CMP CONSUMABLES

COMPLETE SET 2014

Techcet Group
Critical Materials Report

PREPARED BY

Bob Roberts

Reader's Please Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies and/or individuals. Data was obtained from sources considered reliable. Any statement that may be considered to be "forward thinking" is not a guarantee and not intended to influence the reader's financial interest nor position. The global semiconductor industry has historically been cyclical due to several factors including changes in customer demand on all levels including end-user demands. Future events are affected by the global economy and the periodic and unpredictable volatile nature of the semiconductor, microelectronics, and nanofabrication industries.

Techcet Group Report
CMP Consumables - 2014

MAIN TABLE OF CONTENTS:

Section	Contents
SECTION ONE	1.0 Historical Perspective plus a Look Ahead 1.1 A brief Early History of CMP use in Semiconductor Device Fabrication 1.2 Looking for "Adam" 1.3 Adapting to the Expanding Role of CMP 1.4 A View of the Year that has Passed, and a View of the Years to Come
SECTION TWO	2.0 CMP Slurries and Abrasives 2.1 CMP Slurry and Abrasive Suppliers - List 2.2 Executive Summary 2.3 Business Environment 2.4 Company Profiles of CMP Slurry and Abrasive Suppliers 2.5 Other Companies Related to this Market Segment
SECTION THREE	3.0 CMP Polishing Pad Suppliers 3.1 CMP Polishing Pad Suppliers – List 3.2 Executive Summary 3.3 Business Environment 3.4 Company Profiles of CMP Polishing Pad Suppliers 3.5 Other Companies Related to this Market Segment
SECTION FOUR	4.0 CMP Polishing Pad Conditioner Suppliers 4.1 CMP Polishing Pad Conditioner Suppliers – List 4.2 Executive Summary 4.3 Business Environment 4.4 Company Profiles of CMP Polishing Pad Conditioner Suppliers 4.5 Other Companies related to this Market Segment
SECTION FIVE	5.0 CMP Post-CMP PVA Brushes 5.1 CMP Post-CMP PVA Brush Suppliers – List 5.2 Executive Summary 5.3 Business Environment 5.4 Company Profiles of CMP PVA Brush Suppliers 5.5 Other Companies Related to this Market Segment
SECTION SIX	6.0 CMP Polishing Slurry Filter Suppliers 6.1 CMP Polishing Slurry Filter Suppliers – List 6.2 Executive Summary 6.3 Business Environment 6.4 Company Profiles of CMP Slurry Filter Suppliers 6.5 Other Companies Related to this Market Segment
SECTION SEVEN	7.0 CMP Wafer Carrier Retaining Rings 7.1 CMP Wafer Carrier Retaining Ring Suppliers – List 7.2 Executive Summary 7.3 Business Environment 7.4 Company Profiles of CMP Retaining Ring Suppliers 7.5 Other Companies Related to this Market Segment
SECTION EIGHT	8.0 Post-CMP Cleaning Chemistries 8.1 Post-CMP Cleaning Chemistries Suppliers – List 8.2 Executive Summary 8.3 Business Environment

Reader's Please Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies and/or individuals. Data was obtained from sources considered reliable. Any statement that may be considered to be "forward thinking" is not a guarantee and not intended to influence the reader's financial interest nor position. The global semiconductor industry has historically been cyclical due to several factors including changes in customer demand on all levels including end-user demands. Future events are affected by the global economy and the periodic and unpredictable volatile nature of the semiconductor, microelectronics, and nanofabrication industries.

	8.4 Company Profiles of Post-CMP Cleaning Chemistries Suppliers 8.5 Other Companies Related to this Market Segment
SECTION NINE	9.0 CMP Support Products and Services Suppliers 9.1 CMP Support Products and Services Suppliers – List 9.2 Executive Summary 9.3 Business Environment 9.4 Company Profiles of Support Products and Services Suppliers 9.5 Other Companies related to this Market Segment
SECTION TEN	10.0 University Programs
SECTION ELEVEN	11.0 CMP Equipment Suppliers 11.1 CMP Equipment Suppliers – List 11.2 Executive Summary 11.3 Business Environment 11.4 Company Profiles of CMP Equipment Suppliers 11.5 Other Companies Related to this Market Segment
SECTION TWELVE	12.0 CMP Process Flows 12.1 FEOL 12.1.1 STI 12.1.2 Pre-Metal Dielectric 12.1.3 Poly Open Polish for Metal Gates 12.1.4 Aluminum for Metal Gates 12.1.5 Tungsten Contacts 12.1.6 Poly Contacts 12.2 BEOL 12.2.1 Copper 12.2.2 Copper Barrier 12.2.3 Tungsten 12.2.4 ILD 12.3 TSV 12.3.1 TSV Front Side 12.3.2 TSV Back Side

MAIN TABLE OF FIGURES

SECTION ONE	1.0	A Look Ahead				
			1.1	Moore and More		
			1.2	New Structures		
			1.3	More CMP Steps		
			1.4	CMP Update		
			1.5	Resistance Rising		
			1.6	Barrier Scaling		
			1.7	Patterning Issues		
			1.8	RC Delay		
			1.9	Emerging Interconnects		
			1.10	Interconnect Apps		
			1.11	Equip. & Consumables		
			1.12	Total CMP Passes		
			1.13	Packaging Innovation		
			1.14	More than Moore		
			1.15	Market Drivers		
			1.16	Logic Starts		
			1.17	More than Moore examples		
			1.18	More than Moore examples		
			1.19	More than Moore examples		
			1.20	Trends		
SECTION TWO	2.0	CMP Slurries				
			2.1	Slurry Revenue		

Reader's Please Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies and/or individuals. Data was obtained from sources considered reliable. Any statement that may be considered to be "forward thinking" is not a guarantee and not intended to influence the reader's financial interest nor position. The global semiconductor industry has historically been cyclical due to several factors including changes in customer demand on all levels including end-user demands. Future events are affected by the global economy and the periodic and unpredictable volatile nature of the semiconductor, microelectronics, and nanofabrication industries.

			2.2	**Slurry Market Shares**		
			2.3	**Slurry Volumes POU**		
			2.4	**Revenue Share - Process**		
			2.5	**Revenue Share – Process**		
			2.6	**Market Share - ILD**		
			2.7	**Market Share - STI**		
			2.8	**Market Share - Tungsten**		
			2.9	**Market Share - Copper**		
			2.10	**Market Share – Cu Barrier**		
			2.11	**TSV Packaging**		
SECTION THREE	**3.0**	**CMP Polishing Pads**				
			3.1	**Pad Market Shares**		
			3.2	**Pad Revenue by Process**		
			3.3	**Pad Rev. by Wafer Size**		
			3.4	**Pads by Application**		
			3.5	**Pads for 200mm**		
			3.6	**Pads for 300mm**		
			3.7	**Pads for 450mm**		
			3.8	**AMAT Reflexion**		
			3.9	**Ebara F*REX**		
			3.10	**innoPad samples**		
			3.11	**“K” Groove Pad**		
SECTION FOUR	**4.0**	**CMP Conditioners**				
			4.1	**Conditioner Market Share**		
			4.2	**Kinik conditioner**		
			4.3	**Saesol conditioners**		
			4.4	**3M conditioner**		
			4.5	**3M Trizact conditioner**		
			4.6	**3M B5-M990**		
			4.7	**3M B75-2990**		
SECTION FIVE	**5.0**	**CMP PVA Brushes**				
			5.1	**PVA Brush Market Shares**		
			5.2	**PVA Brushes**		
			5.3	**PVA Brushes**		
			5.4	**Entegris Brushes**		
SECTION SIX	**6.0**	**CMP Slurry Filters**				
			6.1	**CMP Filter Market Shares**		
			6.2	**Large Particle Counts**		
			6.3	**Depth Filter – Flow Path**		
			6.4	**Depth Filter - multilayer**		
			6.5	**Depth Filter – PALL**		
			6.6	**Membrane Filter - Path**		
			6.7	**Membrane Filter-Millipore**		
			6.8	**How Slurry is Made-filters**		
SECTION SEVEN	**7.0**	**CMP Retaining Ring**				
SECTION EIGHT	**8.0**	**Cleaning Chemistry**				
			8.1	**P-CMP Market Shares**		
			8.2	**Dendrite formation**		
SECTION NINE	**9.0**	**Support/Services**				
SECTION TEN	**10.0**	**University Programs**				
SECTION ELEVEN	**11.0**	**Equipment**				
			11.1	**Equipment Market Shares**		
			11.2	**Ebara F*REX 300**		
			11.3	**Ebara polishing chamber**		
			11.4	**AMAT Reflexion LK**		
			11.5	**AMAT Reflexion GT**		
			11.6	**Mfg. by Wafer Size**		
			11.7	**Brush Cleaner Mkt. Share**		
SECTION TWELVE	**12.0**	**CMP Process Flows**				
			12.1	**Corollary to Moore’s Law**		
					12.1.1	**STI Process**

Reader’s Please Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies and/or individuals. Data was obtained from sources considered reliable. Any statement that may be considered to be “forward thinking” is not a guarantee and not intended to influence the reader’s financial interest nor position. The global semiconductor industry has historically been cyclical due to several factors including changes in customer demand on all levels including end-user demands. Future events are affected by the global economy and the periodic and unpredictable volatile nature of the semiconductor, microelectronics, and nanofabrication industries.

					12.1.2a	1st Gen HkMG
					12.1.2b	2nd Gen HkMG
					12.1.2c	HkMG Multi-Step
					12.1.2d	HkMG
					12.1.3	Poly Open
					12.1.4	Al Polish for MG
					12.1.5	W Contacts
			12.2			
					12.2.1a	Copper CMP
					12.2.1b	Cu issues
					12.2.1c	Cu interconnect
					12.2.4	Inter-Level Ox
			12.3	TSV		
					12.3.1a	Stack Specs
					12.3.1b	Process Flows
					12.3.1c	Cross Section
					12.3.1d	MEOL Flow
					12.3.1e	Post Bonding

TABLES

SECTION TWO	2.0	CMP Slurries		
			2.1	Compound Annual Growth Rate (CAGR)
			2.2	Abrasive Supplier Business Environment
SECTION THREE	3.0	CMP Polishing Pads		
			3.1	Compound Annual Growth Rate (CAGR)
SECTION SEVEN	7.0	CMP Retaining Ring		
			7.1	Edge Exclusion Surface Area
SECTION TWELVE	12.0	Process Flows	12.1	CMP Process Steps and their Impact Yield

Reader's Please Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies and/or individuals. Data was obtained from sources considered reliable. Any statement that may be considered to be "forward thinking" is not a guarantee and not intended to influence the reader's financial interest nor position. The global semiconductor industry has historically been cyclical due to several factors including changes in customer demand on all levels including end-user demands. Future events are affected by the global economy and the periodic and unpredictable volatile nature of the semiconductor, microelectronics, and nanofabrication industries.