

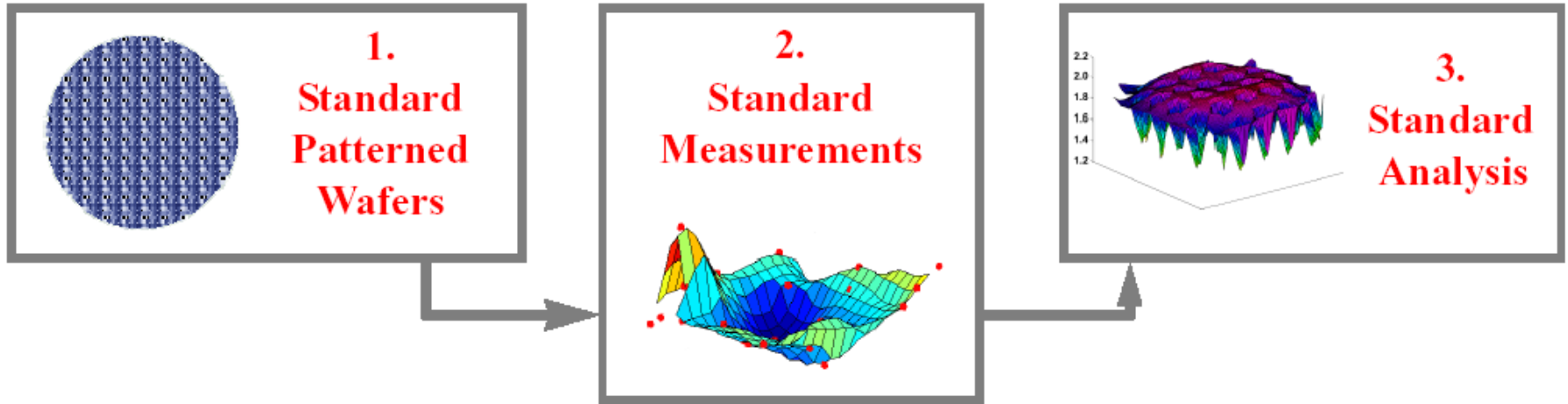
# **CMP Service Support**

**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



## ■ Characterization Wafers

- SiO<sub>2</sub>, Cu, W, STI Wafers
- 6", 8", & 12" Wafers
- State of the Art Layouts
- Years of Experience Manufacturing Wafers

## ■ Polishing Services

## ■ Metrology Support

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

## ■ Metrology Services

## ■ Analysis Software

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

## ■ Analysis Services

# **SKW CMP Service Business (April, 2005)**

**Sookap Hahn  
SKW Associates, Inc.**

**3370 Victor Court, Santa Clara, CA 95054**

**Phone: (408) 919-0094 Fax: (408) 919-0097**

**Email: [skw@testwafer.com](mailto:skw@testwafer.com)**

**Web: [www.testwafer.com](http://www.testwafer.com)**

# 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

- |                             |                  |
|-----------------------------|------------------|
| <b>1. IPEC 472</b>          | <b>4 systems</b> |
| <b>2. Mirra</b>             | <b>2 systems</b> |
| <b>3. Mirra Mesa</b>        | <b>2 systems</b> |
| <b>4. Ebara Frex 200</b>    | <b>1 system</b>  |
| <b>5. Reflexion (300mm)</b> | <b>1 system</b>  |

## Cleaning Services

- |   |                  |
|---|------------------|
| <b>1. Synergy (Both 200 &amp; 300 mm)</b> | <b>2 systems</b> |
|---|------------------|

# 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

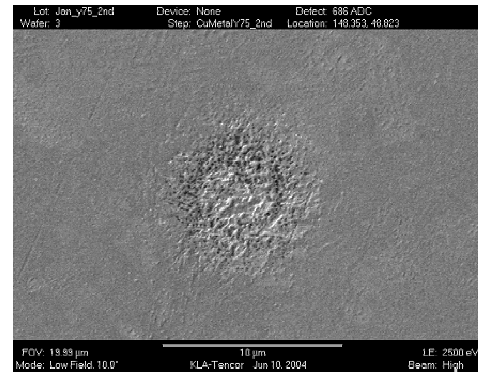
## ■ Level-4 : 200/300MM Polishing w/unlimited metrology-shift

- 200MM polishing w/unlimited metrology for 1shift
- 300MM polishing w/unlimited metrology for 1 shift

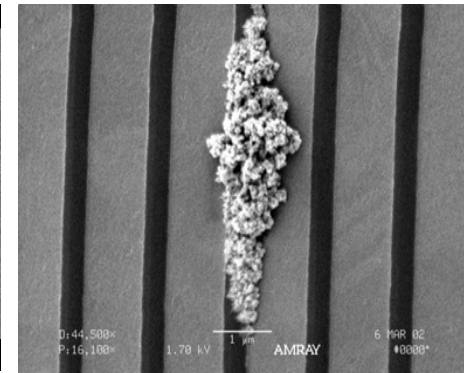
# Level-1 Support Categories

## Defectivity

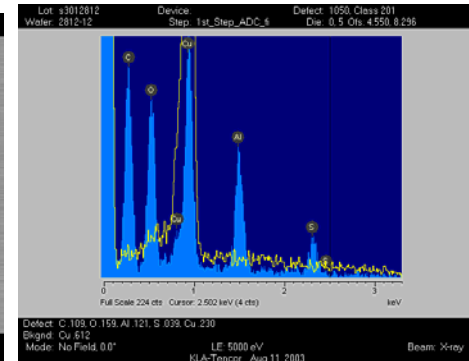
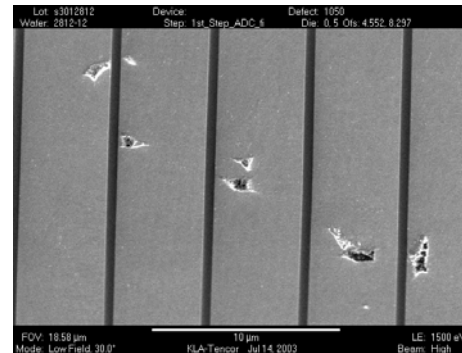
- AIT-xp w/ SEM Review Capability
- SP-1 200MM with optical review verification
- SP-1 300MM with optical review verification
- AIT-xp w/SEM Review for 300MM wafers



Defect due corrosion



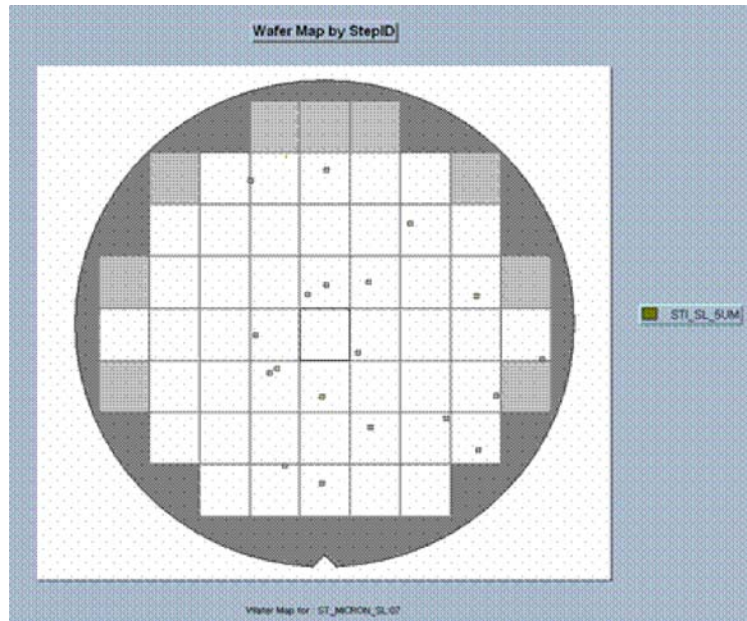
Slurry related defect on a pattern wafer



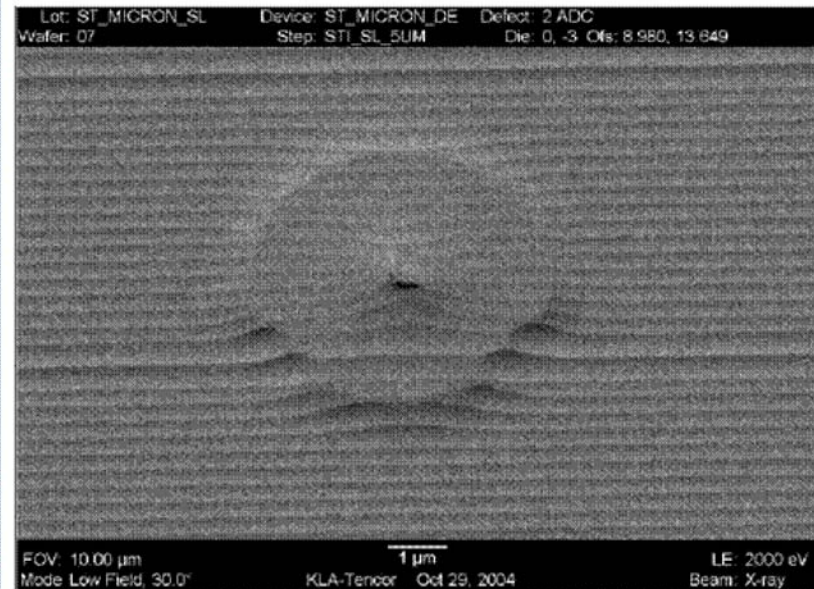
SEM defect review enable to chemically characterize defect through EDX analysis

# AIT-Xp & SEM Review of Defects

**Wafer Map of AITxp Inspected Defects**



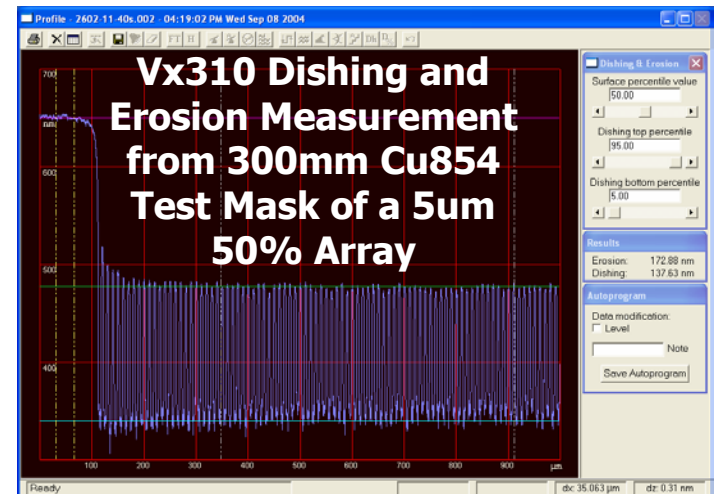
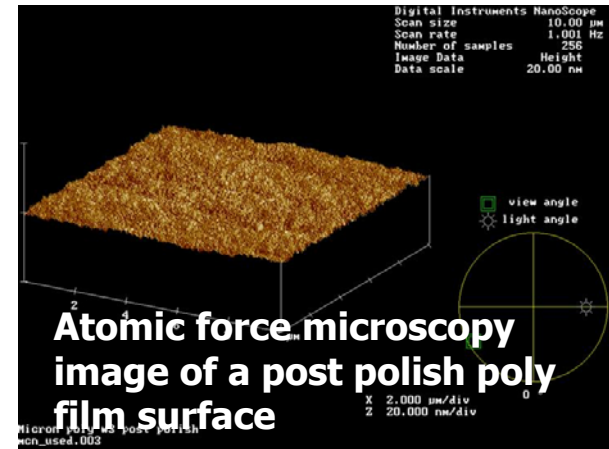
**eV300 SEM Image From Review of AITxp Inspected Defects**



# Level-1 Support Categories

## Profilometry (5-dies ,9-sites)

- HRP 200MM
- HRP 300MM
- Vx-310 200MM
- Vx-310 300MM
- AFM imaging

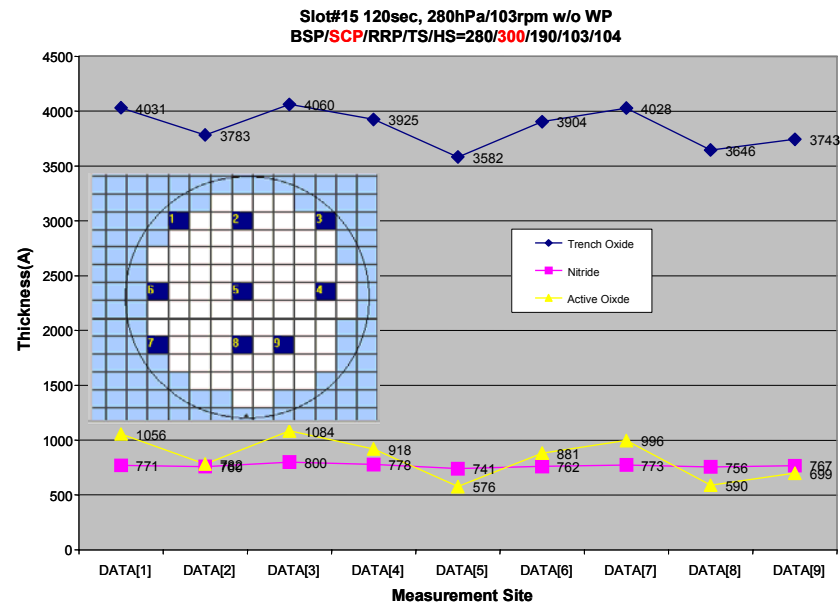


# Level-1 Support Categories (contd.)

## 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

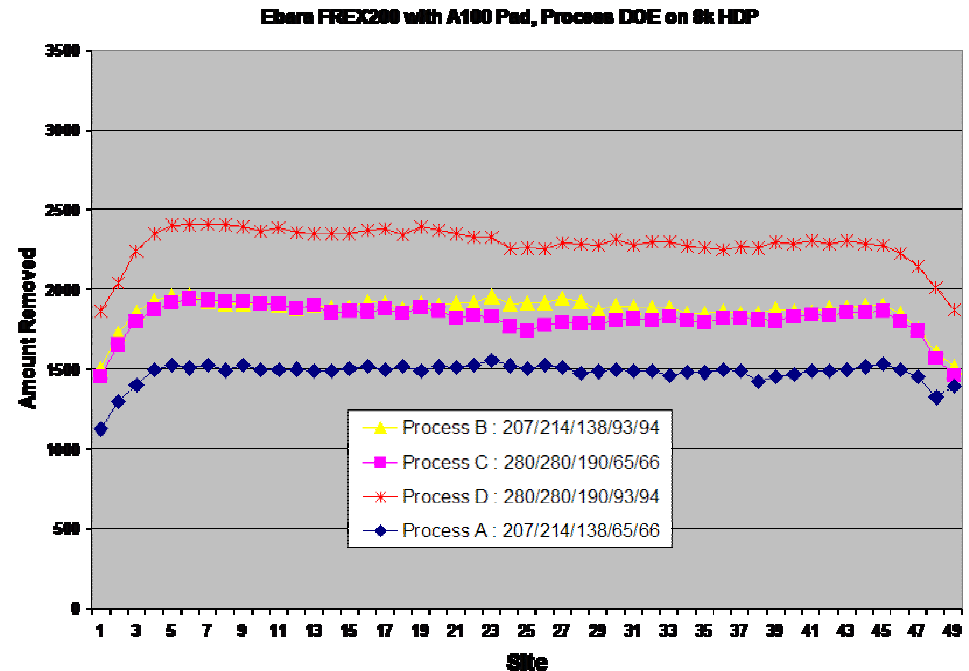
F5x thickness measurements performed on a post polished 200MM pattern wafer.



# Level-2 Support Categories

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

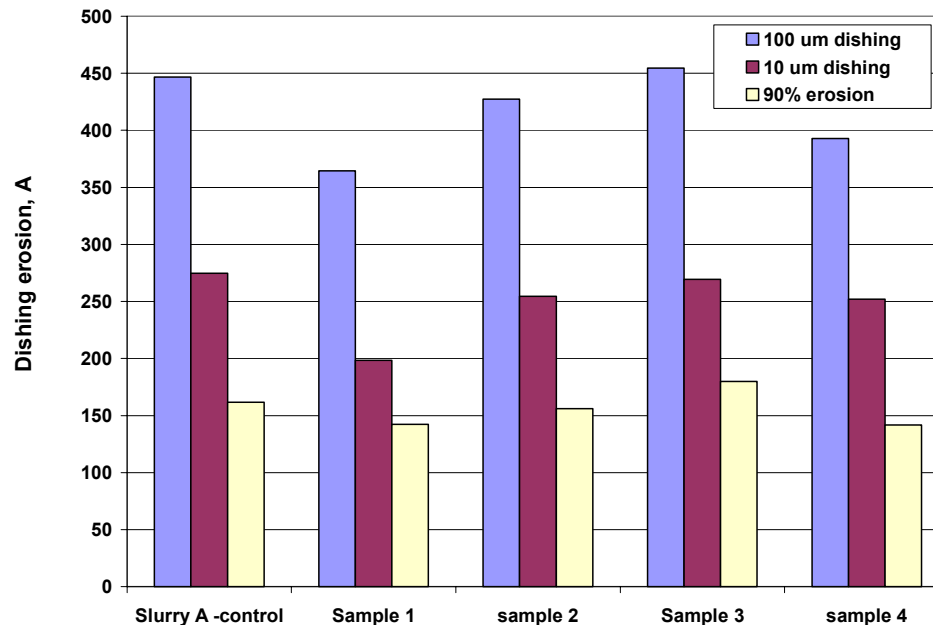
Removal Rate study on 200MM 6K HDP wafers for multiple processes under a defined tool operating parameters are shown above.



# Level-3 Support Categories

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

Dishing erosion on inhibitors formulation window width



# 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.**