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Challenges for CMP Consumable Suppliers

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The Challenge of Chip Technology

Smaller dimensions and larger wafers

- CMP process requirements are more demanding
- Innovative wafer states, structures, and materials are required
  - Drives new CMP applications
  - Each new CMP process must robustly meet requirements
  - Added chip complexity leads to divergent requirements
- Investment is required years in advance

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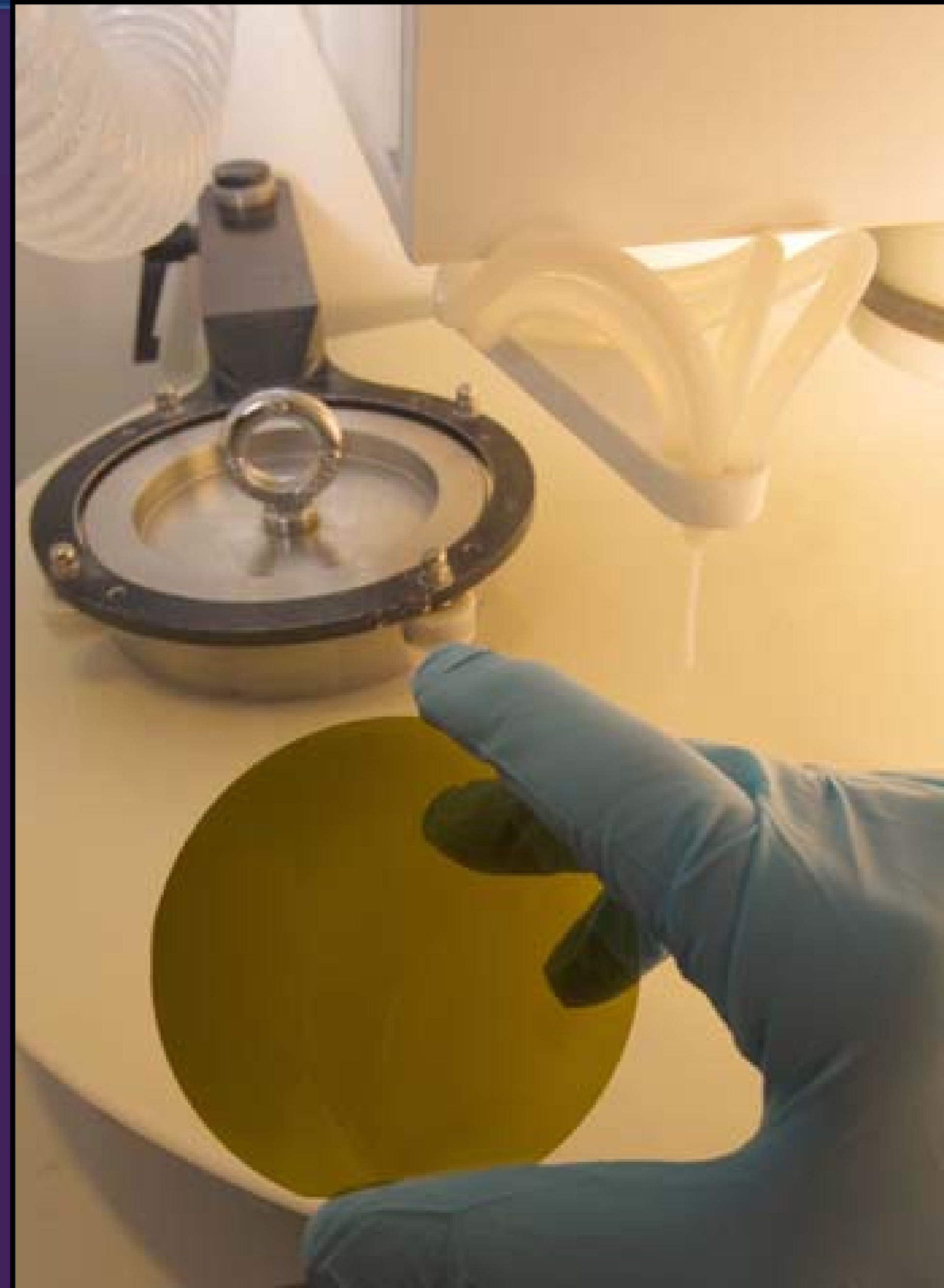
Outline

CMP Challenges:

- Tighter performance requirements
  - Epic® D100 Pad / Tungsten
- Customized solutions
  - Poly/Nitride/Oxide Platform
- New applications / materials
  - Ruthenium
- Q&A



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Tighter Performance Requirements

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"Big 4" CMP Requirements by Application

Wafer Yield

Planarity

Cu M1-M5 loss
-13% / yr

With Lower
Variation

Defectivity

Density -25% / yr
Size -13% / yr

Eliminates
Impurities
and Variation

Productivity

CoO/CoC

Step Function
versus Past

Driving CoO
and also CoC

Support

Customization
Consistency / CI

Full Support
Supply
Assurance

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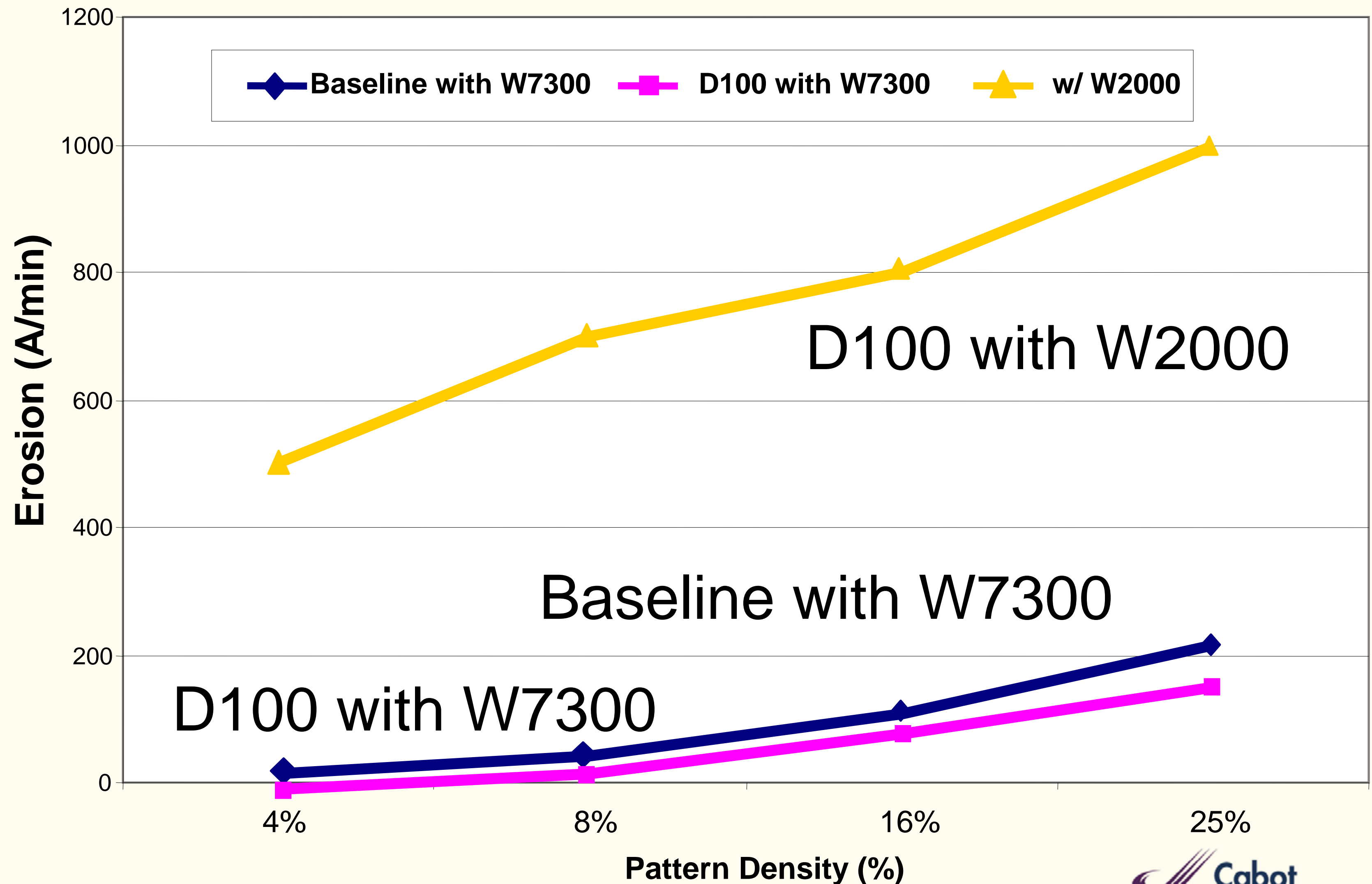
Improved Erosion with Epic® D100 Pad and WIN W7300



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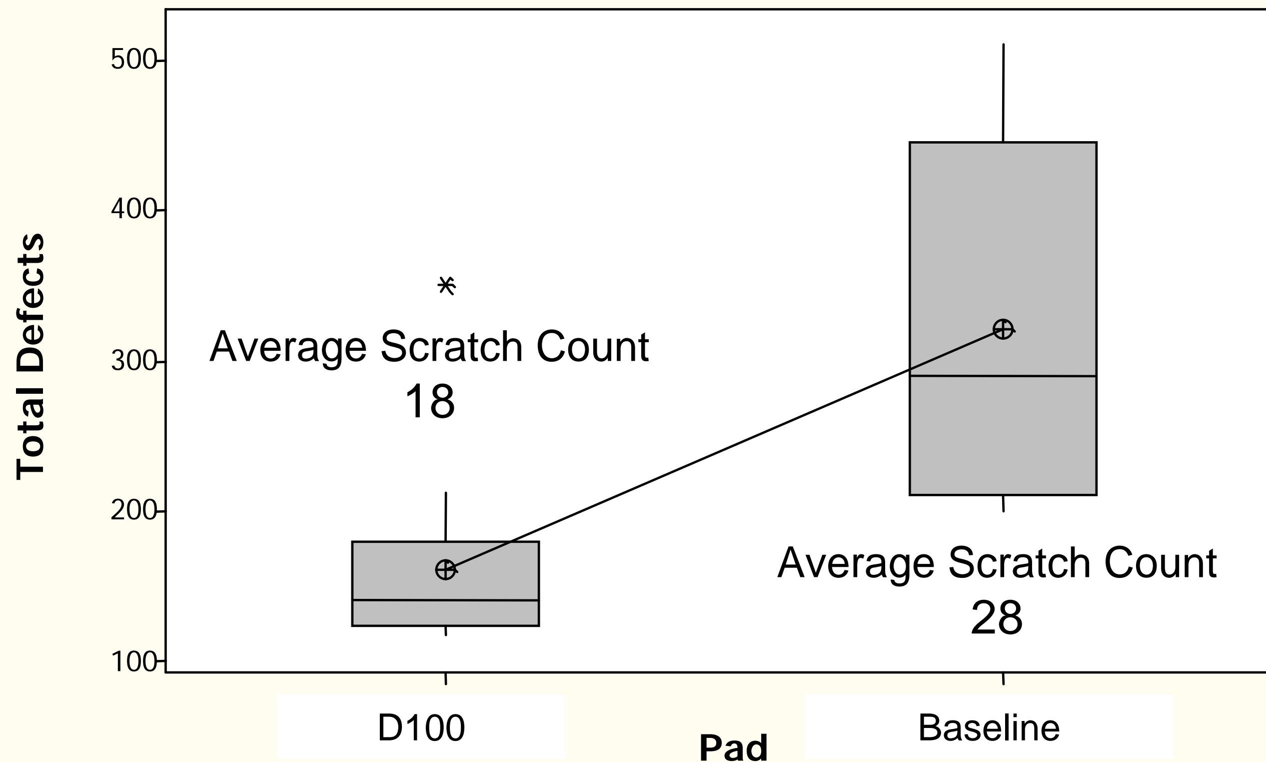
Better Defectivity Performance



D100 pad shows improvement in total defect counts compared to baseline

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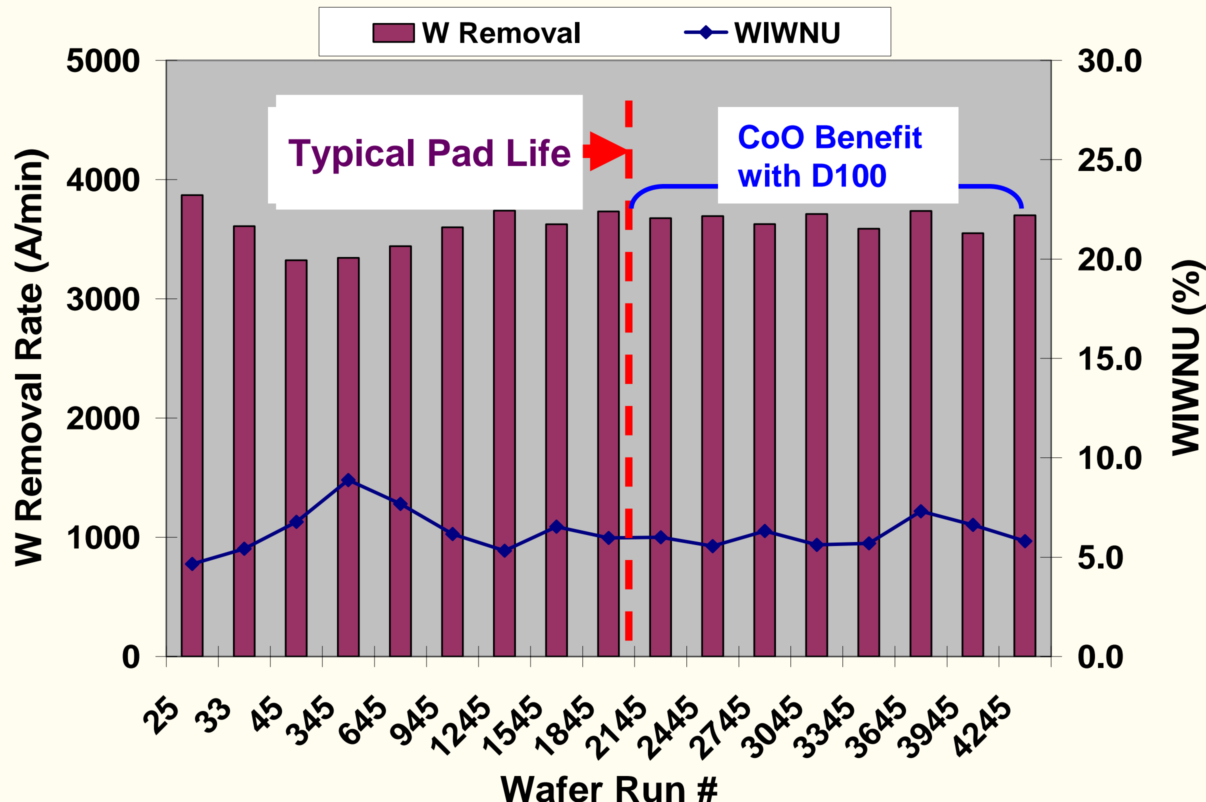
Improved CoO for Customers

Extended Run* on D100 Window Pad (W2000 1:1 diluted with 2.4% H_2O_2)



Stable Tungsten RR up to 4245 wafers* with an extended Pad Life of 2x

* From experiments which simulate the production polishing process with long conditioning process.

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Customized Solutions

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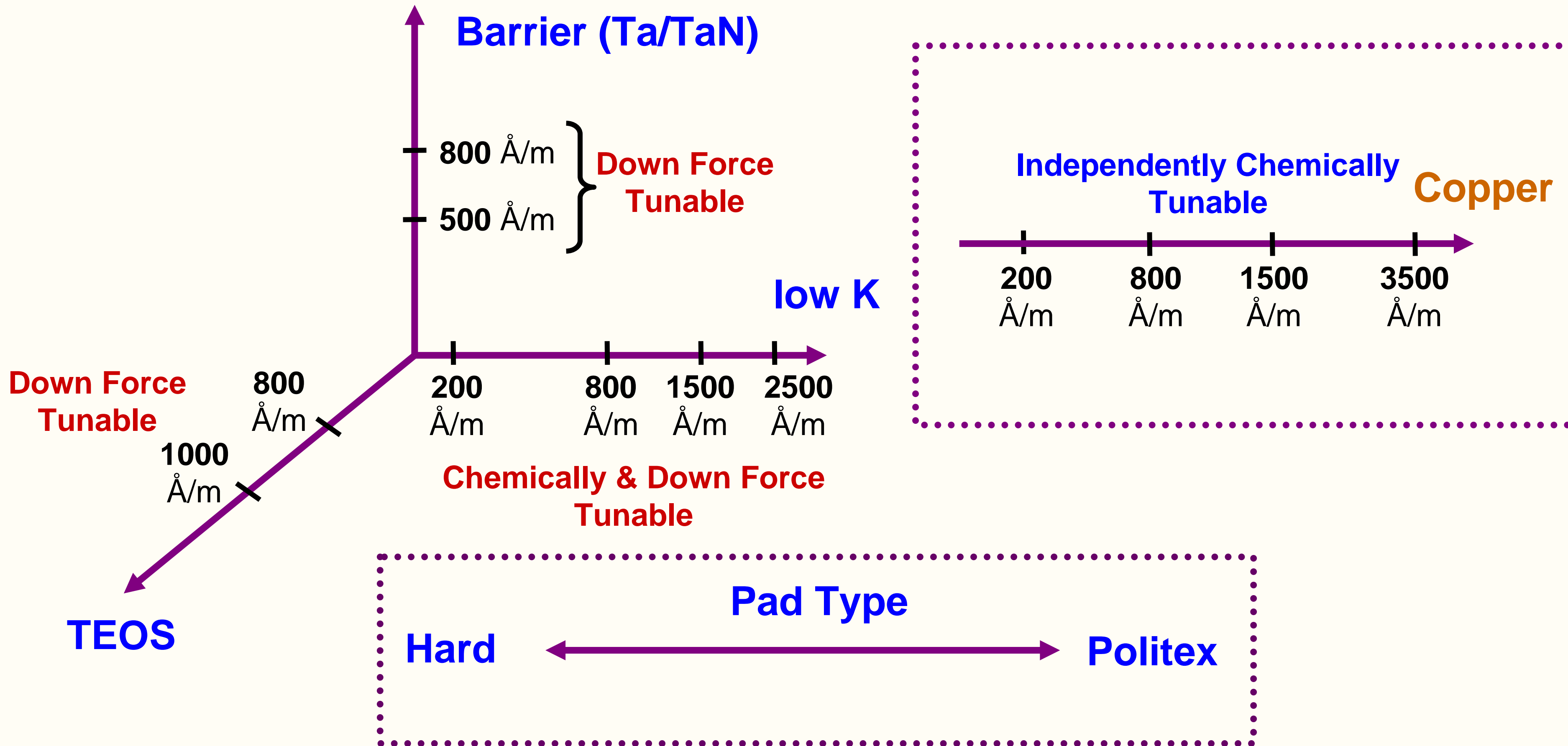
Platform Development—Optimization of Tunability



Tuned to Customer-Specific Incoming Topography

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New Applications and Materials

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The Future CMP Alphabet

Aluminum

Ir/IrO2

BARC

Cu

Ta/TaN

Ru

FUSI

SiO_2

TiN

CDO

CoFe

NiFe

BPSG

W

Noble Metals

GST

HfO2

SiO_2/SiN

Poly Si

HfSiO

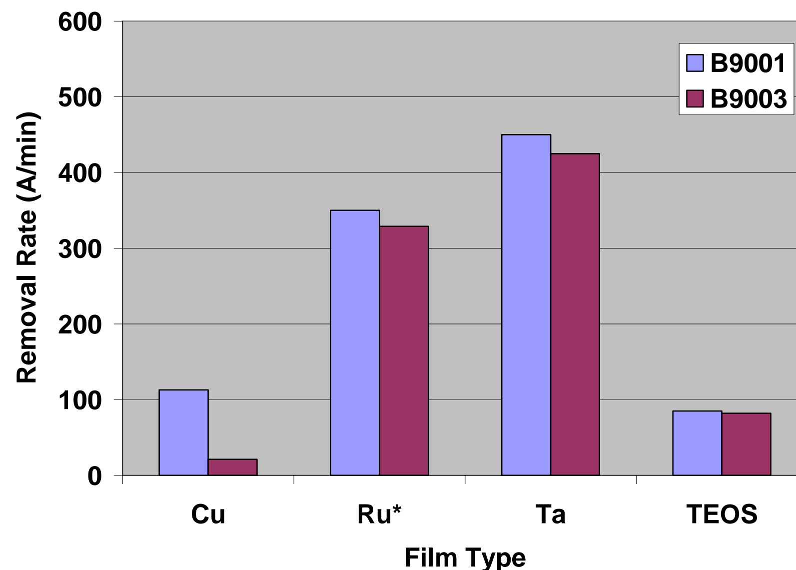
CuMn

iCue® B9000 Slurry (Platform) Tunable Selectivity

Process comparable to DF/TS=1.5psi/120rpm on Mirra

B9000 Ru and Ta Slurry (Platform) with H_2O_2 as an oxidizer and selected chemistries:

- Safe (will not form toxic RuO_4)
- Colloidally stable
- Applicable to Ru and Cu with no galvanic corrosion
- Tunable for Cu / Ru / Ta barrier selectivity with knobs identified and understood



* Ru removal rate is dependent on the deposition process (between 350-500 Å/min)

i-Cue® B9000 platform shows good Ru RR and tunable Cu/Ru/Ta selectivity

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Summary

- Current Challenges for CMP Suppliers are:
  - Tighter Performance Requires, and CoO
  - Customized Solutions
  - Development for a variety of new materials
- We hope to work together with our customers to meet these challenges

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