Applications of MRF

Case Study – Improving Thickness Uniformity of Coating

Presented By:

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Introduction

- Goal
  - Some advanced technologies require tight specifications around thickness and total thickness variation without compromising other critical tolerances such as surface finish, subsurface damage and contamination
- Challenge
  - Achieving next generation accuracy and thickness control requirements is extremely difficult using conventional manufacturing processes
- Proposed solution
  - MRF can be used to target a desired thickness and meet tight total thickness variation specifications for:
    - SOI wafers
    - Coatings
    - MEMS applications

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Thickness Uniformity Correction - SOI Wafer

- The Objective
  - Correct thickness uniformity of top Si layer
- SOI (Silicon-on-Insulator) Wafer
  - Size: 200 mm Φ
  - Material: Silicon
- The MRF System Configuration
  - Rotational polishing mode
  - 150 mm wheel
    - Large spot to minimize cycle time
  - D20 MRF fluid
    - Low roughness

- Rotational mode
- 150 mm wheel
- D20 fluid

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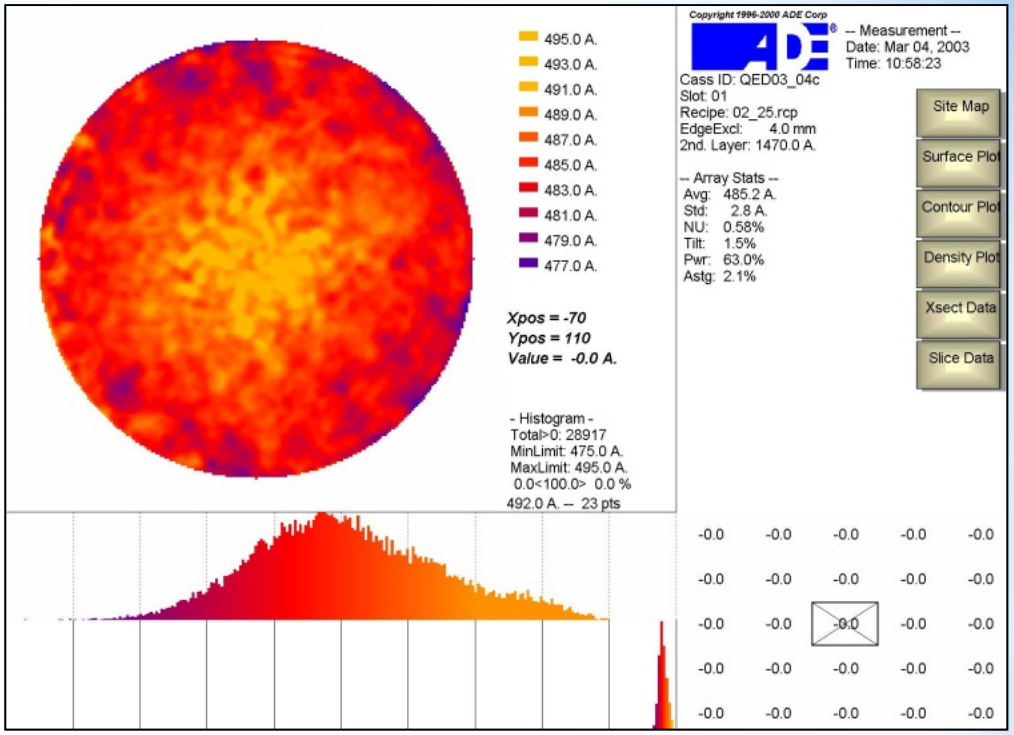
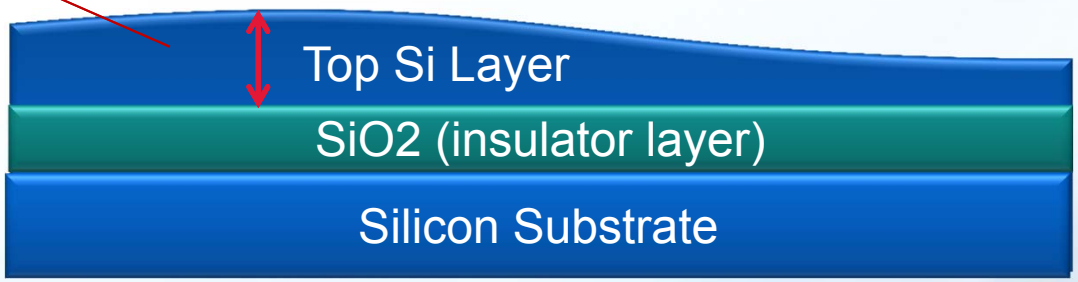
Measuring Thickness Uniformity

- Measure thickness of top Si coating layer
  - Wafer flatness does not have to be perfect
- Measurement is extremely accurate and repeatable

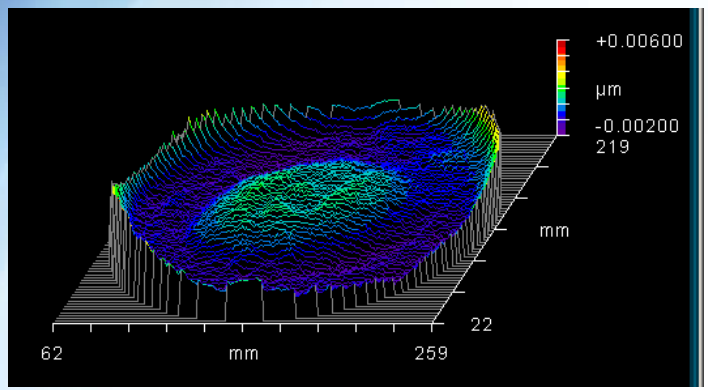


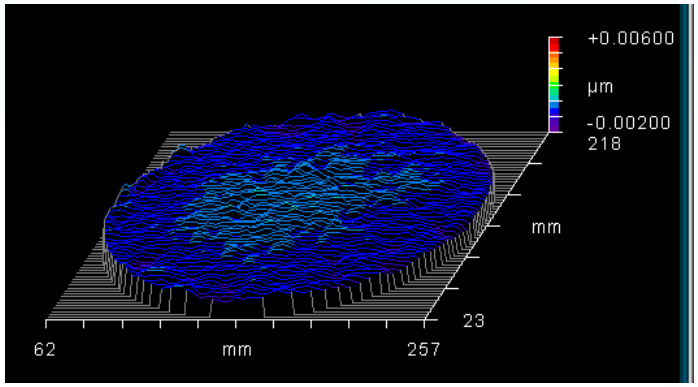
Thickness variation measured and corrected



Thin film 200mm SOI Wafer

Ultimate MRF Correction - thickness variation

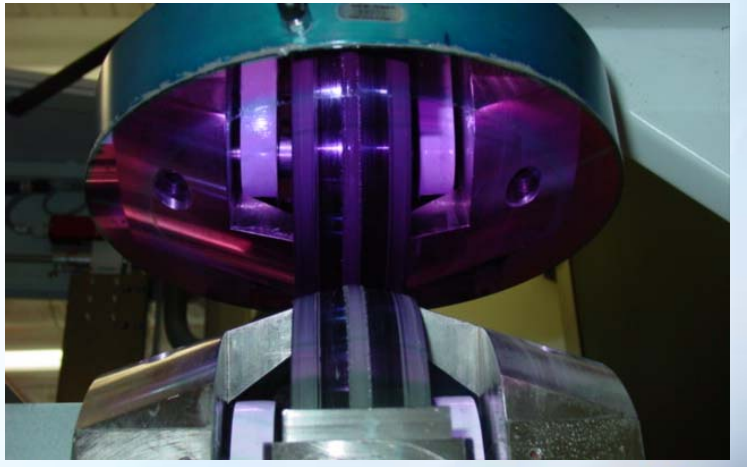




- Rotational Mode
- 150 mm Wheel
- D20 Fluid

Before MRF:
Range (PV) = 70 A
Std (rms) = 9.0 A
Avg Thick = 694 A

After 2 Runs:
Range (PV) = 17 A
Std (rms) = 2.8 A
Avg Thick = 485 A



- *PV < 2 nm achieved!*
- *Shows MRF capable of polishing to metrology limit*

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Conclusions

- Total thickness variation of <2nm was achieved
- MRF routinely polishes glass and crystalline materials to a surface roughness of <5Å RMS
- MRF uses sheering forces to removal material so no subsurface damage is introduced

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