |
| 12:00 | LUNCH | |



Workshop Agenda (Cont.)

- 13:00 Removing Carbon Contamination from Optics Sam Graham, VNL
- 13:20 Technical Thin Spots Lennie Klebanoff, VNL
- 13:40 Identification & Ranking of Critical Issues
- 14:15 BREAK**
- 14:30 Explanation of Breakout Obert Wood, ISMT
- 14:45 Parallel Breakout Sessions:
- Round Robin Testing of EUV Coatings (I)
 - Condenser Erosion Mitigation (II)
 - Global Cooperation (III)
- 16:00 BREAK**
- 16:15 Readout from Session I
- 16:30 Readout from Session II
- 16:45 Readout from Session III
- 17:00 First Pass Plan of Global Cooperation
- 18:00 DINNER (Cypress Room)



OPTICS CONTAMINATION CRITICAL ISSUES

1. Condenser erosion
2. Oxidation resistance of the capping layer
3. Method of in-situ cleaning of projection optics
4. Condenser debris mitigation
5. Agreed to specs and standard tests for projection optics & condenser
6. Validated contamination models with parametric dependencies
7. EUV-induced reticle contamination
8. Plasma induced out-gassing control
9. Additional studies of hydrocarbon contamination, etc.
10. Choice of condenser materials and configuration

Condenser Erosion Needs Further Study

Requirement: Lifetime of 6 months ($\sim 1.7E5$ 300mm wafers) with $\Delta R/R_o < 10\%$

Status: Assuming ETS flux/pulse, C1 lifetime is ~ 15 wafers (300mm), erosion

risk

Thin Spots:

- Erosion Mechanism unknown, needs identification for LPP, Discharge
- No erosion studies for grazing incidence R_u
- Power, angular dependence of erosion unknown
- Several potential mitigation methods identified (gas flows, foil trap), need assessment using high-power source
- Long-duration exposure tests not yet available



Global cooperation needed in erosion mitigation work