Summary of Technical Interchange Meeting of Jul 19, 2001

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SEMATECH Meeting on

EUVL Mask Mechanical Fixturing in Write, Metrology, and Exposure Tools

Mar 7, 2002

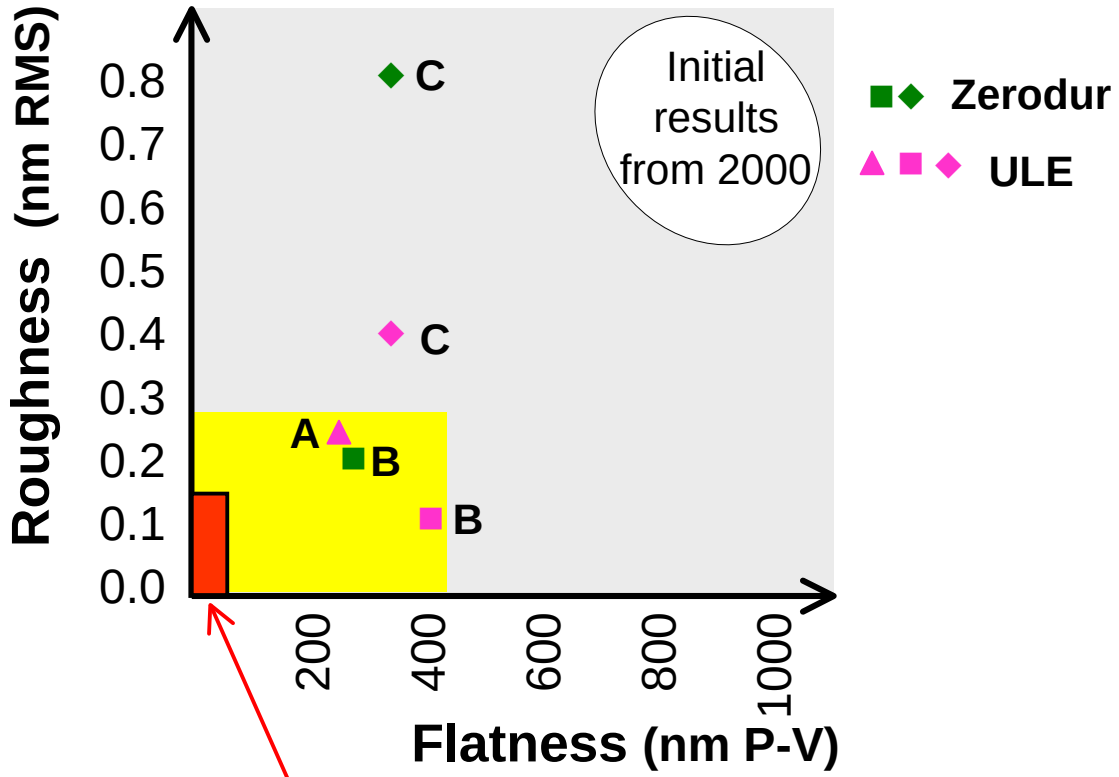
Santa Clara, CA

IBM/Photronics MCoC and Sematech TIM at Semicon West – Jul 19, 2001

"EUVL Mask Mechanical Fixturing in Write, Metrology, and Exposure Tools"

- **30 attendees from 22 companies signed in.**
  - **Blank suppliers: Asahi, Hoya, Rodel, Schott Lithotec, Xenocs**
  - **Mask users: IBM, Infineon, Intel, Motorola and Philips**
  - **Mask equipment suppliers included ETEC and Balzers**
  - **Exposure tool suppliers: ASML, Canon and Nikon**
  - **Mask suppliers: MCOC**
  - **Other: EUV LLC, LLNL, NIST and Univ of Wisc**
- **Topics discussed**
  - **Status of substrate manufacture** (K L Blaedel/LLNL) **(4688-109)**
  - **Status of SEMI standards** (S Hector/Motorola)
  - **Chucking Analyses** (Univ of Wisc) **(4688-20)**
  - **Chucking proposal** (ASML)
- **Discussion**

The flatness of substrates continues to improve



Conclusions and Observations

- **Need more widespread participation, particularly from suppliers of measuring tools and writers**

1. **There are two approaches to constructing a standard for mounting masks**
    1. **Specify that all mask writing, measurement and exposure be performed with reference to (i.e., within some tolerance of) the mask front surface being ideally flat**
    2. **Specify an electrostatic chuck that will be universally used to physically flatten a mask**

Approach #1.

Writing, inspection and exposure are each referenced to an ideally flat plane

Advantage

- Accommodates any and different chuck designs during writing, measuring and exposing masks

Disadvantages

- Sensitive to backside flatness of substrate and its interaction with e-chuck
- Assessing uncertainty associated with compensation algorithms may be difficult and may be large
- Must also specify the (external) in-plane forces imposed on the mask
- Avoid the case where you can write and inspect a mask, but an e-chuck could not clamp it with high enough force to make it flat

Approach #2

Standardize the attributes of a chuck that must be used to flatten a mask

Advantages

- IPD at mask is insensitive to variation in friction (U of W simulations)
- Variation in OPD from chuck to chuck is insensitive to backside substrate flatness

Disadvantages

- Locks in (prematurely) the conceptual design of all chucks on all equipment
- Chuck design specific to an exposure tool may not be a good design when applied to writing or measuring
- Practical hurdles such as how to distinguish between a reject mask and an entrapped particle

Things to keep in mind

- The standard must allow inspection at each stage of manufacture, that is, the standard interacts with SEMI standards for substrates and blanks.
  - The mask substrate must pass inspection guaranteeing that it can be flattened in the exposure tool after coating and patterning.
- The mask could be written face up and then exposed face down
- While writing and inspecting do not have to be done in the flat state, exposure must be

End of Talk

A compromise specification?

Specify

- all mask writing and metrology apply to the ideally flat state

and

- mask substrates will be flattened, within some tolerance of the ideally flat state, by a performance-specified electrostatic chuck (SEMI P37)
- mask coatings will be deposited uniformly and less than some maximum residual stress (SEMI 3414)