CMP Service Support

SKW Associates, Inc.
SKW CMP Business Objectives

- Develop CMP Patterned Wafer Standards
  - Standard Characterization Mask Patterns
  - Standard Process Flow for Manufacturing Wafer
  - Standard Metrology Recipes
  - Standard Analysis Software

- Develop Advanced CMP Patterned Wafer Standards for Future 65 and 45nm Technology Nodes

- Total Solution Provider for CMP Process Characterization
SKW’s Total Solution for CMP Process Development and Characterization

1. Standard Patterned Wafers
2. Standard Measurements
3. Standard Analysis

- Characterization Wafers
  - SiO₂, Cu, W, STI Wafers
  - 6”, 8”, & 12” Wafers
  - State of the Art Layouts
  - Years of Experience Manufacturing Wafers

- Metrology Support
  - Detailed Metrology Recommendations
  - Carefully Designed Sample Plans
  - Metrology Recipes

- Analysis Software
  - Data Import from Metrology Tools
  - Automatic Calculation of Standard Metrics
  - Easy to Use

- Polishing Services
- Metrology Services
- Analysis Services
SKW CMP Service Business (April, 2005)

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INTRODUCTION

- CMP Industry has been Maturing. Typically, These Days, Most of IC Device Companies Demand the Data Generated by Using Either AMAT’s Mirra System or Ebara’s Frex-200 System
- Establishing In-house CMP Application Lab Costs at Least $10 Mil. In Addition, Running Cost Typically Exceeds $2 Mil. Per Year Including the Test Blanket and Patterned Wafers.
- Outsourcing the Bulk of CMP Process Characterization Needs is Attractive Solution
- SKW CMP Service Business Aims to Provide High Quality Total CMP Process Characterization and Analysis Supports for CMP Infrastructure Companies with Sound Pricing Policy.
## Polishing Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPEC 472</td>
<td>4 systems</td>
</tr>
<tr>
<td>Mirra</td>
<td>2 systems</td>
</tr>
<tr>
<td>Mirra Mesa</td>
<td>2 systems</td>
</tr>
<tr>
<td>Ebara Frex 200</td>
<td>1 system</td>
</tr>
<tr>
<td>Reflexion (300mm)</td>
<td>1 system</td>
</tr>
</tbody>
</table>

## Cleaning Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synergy (Both 200 &amp; 300 mm)</td>
<td>2 systems</td>
</tr>
</tbody>
</table>
Measurement Supports

I. Thin Film Thickness Measurements

1. KLA-Tencor ASET F-5 system
2. Therma Wave Optiprobe 3260 system

II. Profilometry

1. HRP (200 mm): KLA-Tencor
2. Vx (200 mm): Veeco
3. Vx (300 mm): Veeco
4. XE 300P (up to 300mm): PSIA
Measurement Supports

III. Defectivity

1. Blanket Film Wafer
   - SP-1 200 mm with optical verification
   - SP-1 300 mm with optical verification

2. Patterned Wafer
   - AITxp with EV200 Classification (200 mm)
   - AITxp with EV300 Classification (300 mm)
   - AITxp with SEM (300 mm)
   - KLA-Tencor 2139
   - KLA-Tencor 2360 (STEALTH)
   - Orbot WF 736
   - AIT-II system
   - Klarity Defect Management Service Available
Measurement Supports

IV. Other Services

1. E-Testing
2. TOF SIMS
3. TXRF
4. FIB Analysis

V. Analysis Software

1. ChampiAn for ILD, STI, W and Cu Patterned Wafer Analysis
2. Champi-Sim (Simulator for Oxide, STI and Cu CMP Process Characterization)
Support Level

Level-1: Metrology
- Defectivity Analysis
- Profilometry
  - Thin Films

Level-2: 200MM Polishing
- Ebara
- Mirra
- 472

Level-3: 300MM Polishing
- Reflexion

Level-4: 200/300MM Polishing w/unlimited metrology-shift
- 200MM polishing w/unlimited metrology for 1 shift
- 300MM polishing w/unlimited metrology for 1 shift
Level-1 Support Categories

Defectivity

- AIT-xp w/ SEM Review Capability
- SP-1 200MM with optical review verification
- SP-1 300MM with optical review verification
- AIT-xp w/SEM Review for 300MM wafers

Defect due corrosion
Slurry related defect on a pattern wafer

SEM defect review enable to chemically characterize defect through EDX analysis
AIT-Xp & SEM Review of Defects

Wafer Map of AITxp Inspected Defects

eV300 SEM Image From Review of AITxp Inspected Defects
Level-1 Support Categories

Profilometry (5-dies, 9-sites)

- HRP 200MM
- HRP 300MM
- Vx-310 200MM
- Vx-310 300MM
- AFM imaging
Level-1 Support Categories (contd.)

**Thin Films**
- KLA 5x – 200MM 49 points radial
- KLA 5x – 200MM 5 dies; 9-sites
- KLA 5x – 300MM 49 points
- KLA 5X – 300MM 5 dies; 9-sites

F5x thickness measurements performed on a post polished 200MM pattern wafer.
Level-2 Support Categories

- **Wafer Pre-/Post thickness measurements**
- **200MM wafer polishing**
  - Removal rate
  - Dishing, Erosion

Removal Rate study on 200MM 6K HDP wafers for multiple processes under a defined tool operating parameters are shown above.
Level-3 Support Categories

- Wafer Pre-/Post thickness measurements
- 200MM wafer polishing
  - Removal rate
  - Dishing, Erosion

Dishing erosion on inhibitors formulation window width

Slurry A - control  Sample 1  sample 2  Sample 3  sample 4

Dishing erosion, A

100 um dishing  10 um dishing  90% erosion
Summary & Conclusions

- Removal rate, dishing, and erosion tests can be performed on 200/300MM dia. wafers.

- Defect review using; optical, electrons, and EDX methods can be performed.

- Klarity & ADC manager defect analysis capability is available.