

# THIN FILM DEPOSITION: TRENDS, KEY ISSUES, MARKET ANALYSIS

## Table of Contents

<b>Chapter 1</b>	<b>Introduction</b>	<b>1-1</b>
<b>Chapter 2</b>	<b>Executive Summary</b>	<b>2-1</b>
<b>Chapter 3</b>	<b>Physical Vapor Deposition</b>	<b>3-1</b>
3.1	Introduction	3-1
3.2	Sputtering Technology	3-2
3.3	Plasma Technology	3-5
3.4	Reactor Designs	3-14
3.4.1	Long-Throw Deposition	3-14
3.4.2	Collimated Sputter Deposition	3-16
3.4.3	Showerhead Deposition	3-18
3.4.4	Ionized PVD	3-22
3.5	Semiconductor Processing	3-28
3.5.1	Feature Patterning	3-28
3.5.2	Gap Fill	3-31
3.6	Targets	3-34
<b>Chapter 4</b>	<b>Chemical Vapor Deposition</b>	<b>4-1</b>
4.1	Introduction	4-1
4.2	Chemical Vapor Deposition (CVD) Techniques	4-1
4.2.1	APCVD	4-1
4.2.2	LPCVD	4-6
4.2.3	PECVD	4-9
4.2.4	HDPCVD	4-13
4.2.5	ALD	4-19
<b>Chapter 5</b>	<b>Electrochemical Deposition</b>	<b>5-1</b>

5.1	Introduction	5-1
5.2	Reactor Design	5-5
5.3	Challenges	5-6
5.4	Additives	5-8
5.5	Processing	5-9
5.5.1	Superfilling	5-9
5.5.2	Aspect Ratios	5-9
5.6	Copper Cathodes	5-10
5.7	Wet Copper Seed-Layer	5-11
<b>Chapter 6</b>	<b>Film Deposition And Film Properties</b>	<b>6-1</b>
6.1	Introduction	6-1
6.2	Dielectric Deposition	6-4
6.2.1	Silicon Dioxide	6-5
6.2.1.1	Thermal CVD	6-5
6.2.1.2	PECVD	6-6
6.2.1.3	HDPCVD	6-9
6.2.2	Silicon Nitride	6-13
6.2.2.1	Thermal CVD	6-13
6.2.2.2	PECVD	6-14
6.2.2.3	HDPCVD	6-19
6.2.3	High-K Dielectrics	6-19
6.2.4	Low-K Dielectrics	6-22
6.3	Metal Deposition	6-23
6.3.1	Aluminum	6-23
6.3.2	Tungsten/Tungsten Silicide	6-26
6.3.3	Titanium Nitride	6-28
<b>Chapter 7</b>	<b>Vendor Issues</b>	<b>7-1</b>
7.1	Introduction	7-1
7.2	450mm Processing	7-6

7.3	Integrated Processing	7-8
7.4	Copper	7-11
7.5	Metrology	7-14
7.6	ESD	7-17
7.7	Parametric Test	7-18
<b>Chapter 8</b>	<b>Market Forecast</b>	<b>8-1</b>
8.1	Introduction	8-1
8.2	Key Issues	8-4
8.3	Market Forecast Assumptions	8-7
8.4	Market Forecast	8-8
8.4.1	Chemical Vapor Deposition	8-8
8.4.2	Physical Vapor Deposition	8-28
8.4.3	Copper Electroplating Market	8-32
8.4.4	Atomic Layer Deposition Market	8-36
<b>List of Figures</b>		
3.1	Schematic Of Sputtering System	3-3
3.2	Magnetron Sputtering Design	3-9
3.3	Showerhead Reactor Design	3-19
3.4	Ionized PVD	3-24
4.1	APCVD Reactor	4-3
4.2	Tube CVD Reactor	4-7
4.3	HDPCVD Reactor	4-17
4.4	ALD Versus PVD Copper Barrier	4-26
5.1	Copper Electroplating System	5-3
7.1	Comparison Between Semiconductor and Equipment Revenues	7-4
8.1	Worldwide MCVD Market Shares	8-12
8.2	Worldwide DCVD Market Shares	8-13
8.3	Worldwide DCVD Market By Sectors	8-15
8.4	Worldwide HDHCVD Market Shares	8-18
8.5	Worldwide PECVD Market Shares	8-21

8.6	Worldwide SACVD Market Shares	8-24
8.7	Worldwide LPCVD Market Shares	8-27
8.8	Worldwide PVD Market Shares	8-31
8.9	Worldwide ECD Market Shares	8-34
8.10	Worldwide ALD Market Shares	8-38
<b>List of Tables</b>		
8.1	Worldwide CVD Market Forecast	8-9
8.2	Worldwide MCVD Market Shares	8-10
8.3	Worldwide DCVD Market Shares	8-11
8.4	Worldwide HDPCVD Market Forecast	8-16
8.5	Worldwide HDPCVD Market Shares	8-17
8.6	Worldwide PECVD Market Forecast	8-19
8.7	Worldwide PECVD Market Shares	8-20
8.8	Worldwide SACVD Market Forecast	8-22
8.9	Worldwide SACVD Market Shares	8-23
8.10	Worldwide LPCVD Market Forecast	8-25
8.11	Worldwide LPCVD Market Shares	8-26
8.12	Worldwide PVD Market Forecast	8-29
8.13	Worldwide PVD Market Shares	8-30
8.14	Worldwide ECD Market Forecast	8-33
8.15	Worldwide ALD Market Forecast	8-37