EUV Source Program at International SEMATECH

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INTERNATIONAL SEMATECH

Presentation Outline

- EUV Source Technology Status
- ISMT EUV Source Program Approach
- ISMT EUV Source Program Description
- Summary

EUV Source Technology Status

From October 2002 EUVL Symposium

- **Source Output is the # 1 issue for EUVL**
  - Issue: # 3 Source and optics reliability and #10 Resist high sensitivity at low power are also EUV source related
- **EUV sources need to deliver ~ 115 W of clean power at the intermediate focus**
  - Expected power of ~ 10 W of power at intermediate focus was reported
  - Additional requirements to be met by the sources
  - We look forward to progress reports from suppliers today
- **Low CE of Xe is an issue and we may need to move to alternate materials like Sn**
  - Sn as a source material will come with a large debris mitigation issue
- **We need a large improvement in the source critical component life-time**
  - Reported life-time of electrode and collector are 10^8 pulses

ISMT EUV Source Program Approach

- **ISMT's goal is to have the EUV infrastructure elements in place by 2007**
- **To achieve our mission we need to :**
  - Model Xe and Sn EUV sources to understand the CE limitations and life-time issues
  - Explore new materials for electrodes and the collector. Create a pipe-line to test new materials
  - Support metrology infrastructure to ensure creation and implementation of accurate and standard methods for in-band and out-of-band radiation measurements
  - Leverage world-wide resources by increasing co-operation between ISMT, MEDEA+ and EUVA programs in the pre-competitive areas: materials, modeling, metrology and debris mitigation
  - Organize *EUV Source Workshops* and *Working Groups* to generate industry consensus on EUV source status and issues

ISMT EUV Source Programs

- **EUV Source Fundamental Data Working Group**
  - Mission: Identify the fundamental data needed to model EUV sources. Evaluate the available fundamental data and make recommendations to the industry for activities in this area.
- **EUV Source Metrology Working Group**
  - Mission: Generate and update the *EUV Source Metrology Roadmap* to outline the development needs. Generate consensus on standard EUV source metrology.

ISMT EUV Source Programs …continued

- **NIST program**
  - Generation and identification of Xe and Sn fundamental data relevant to EUV sources and co-ordination of the *EUV Source Fundamental Data Working Group*
  - Study mechanism of ion-induced damage to material relevant to EUV sources
- **University of Maryland Program**
  - Model conversion efficiency of Xe and Sn LPP
  - Develop further understanding of Xe LPPs to enable us to increase CE

ISMT EUV Source Program Description

…continued

- **Argonne National Lab Program**
  - Test the life-time of new materials for electrode and collector. Provide new candidate materials to suppliers for testing. Compare life-time results with models.
- **Lawrence Berkley National Lab Program**
  - Investigate ECR plasmas as a pre-ionization source for pinch devices
- **Flying Circus II program**
  - Generate and provide standard EUV source metrology procedures to industry

Summary

- **Significant barriers remain to achieving the required EUV source power**
- **We need to continue to define projects in the pre-competitive area, to enable EUV sources meet the stepper manufacturer's requirements**