US Update

IEUVI Optics Contamination/Lifetime TWG
Sapporo, November 1, 2007

Andrea Wüest, SEMATECH
Tom Lucatorto, NIST

Accelerating the next technology revolution.
1. Correlation of secondary electron yield (SEY) and MLM degradation rates:
   • Resonance and chemical effects on SEY under study – factors of 3X or larger connected to position of electric field node and also to surface chemistry (Rutgers U.)
   • Dependence of degradation rate vs. SEY presently under study (NIST).
2. Electron-impact-induced structural changes on surface of TiO$_2$ (Rutgers - Tulane):
   • Defects associated with EUV-induced O-vacancies are possible nucleation sites for higher damage rates.
3. Carbon accumulation and mitigation studies (Talk by Ted Madey later in this session)
4. Continued program to identify critical factors in mirror lifetime testing. New tests with various HCs on TiO$_2$. (NIST poster in Contam. & Cleanliness Session.)
5. The development of TiO$_2$- and RuO$_2$-capped MLMs with improved reflectivity; removal of carbon contamination; studies of effects of pulsed EUV (Oral presentation in Contamination & Cleanliness Section by S. Yulin of IOF)

6. Resist outgassing rates measured by mechanical pressure gauges (NIST)
   - Pressure measurements insensitive to chemical composition. First experiments done at SUNY Albany on pulsed source – experiments at NIST on cw source to follow shortly.

7. Analysis of resist outgas products and MET contamination; collection by cold trap followed by GC/MS (NIST poster in Contam. & Cleanliness Session.)
   - First experiments done on pulsed source at SUNY Albany – experiments at NIST ongoing.
SEMATECH, INVENT projects at U. Albany

EUV resist outgassing and optics contamination is performed regularly to screen resists and materials for use in exposure tools.

Accelerated mask contamination studies help the understanding of mask lifetime as well as tool conditions to reduce mask and optics contamination.
Activities at Lawrence Livermore National Laboratory

- S. Bajt, N. V. Edwards and T. E. Madey, “Properties of ultrathin films appropriate for optics capping layers exposed to high energy photon irradiation”, accepted in Surface Science Reports, 2007. (A comprehensive study of the possible capping layers conducted at LLNL and fundamentals needed to understand the underlying physics and chemistry connected with capping layer performance.)


This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.