Back On Track

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Outline

- The Business
- The Players
- The Buzz
- The End
The Business of Semiconductors

Annual Wafer Starts (200mm equivalents)

Source: Techcet Group, June 2012

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Recession & Recovery
The Business of CMP
Pad & Slurry Revenue by Application

Source: Techcet Group, June 2012

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The Business of CMP

❖ Modest revenue growth for 2011
  ✦ Up 3% over 2010’s 76% recovery blast
  ✦ 2012 forecast: +5.7% to $1.73B; new processes
  ✦ 5-year CAGR: 2.8%

❖ Revenue shuffle continues
  ✦ More copper & STI, less tungsten & ILD
  ✦ Resurgence of premium silica markets
  ✦ New applications emerging for ceria

❖ No entries/exits in CMP supplier base
The Players - Slurry

Air Products buys DuPont’s DANM share
- DANM / Cabot IP settlement has had little effect

- No significant share movement in 2011
- >15 suppliers share $994M market (est. 2012)
  - Tier 1 – Cabot Microelectronics ~40% share
  - Tier 2 – DANM, Dow, FujiFilm, Fujimi, Hitachi
    - Shares 5% to 12%
  - Tier 3 – Anji, AGC, ATMI, BASF, Bayer, Cheil, Ferro, JSR, Wacker
    - Shares <5%
The Players - Slurry

- July, 2011: proposed a CMP slurry market statistics program
  - Modeled after SEMI silicon wafer and photoresist programs
  - All key suppliers invited to participate
  - Zero participants signed up

- CMP market statistics will continue to be consensus estimates
The Players - Pads

- No significant share movement in 2011

- >16 makers share $646M market (est. 2012)

  - Tier 1 – Dow ~80% share
  - Tier 2 – Cabot ~5–10% share
  - Tier 3 – innoPad, JSR, Praxair, Thomas West
    - Shares 3–5%
  - Others – 3M, Fujibo, IVT, KPX, NexPlanar, Rogers, SKC, Toray, Toyo, Toyobo
The Players – Other CMP

- Pad conditioners ~$250M market
  - 3M & Kinik combined share >50%
- PCMP Cleaners ~$75M market
  - ATMI & Air Products combined share >65%
- PVA brushes ~$45M market
  - ITW & Aion combined share >80%
- Slurry filters ~$35M market
  - Pall & Entegris combined share >90%

*Total CMP Consumables: ~$2.04B*
CMP Consumables Grand Total

2012 Revenue

Total CMP Consumables: ~$2.04B
The Buzz – Ceria & China

idades

★ Ceria remains highly cost competitive due to China’s export restrictions
   ✷ 10–30% jump in ceria slurry prices
   ✷ Slurry suppliers more engaged in refining
   ✷ Alternative mines reopening globally

★ New FEOL device structures leverage ceria rate, selectivity, defectivity
   ✷ Same abrasive, different additives
   ✷ ~1% solids for S–STI, less for new FEOL
The Buzz – Defect Reduction

Reducing microscratching at STI and other FEOL steps is a critical issue below 32nm – *crazy sensitive*

- Real-time slurry monitoring brings 6σ line control capability to CMP (Vantage Tech)
- Customers asking for post-polish debris analysis for scratching incident diagnosis
- New metrology and hardware will need new line management protocols to be effective
The End

- CMP consumables market has returned to its pre-recession trajectory.
- CMP growth rate will *once again* exceed semiconductor growth for the next 3–5 years as new device structures call for new CMP processes.
- CMP process yield will benefit from metrology innovations.
The Techcet Group, LLC

2012 CMP Consumables Report

- **New:** available by individual consumable
- **New:** some content available by the page

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