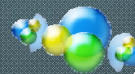


Electronics Materials Information



Critical Materials Report™ Sputtering Targets

By Christopher Michaluk

Edited by L. Shon-Roy

Techcet Group

a Techcet CA LLC Company

April 2015

www.Techcet.com

info@Techcet.com

Table of Contents

	Executive Summary.....	10
	§ 1: Introduction.....	13
	§ 2: Semiconductor Market Overview.....	18
	§ 3: Raw Material Economic Overview.....	22
	§ 4: Supply Chain Update.....	38
	§ 5: Key Manufacturing Cost Drivers.....	44
	§ 6: Supply Chain Analysis and Pricing.....	70
	§ 7: Technology Trends.....	86
	§ 8: Business Trends and Analysis.....	91
	§ 9: Target Materials Forecast.....	97
	§ 10: Regulatory Update.....	107
	§ 11: Supplier News and Profiles.....	112

List of Figures

 Figure 2.1 Wafer Starts by Device Type.....19	 Figure 3.10: 2013 Ti Sponge Production.....32
 Figure 2.2 Wafer Start Forecast.....21	 Figure 3.11: 2013 Global Ti Demand.....33
 Figure 3.1: 2014 Global Cu Mine Production....23	 Figure 3.12: Ti Process Summary.....34
 Figure 3.2: 2014 Global Cu Consumption.....24	 Figure 3.13: 2014 W Mine Production.....35
 Figure 3.3: Cu Process Summary.....25	 Figure 3.14: 2014 Global W Metal Demand.....36
 Figure 3.4: 2014 Ta Mine Production.....26	 Figure 3.15: W Process Summary.....37
 Figure 3.5: 2014 Global Ta Metal Demand.....27	 Figure 5.1: Copper Raw Material Cost Driver...48
 Figure 3.6: Ta Process Summary.....28	 Figure 5.2: Copper Purification/Consolidation Cost Driver.....49
 Figure 3.7: 2014 Al Smelter Production.....29	 Figure 5.3: Copper Forming Cost Driver.....50
 Figure 3.8: 2014 Domestic Al Consumption.....30	 Figure 5.4: Copper Machining and Bonding Cost Driver.....51
 Figure 3.9: Al Process Summary.....31	

List of Figures (Continued)

 Figure 5.5: Ta Raw Material Cost Driver.....52	 Figure 5.16: Ti Forming Cost Driver.....63
 Figure 5.6: Ta Purification Cost Driver.....53	 Figure 5.17: Ti Machining and Bonding Cost Driver.....64
 Figure 5.7: Ta Consolidation Cost Driver.....54	 Figure 5.18: W Raw Material Cost Driver.....65
 Figure 5.8: Ta Forming Cost Driver.....55	 Figure 5.19: W Purification Cost Driver.....66
 Figure 5.9: Ta Machining and Bonding Cost Driver.....56	 Figure 5.20: W Consolidation Cost Driver.....67
 Figure 5.10: Al Raw Material Cost Driver.....57	 Figure 5.21: W Forming Cost Driver.....68
 Figure 5.11: Al Purification/Consolidation Cost Driver.....58	 Figure 5.22: W Machining and Bonding Cost Driver.....69
 Figure 5.12: Al Forming Cost Driver.....59	 Figure 6.1: Cu Target Price Forecast.....73
 Figure 5.13: Al Machining and Bonding Cost Driver.....60	 Figure 6.2: Ta Target Price Forecast.....76
 Figure 5.14: Ti Raw Material Cost Driver.....61	 Figure 6.3: Al Target Price Forecast.....79
 Figure 5.15: Ti Purification/Consolidation Cost Driver.....62	 Figure 6.4: Ti Target Price Forecast.....82
	 Figure 6.5: W Target Price Forecast.....85

List of Figures (Continued)

 Figure 7.1: ALD / CVD Barrier Materials used for Mo and M1.....90	 Figure 9.4 : Cu Sputtering Target Revenue Forecast..... 101
 Figure 8.1: 2014 Target Supplier Market Share.....92	 Figure 9.5 : Ta Sputtering Target Revenue Forecast..... 102
 Figure 8.2a: 2014 Target Unit Production... 93	 Figure 9.5 : Al Sputtering Target Revenue Forecast..... 103
 Figure 6.2b: 2019 Target Unit Production...93	 Figure 9.6 : Ti Sputtering Target Revenue Forecast..... 104
 Figure 9.1: 2014 Total Sputtering Target Market.....98	 Figure 9.7 : W Sputtering Target Revenue Forecast..... 105
 Figure 9.2: Sputtering Target Cumulative Price Forecast.....99	 Figure 9.8 : Other Sputtering Target Revenue Forecast..... 106
 Figure 9.3: Sputtering Target Cumulative Revenue Forecast.....100	

List of Tables

	Table 2.1: Target Growth Drivers	19
	Table 5.1: General Process to Manufacture High-Purity Semiconductor Grade Sputtering Targets.....	46
	Table 6.1: Copper Target Supplier Supply Chain Integration.....	71
	Table 6.2: Tantalum Target Supplier Supply Chain Integration.....	73
	Table 6.3: Aluminum Target Supplier Supply Chain Integration.....	77
	Table 6.4: Titanium Target Supplier Supply Chain Integration.....	80
	Table 6.5: Tungsten Target Supplier Supply Chain Integration.....	83