

| | |
|--|---------------|
| INTRODUCTION | XXVIII |
| STUDY GOALS AND OBJECTIVES..... | XXVIII |
| REASONS FOR DOING THE STUDY | XXVIII |
| INTENDED AUDIENCE..... | XXVIII |
| SCOPE OF REPORT | XXIX |
| METHODOLOGY | XXIX |
| INFORMATION SOURCES..... | XXIX |
| ANALYST'S CREDENTIALS..... | XXX |
| RELATED BCC REPORTS | XXX |
| BCC ONLINE SERVICES..... | XXX |
| DISCLAIMER | XXXI |
| SUMMARY..... | XXXII |
| SUMMARY..... | XXXII |
| <i>SUMMARY TABLE VALUE OF GLOBAL PVD INDUSTRY, THROUGH</i> <i>2013 (\$ MILLIONS)</i> | <i>XXXIII</i> |
| <i>SUMMARY FIGURE GLOBAL VALUE OF PVD INDUSTRY, 2007-2013</i> <i>(\$ MILLIONS)</i> | <i>XXXIII</i> |
| OVERVIEW | 1 |
| PVD DEPOSITION TECHNOLOGY | 1 |
| <i>TABLE 1 BASIC PHYSICAL VAPOR DEPOSITION TECHNOLOGIES</i> | <i>2</i> |
| CLASSIFICATION OF MATERIALS..... | 2 |
| <i>TABLE 2 TYPICAL MATERIALS DEPOSITED BY PVD AND THEIR</i> <i>PROPERTIES</i> | <i>3</i> |
| MAJOR APPLICATIONS..... | 3 |
| <i>TABLE 3 LEADING PVD APPLICATIONS BY INDUSTRY</i> | <i>4</i> |
| PVD INDUSTRY STRUCTURE | 5 |
| <i>TABLE 4 KEY COMPANIES INVOLVED IN THE GLOBAL PVD</i> <i>BUSINESS</i> | <i>5</i> |
| <i>TABLE 4 (CONTINUED)</i> | <i>6</i> |
| <i>TABLE 4 (CONTINUED)</i> | <i>7</i> |
| RECENT CHANGES IN THE INDUSTRY | 8 |
| PVD KEY PLAYER IN LARGE SCALE SOLAR PRODUCTION | 8 |
| MERGER TREND CONTINUES | 9 |
| PVD CONTINUES TO GROW IN INDIA AND CHINA | 10 |
| <i>TABLE 5 FACTORS INFLUENCING CHINA AND INDIA GROWTH IN</i> <i>PVD MICROELECTRONIC MANUFACTURING</i> | <i>10</i> |
| PVD EFFICIENCY CONSTANTLY IMPROVING..... | 11 |
| GLOBAL PVD MANUFACTURING..... | 12 |
| <i>TABLE 6 REGIONAL SHARE OF GLOBAL PVD MANUFACTURING</i> <i>2007-2013 (%)</i> | <i>12</i> |

| | |
|---|----|
| <i>FIGURE 1 GLOBAL PVD MANUFACTURING BY REGION, 2007-2013</i> | |
| (<i>%</i>)..... | 13 |
| GLOBAL CONSUMPTION OF PVD EQUIPMENT | 14 |
| <i>TABLE 7 GLOBAL SHARE OF PVD CONSUMPTION, 2007-2013 (%)</i> | 14 |
| <i>FIGURE 2 GLOBAL PVD CONSUMPTION BY REGION, 2007-2013 (%)</i> | 15 |
| MARKET SHARES..... | 15 |
| <i>TABLE 8 MARKET SHARES OF GLOBAL PVD MANUFACTURING</i> | 16 |
| <i>COMPANIES, 2007 (\$ MILLIONS, %)</i> | 16 |
| COMPANY PROFILES | 17 |
| AJA INTERNATIONAL, INC., SCITUATE, MA..... | 17 |
| APPLIED MATERIALS, INC., SANTA CLARA, CA..... | 18 |
| AVIZA TECHNOLOGY, INC., SCOTTS VALLEY, CA..... | 18 |
| NV BEKAERT, KORTRIJK, BELGIUM..... | 19 |
| BOC EDWARDS, WEST SUSSEX, UNITED KINGDOM | 20 |
| CHA INDUSTRIES, FREMONT, CA..... | 21 |
| DENTON VACUUM, MOORESTOWN, NJ..... | 22 |
| INTEVAC, SANTA CLARA, CA | 23 |
| KDF ELECTRONICS, ROCKLEIGH, NJ..... | 24 |
| KURT J. LESKER COMPANY, CLAIRTON, PA | 25 |
| LEYBOLD OPTICS GMBH, ALZENAU, GERMANY..... | 25 |
| MILL LANE ENGINEERING, LOWELL, MA | 26 |
| NANOSHIELD & ROYAL ACE PVD ION PLATING, | |
| THAILAND | 27 |
| NOVELLUS SYSTEMS, INC., SAN JOSE, CA..... | 27 |
| OERLIKON BALZERS AND LEYBOLD, EUROPE | 28 |
| Oerlikon Balzers Coating Services | 29 |
| Oerlikon Leybold Vacuum..... | 29 |
| RICHTER PRECISION, INC., EAST PETERSBURG, PA | 29 |
| SINGULUS TECHNOLOGIES, FRANKFURT, GERMANY..... | 30 |
| SYSTEM CONTROL TECHNOLOGIES, SANTA CLARA, | |
| CALIFORNIA..... | 31 |
| ULVAC TECHNOLOGIES, METHUEN, MA..... | 31 |
| VEECO INSTRUMENTS, WOODBURY, NY..... | 32 |
| Veeco Instruments (Continued) | 33 |
| PVD TECHNOLOGY..... | 34 |
| THE BASIC PHYSICAL VAPOR DEPOSITION PROCESS..... | 34 |
| THE EVAPORATION PROCESS..... | 35 |
| <i>TABLE 9 PVD EVAPORATION SOURCES</i> | 36 |
| Key Advantages of Evaporation..... | 36 |
| <i>TABLE 10 KEY ADVANTAGES OF THE PVD EVAPORATION</i> | |
| <i>PROCESS</i> | 37 |
| Some Limitations of Evaporation | 37 |
| <i>TABLE 11 MAJOR LIMITATIONS OF EVAPORATION</i> | 37 |
| SPUTTERING | 38 |

| | |
|--|----|
| <i>TABLE 12 MAJOR ADVANTAGES OF THE SPUTTERING PROCESS</i> | 39 |
| Radio Frequency (RF) and Direct Current (DC) Diode Sputtering | 39 |
| Magnetically Enhanced Sputtering | 39 |
| Magnetron Sputtering Can Produce High Rates..... | 40 |
| Reactive Sputtering | 40 |
| <i>TABLE 13 LIMITATIONS OF THE SPUTTERING PROCESS</i> | 41 |
| ION BEAM ASSISTED DEPOSITION | 41 |
| <i>TABLE 14 ADVANTAGES/LIMITATIONS OF THE ION BEAM ASSISTED DEPOSITION PROCESS</i> | 42 |
| PULSED LASER DEPOSITION | 43 |
| Basic Components | 43 |
| <i>TABLE 15 KEY ADVANTAGES OF PULSED LASER DEPOSITION</i> | 44 |
| CATHODIC ARC DEPOSITION | 44 |
| Key Components | 45 |
| <i>TABLE 16 ADVANTAGES AND LIMITATIONS OF THE CATHODIC ARC PROCESS</i> | 46 |
| ROLL COATING | 46 |
| <i>TABLE 17 BASIC ADVANTAGES OF ROLL COATING</i> | 47 |
| EQUIPMENT CONFIGURATIONS | 47 |
| CLUSTER TOOLS | 48 |
| Technical Advantages..... | 48 |
| <i>TABLE 18 TECHNICAL ADVANTAGES OF CLUSTER TOOLS</i> | 49 |
| IN-LINE SYSTEMS | 49 |
| Advantages of In-line Systems..... | 50 |
| <i>TABLE 19 BASIC BENEFITS OF IN-LINE PVD SYSTEMS</i> | 50 |
| TECHNOLOGY TRENDS IN PVD | 51 |
| THE IMPACT OF NANOTECHNOLOGY | 51 |
| PVD's Early Success with Nanocoatings | 51 |
| SPUTTERED NANOLAMINATE COATINGS..... | 52 |
| <i>TABLE 20 KEY BENEFITS OF A MAGNETRON SPUTTERED NANOLAMINATE COATING</i> | 53 |
| DEPOSITION OF LARGE-SCALE DECORATIVE COATINGS..... | 53 |
| Current Technologies | 53 |
| Magnetron Sputtering | 54 |
| Arc Bond Sputtering..... | 54 |
| FLAT GLASS COATING WITH ROTATABLE MAGNETRONS | 54 |
| BETTER PERFORMANCE, LOWER COST IN CURRENT EQUIPMENT | 55 |
| <i>TABLE 21 SUGGESTIONS FOR BETTER PERFORMANCE OF CURRENT EQUIPMENT</i> | 55 |
| Cluster Tool Recommendations | 55 |
| PERSPECTIVE ON TRADITIONAL TECHNOLOGIES | 56 |
| INDUSTRY COMPETITIVENESS | 57 |

| | |
|---|----|
| PATENT ANALYSIS | 57 |
| PATENTS BY TECHNOLOGICAL TOPIC | 57 |
| <i>TABLE 22 PVD-RELATED PATENTS BY TECHNOLOGICAL TOPIC,</i> | |
| <i>2005-2007</i> | 58 |
| PATENTS BY WORLDWIDE REGION..... | 59 |
| <i>TABLE 23 PVD-RELATED PATENTS BY REGION, 2005-2007</i> | 59 |
| PATENTS BY ASSIGNEES | 60 |
| <i>TABLE 24 ASSIGNEES WITH THREE OR MORE PATENTS</i> | 60 |
| SAMPLE PATENT ABSTRACTS..... | 61 |
| Methods, Devices, and Compositions for Depositing and | |
| Orienting Nanostructures..... | 61 |
| Method and Apparatus for Improving Metal Interconnects..... | 61 |
| Magnetically Enhanced Capacitive Plasma Source for | |
| Ionized Physical Vapor Deposition..... | 62 |
| Source for Physical Vapor Deposition of Organic | |
| Electroluminescent Layers | 62 |
| Sputtering Thin Film Solar Cells | 63 |
| Depositing a Metal Seed Layer on Semiconductor | |
| Substrates..... | 63 |
| Depositing a Metal on ... (Continued)..... | 64 |
| PVD MARKETS..... | 65 |
| INDUSTRY FOCUS..... | 65 |
| MEASUREMENT OBJECTIVES..... | 66 |
| PVD IN THE MICROELECTRONICS MARKET | 67 |
| PVD IN THE MICROELECTRONICS MARKET | 67 |
| MICROELECTRONICS PRODUCT DEFINITION | 68 |
| <i>TABLE 25 BASIC TYPES OF MICROELECTRONIC PRODUCTS</i> | |
| <i>USING THE PVD PROCESS</i> | 68 |
| CHANGING PRODUCT CHARACTERISTICS..... | 69 |
| <i>TABLE 26 INTEGRATED CIRCUIT CHARACTERISTICS</i> | 69 |
| INDUSTRY COMPETITIVENESS OF PVD IN | |
| MICROELECTRONICS | 70 |
| MICROELECTRONICS ECONOMIC CONDITIONS..... | 70 |
| <i>TABLE 27 GLOBAL DEMAND FOR KEY MICROELECTRONIC</i> | |
| <i>PRODUCTS BY TYPE, THROUGH 2006 (\$ BILLIONS)</i> | 70 |
| GLOBAL ENVIRONMENT | 71 |
| <i>TABLE 28 ESTIMATED GLOBAL FABRICATION CAPACITY, 2007</i> | 71 |
| PRODUCT DEVELOPMENT AND STANDARDS..... | 72 |
| SEMI | 72 |
| Globalization | 73 |
| Standards | 73 |
| Benefits of Standards | 73 |
| <i>TABLE 29 BASIC ADVANTAGES OF STANDARDS</i> | 73 |

| | |
|--|-----------|
| SEMATECH..... | 74 |
| What They Do | 74 |
| International Technology Roadmap for Semiconductors (ITRS)..... | 75 |
| The Semiconductor Industry Association | 75 |
| <i>TABLE 30 CHALLENGES FACING THE SIA</i> | <i>75</i> |
| PVD TECHNOLOGY | 76 |
| Technology Challenge..... | 76 |
| MIRCOELECTRONICS GROWTH FACTORS | 76 |
| Driving Force for PVD | 77 |
| Impact of Market Growth Factors | 77 |
| <i>TABLE 31 IMPACT OF MAJOR FACTORS ON THE GROWTH OF PVD IN THE MICROELECTRONICS INDUSTRY (%).....</i> | <i>77</i> |
| SEMICONDUCTOR APPLICATIONS | 78 |
| <i>TABLE 32 BASIC PVD SEMICONDUCTOR APPLICATIONS.....</i> | <i>78</i> |
| IMPACT OF COPPER METALLURGY | 79 |
| DEPOSITION OF THIN FILMS | 79 |
| Gate Dielectrics | 80 |
| <i>TABLE 33 DESIRED DIELECTRIC PROPERTIES FOR MICROELECTRONIC PRODUCTS.....</i> | <i>80</i> |
| Interconnects | 81 |
| Barrier Layers | 81 |
| Contact and Adhesion Layers | 82 |
| TYPES OF PVD SYSTEMS | 82 |
| <i>TABLE 34 IMPACTS MADE ON PVD SYSTEMS BY CHANGES IN SEMICONDUCTOR APPLICATIONS.....</i> | <i>83</i> |
| Technological Expansion in PVD for Semiconductors | 84 |
| ADVANTAGES OF PVD IN SEMICONDUCTOR FABRICATION | 84 |
| <i>TABLE 35 ADVANTAGES OF PVD IN SEMICONDUCTOR FABRICATION.....</i> | <i>84</i> |
| Nanotechnology and the Future of PVD..... | 85 |
| MAJOR MATERIALS USED IN SEMICONDUCTOR PRODUCTS..... | 86 |
| <i>TABLE 36 KEY MATERIALS DEPOSITED BY PVD FOR SEMICONDUCTOR FABRICATION.....</i> | <i>86</i> |
| Sputtering Targets | 87 |
| SEMICONDUCTOR MARKET DRIVERS AND TRENDS..... | 87 |
| SEMICONDUCTOR MARKET DRIVERS ... (CONTINUED) | 88 |
| PVD EQUIPMENT DEMAND..... | 89 |
| <i>TABLE 37 PVD FUNCTIONS VERSUS OTHER TECHNOLOGIES IN SEMICONDUCTOR FABRICATION.....</i> | <i>89</i> |
| CMOS Business Model | 89 |
| Fluctuating Growth Trends | 90 |

| | |
|--|-----|
| <i>TABLE 38 GLOBAL GROWTH TREND OF PVD FOR SEMICONDUCTORS, THROUGH 2007 (VALUE AND PERCENTAGE RATIO)</i> | 91 |
| OTHER MICROELECTRONICS APPLICATIONS | 92 |
| FLAT PANEL DISPLAYS..... | 92 |
| ELECTRONIC COMPONENTS..... | 93 |
| Impact of MEMS Manufacturing..... | 93 |
| <i>TABLE 39 OVERVIEW OF OTHER MICROELECTRONICS PVD APPLICATIONS</i> | 94 |
| ADVANTAGES OF PVD FOR OTHER MICROELECTRONIC APPLICATIONS | 94 |
| <i>TABLE 40 ADVANTAGES OF PVD FOR OTHER MICROELECTRONIC PRODUCTS</i> | 94 |
| KEY MATERIALS USED IN OTHER MICROELECTRONIC PRODUCTS..... | 95 |
| <i>TABLE 41 KEY MATERIALS USED IN OTHER MICROELECTRONIC PRODUCTS</i> | 95 |
| MARKET DRIVERS FOR OTHER MICROELECTRONICS PRODUCTS..... | 95 |
| PVD Demand | 96 |
| Impact of Other Production Methods | 96 |
| FORECAST ASSUMPTIONS—PVD IN MICROELECTRONICS..... | 96 |
| <i>TABLE 42 FORECAST ASSUMPTIONS: PVD GROWTH IN MICROELECTRONICS</i> | 97 |
| <i>TABLE 43 PROJECTED GLOBAL GROWTH TREND OF PVD FOR SEMICONDUCTORS, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | 98 |
| FORECAST—VALUE OF PVD EQUIPMENT SHIPMENTS | 98 |
| <i>TABLE 44 FORECAST—VALUE OF GLOBAL SHIPMENTS OF PVD EQUIPMENT FOR MICROELECTRONICS, THROUGH 2013 (\$ MILLIONS)</i> | 99 |
| <i>FIGURE 3 GLOBAL SHIPMENTS OF PVD EQUIPMENT FOR THE MICROELECTRONICS INDUSTRY, 2007-2013 (\$ MILLIONS)</i> | 100 |
| FORECAST—VALUE OF DEPOSITED PVD MATERIALS | 101 |
| Measurement Considerations | 101 |
| Sputtering Target Materials | 102 |
| <i>TABLE 45 FORECAST OF THE GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN MICROELECTRONICS, THROUGH 2013 (\$ MILLIONS)</i> | 102 |
| <i>FIGURE 4 GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN MICROELECTRONICS, 2007-2013 (\$ MILLIONS)</i> | 103 |
| FORECAST—VALUE OF PVD SERVICES | 104 |

| | |
|---|-----|
| <i>TABLE 46 VALUE OF GLOBAL PVD DEPOSITION SERVICES FOR THE MICROELECTRONICS INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | 105 |
| SUMMARY | 105 |
| PVD IN THE STORAGE MARKET | 106 |
| PVD IN THE STORAGE MARKET | 106 |
| STORAGE PRODUCT DEFINITION | 107 |
| <i>TABLE 47 REPRESENTATIVE STORAGE PRODUCTS</i> | 107 |
| STORAGE INDUSTRY COMPETITIVENESS | 108 |
| DATA STORAGE ECONOMICS | 108 |
| The Cost Factor | 109 |
| Tape Drives | 109 |
| Tape Packaging | 109 |
| INTERNATIONAL INVOLVEMENT | 110 |
| <i>TABLE 48 FUNCTIONS OF THE IDEMA</i> | 110 |
| Where Storage Is Made | 110 |
| <i>TABLE 49 GLOBAL STORAGE MANUFACTURING COMPANIES BY REGION, 2007 (%)</i> | 111 |
| STANDARDS..... | 111 |
| <i>TABLE 50 REPRESENTATIVE STANDARDS TOPICS</i> | 112 |
| DEVELOPMENTS IN PVD TECHNOLOGY | 112 |
| STORAGE GROWTH FACTORS | 113 |
| Driving Force for PVD | 113 |
| Impact of Market Growth Factors | 114 |
| <i>TABLE 51 IMPACT OF MAJOR FACTORS ON THE GROWTH OF PVD IN THE DATA STORAGE MARKET (%)</i> | 114 |
| STORAGE APPLICATIONS | 114 |
| <i>TABLE 52 KEY STORAGE APPLICATIONS BY SUBSTRATE MATERIAL</i> | 115 |
| PVD SYSTEM TYPES | 116 |
| EMERGING APPLICATIONS..... | 116 |
| Tape Products | 116 |
| <i>TABLE 53 DEVELOPMENT OF TAPE STORAGE AND DEPOSITION</i> | 117 |
| Disk Products..... | 118 |
| Optical Disks | 118 |
| Nanofilms | 119 |
| ADVANTAGES OF PVD IN THE STORAGE INDUSTRY | 119 |
| <i>TABLE 54 MAJOR ADVANTAGES OF PVD FOR STORAGE PRODUCTS</i> | 119 |
| PVD Products Keep Evolving..... | 120 |
| MAJOR MATERIALS USED IN STORAGE MEDIA..... | 120 |
| <i>TABLE 55 MAJOR MATERIALS DEPOSITED BY PVD FOR THE FABRICATION OF STORAGE DEVICES</i> | 120 |
| <i>TABLE 55 (CONTINUED)</i> | 121 |

| | |
|--|------------|
| STORAGE MARKET DRIVERS AND TRENDS..... | 122 |
| PROJECTED PVD EQUIPMENT DEMAND | 123 |
| Growth Trends..... | 123 |
| <i>TABLE 56 GLOBAL GROWTH TREND OF PVD FOR THE STORAGE INDUSTRY, THROUGH 2007 (VALUE AND PERCENTAGE RATIO).....</i> | <i>124</i> |
| FORECAST ASSUMPTIONS—PVD GROWTH IN THE STORAGE INDUSTRY..... | 124 |
| <i>TABLE 57 FORECAST ASSUMPTIONS FOR PVD GROWTH IN THE STORAGE INDUSTRY</i> | <i>125</i> |
| <i>TABLE 58 PROJECTED GLOBAL GROWTH TREND OF PVD FOR THE STORAGE INDUSTRY, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | <i>126</i> |
| FORECAST—VALUE OF PVD SHIPMENTS..... | 126 |
| <i>TABLE 59 FORECAST—VALUE OF GLOBAL PVD SHIPMENTS BY TYPE FOR THE STORAGE INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>127</i> |
| <i>FIGURE 5 GLOBAL VALUE OF PVD EQUIPMENT FOR THE STORAGE INDUSTRY, 2007-2013 (\$ MILLIONS).....</i> | <i>127</i> |
| FORECAST—VALUE OF DEPOSITED MATERIALS FOR STORAGE DEVICES..... | 128 |
| Measurement Considerations | 128 |
| Sputtering Target Materials | 129 |
| <i>TABLE 60 FORECAST—GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN THE STORAGE INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>129</i> |
| <i>FIGURE 6 GLOBAL SHIPMENTS OF MATERIALS FOR PVD IN THE STORAGE INDUSTRY, 2007-2013 (\$ MILLIONS).....</i> | <i>130</i> |
| FORECAST—VALUE OF PVD SERVICES | 131 |
| <i>TABLE 61 FORECAST—VALUE OF GLOBAL PVD SERVICES IN THE STORAGE INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | <i>131</i> |
| PVD IN THE CUTTING TOOL MARKET..... | 132 |
| PVD IN THE CUTTING TOOL MARKET | 132 |
| PRODUCT DEFINITION..... | 133 |
| <i>TABLE 62 BASIC TYPES OF CUTTING TOOLS COATED BY PVD.....</i> | <i>133</i> |
| CUTTING TOOL INDUSTRY COMPETITIVENESS | 133 |
| ECONOMIC CONDITIONS | 134 |
| Slowdown Warnings | 134 |
| INTERNATIONAL CONDITIONS..... | 134 |
| Changing Market Shares | 135 |
| <i>TABLE 63 GLOBAL CUTTING TOOL MARKET BY REGION THROUGH 2007-2013 (%).....</i> | <i>135</i> |
| TECHNOLOGY | 136 |
| CUTTING TOOL GROWTH FACTORS | 136 |
| Driving Force for PVD | 137 |

| | |
|--|------------|
| Impact of Market Growth Factors | 137 |
| <i>TABLE 64 IMPACT OF MAJOR FACTORS ON THE GROWTH OF PVD IN THE CUTTING TOOL INDUSTRY (%).....</i> | <i>137</i> |
| CUTTING TOOL APPLICATIONS | 138 |
| <i>TABLE 65 BASIC CUTTING TOOL PVD APPLICATIONS</i> | <i>138</i> |
| TYPES OF PVD SYSTEMS | 139 |
| PVD vs CVD Process | 139 |
| ADVANTAGES OF PVD IN CUTTING TOOL COATING | 140 |
| MAJOR MATERIALS DEPOSITED FOR CUTTING TOOLS | 141 |
| <i>TABLE 66 KEY MATERIALS DEPOSITED BY PVD FOR CUTTING TOOL APPLICATIONS.....</i> | <i>141</i> |
| Nanocoatings | 142 |
| PVD Coated Carbides | 142 |
| CUTTING TOOL MARKET DRIVERS AND TRENDS | 142 |
| PVD EQUIPMENT DEMAND..... | 143 |
| Fluctuating Growth Trends | 143 |
| <i>TABLE 67 GLOBAL GROWTH TREND OF PVD FOR THE CUTTING TOOL INDUSTRY, 1998-2007 (VALUE AND PERCENTAGE RATIO).....</i> | <i>144</i> |
| FORECAST ASSUMPTIONS—PVD IN CUTTING TOOLS | 144 |
| <i>TABLE 68 FORECAST ASSUMPTIONS FOR PVD GROWTH IN CUTTING TOOLS</i> | <i>145</i> |
| <i>TABLE 69 PROJECTED GLOBAL GROWTH TREND OF PVD FOR THE CUTTING TOOL INDUSTRY, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | <i>146</i> |
| FORECAST—VALUE OF PVD SHIPMENTS..... | 146 |
| <i>TABLE 70 FORECAST—VALUE OF GLOBAL PVD EQUIPMENT FOR THE CUTTING TOOL INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>147</i> |
| <i>FIGURE 7 GLOBAL VALUE OF PVD SHIPMENTS FOR THE CUTTING TOOL INDUSTRY 2007-2013 (\$ MILLIONS).....</i> | <i>147</i> |
| FORECAST—VALUE OF CUTTING TOOL MATERIAL SHIPMENTS..... | 148 |
| Measurement Considerations | 149 |
| Sputtering Target Materials | 149 |
| <i>TABLE 71 FORECAST - GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD FOR CUTTING TOOL APPLICATIONS, THROUGH 2013 (\$ MILLIONS).....</i> | <i>149</i> |
| <i>FIGURE 8 GLOBAL SHIPMENTS OF MATERIALS DEPOSITED BY PVD IN THE CUTTING TOOL INDUSTRY, 2007-2013 (\$ MILLIONS).....</i> | <i>150</i> |
| FORECAST—VALUE OF PVD SERVICES | 150 |
| <i>TABLE 72 FORECAST—VALUE OF PVD COATING SERVICES IN THE CUTTING TOOL INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>151</i> |
| PVD IN THE SOLAR INDUSTRY..... | 152 |
| PVD IN THE SOLAR INDUSTRY | 152 |
| PRODUCT DEFINITION | 153 |

| | |
|---|------------|
| THE PHOTOVOLTAIC EFFECT..... | 153 |
| SOLAR THERMAL TECHNOLOGY..... | 153 |
| BCC's Focus | 153 |
| KINDS OF PHOTOVOLTAIC PRODUCTS..... | 154 |
| <i>TABLE 73 BASIC TYPES OF PHOTOVOLTAIC PRODUCTS.....</i> | <i>154</i> |
| SOLAR INDUSTRY COMPETITIVENESS..... | 155 |
| ENERGY DEMAND, THE ENVIRONMENT, AND COSTS | 155 |
| <i>TABLE 74 OVERVIEW OF SOLAR ENERGY STATUS.....</i> | <i>156</i> |
| GLOBAL RESEARCH AND DEVELOPMENT IN SOLAR | |
| ENERGY | 156 |
| North America | 157 |
| <i>TABLE 75 RESEARCH PROJECTS AT NREL.....</i> | <i>157</i> |
| European Industry Activities..... | 157 |
| Japanese Participation in Solar..... | 158 |
| <i>TABLE 76 KEY REASONS FOR JAPANESE INVESTMENT IN</i> | |
| <i>PHOTOVOLTAICS.....</i> | <i>159</i> |
| Other Asian and Chinese Activities..... | 159 |
| TECHNOLOGY..... | 159 |
| Nano-scale Solar Technology | 160 |
| SOLAR INDUSTRY GROWTH FACTORS..... | 160 |
| Driving Force for PVD..... | 161 |
| Impact of Market Growth Factors | 161 |
| <i>TABLE 77 IMPACT OF MAJOR FACTORS IN THE GROWTH OF PVD</i> | |
| <i>IN THE SOLAR INDUSTRY (%).....</i> | <i>161</i> |
| SOLAR INDUSTRY APPLICATIONS | 162 |
| <i>TABLE 78 BASIC PVD SOLAR INDUSTRY APPLICATIONS</i> | <i>162</i> |
| EMERGING SOLAR APPLICATIONS | 163 |
| <i>TABLE 79 EMERGING PVD SOLAR APPLICATIONS.....</i> | <i>163</i> |
| Organic Solar Cells..... | 163 |
| More Nanofilms | 163 |
| Traditional Materials | 164 |
| TYPES OF PVD SYSTEMS | 164 |
| ADVANTAGES OF PVD IN SOLAR MANUFACTURING..... | 164 |
| <i>TABLE 80 MAJOR ADVANTAGES OF PVD IN MAKING SOLAR CELLS....</i> | <i>165</i> |
| MAJOR MATERIALS USED IN THE SOLAR INDUSTRY..... | 165 |
| <i>TABLE 81 MAJOR MATERIALS FOR SOLAR APPLICATIONS.....</i> | <i>166</i> |
| Newer Materials | 167 |
| SOLAR MARKET DRIVERS AND TRENDS | 167 |
| PVD EQUIPMENT DEMAND..... | 168 |
| Solar and PVD Growth Trends | 168 |
| <i>TABLE 82 GROWTH TRENDS FOR PVD IN THE SOLAR INDUSTRY,</i> | |
| <i>THROUGH 2007 (VALUE AND PERCENTAGE RATIO).....</i> | <i>168</i> |
| FORECAST ASSUMPTIONS—PVD GROWTH IN THE SOLAR | |
| INDUSTRY..... | 169 |

| | |
|--|-----|
| <i>TABLE 83 FORECAST ASSUMPTIONS FOR PVD GROWTH IN THE SOLAR INDUSTRY</i> | 169 |
| <i>TABLE 84 PROJECTED GROWTH TRENDS FOR PVD IN THE SOLAR MARKET, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | 170 |
| FORECAST—VALUE OF PVD SHIPMENTS..... | 170 |
| <i>TABLE 85 FORECAST—VALUE OF GLOBAL PVD SHIPMENTS FOR THE SOLAR INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | 171 |
| <i>FIGURE 9 GLOBAL SHIPMENTS OF PVD EQUIPMENT FOR USE IN THE SOLAR INDUSTRY, 2007-2013 (\$ MILLIONS)</i> | 171 |
| FORECAST—VALUE OF SOLAR MATERIALS | 172 |
| Material Market Definition..... | 172 |
| Measurement Considerations | 173 |
| <i>TABLE 86 FORECAST—GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD FOR THE SOLAR INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | 173 |
| <i>FIGURE 10 GLOBAL VALUE OF PVD SHIPMENTS FOR THE SOLAR INDUSTRY, 2007-2013 (\$ MILLIONS)</i> | 174 |
| FORECAST—VALUE OF PVD SERVICES | 175 |
| <i>TABLE 87 FORECAST—VALUE OF GLOBAL PVD SERVICES IN THE SOLAR INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | 175 |
| PVD IN THE OPTICS INDUSTRY | 176 |
| PRODUCT DEFINITION..... | 176 |
| <i>TABLE 88 BASIC TYPES OF OPTICAL PRODUCTS</i> | 177 |
| OPTICAL INDUSTRY COMPETITIVENESS..... | 177 |
| ECONOMIC ENVIRONMENT..... | 177 |
| <i>TABLE 89 POSITIVE ECONOMIC FACTORS FOR THE OPTICS INDUSTRY</i> | 178 |
| INTERNATIONAL ACTIVITY..... | 179 |
| INDUSTRY AND GOVERNMENT SUPPORT..... | 179 |
| TECHNOLOGY..... | 180 |
| <i>TABLE 90 REQUIREMENTS FOR OPTICAL COATINGS</i> | 180 |
| OPTICAL MARKET GROWTH FACTORS | 181 |
| Driving Force for PVD..... | 182 |
| Impact on Market Growth Factors | 182 |
| <i>TABLE 91 IMPACT OF MAJOR FACTORS IN PVD GROWTH IN THE OPTICS INDUSTRY (%)</i> | 182 |
| OPTICS INDUSTRY APPLICATIONS..... | 183 |
| <i>TABLE 92 OVERVIEW OF OPTICS APPLICATIONS</i> | 183 |
| Plastic Lenses | 184 |
| Nanocoatings | 184 |
| TYPE OF PVD SYSTEMS | 184 |
| MATERIALS USED FOR OPTICAL APPLICATIONS | 185 |
| <i>TABLE 93 MAJOR MATERIALS USED FOR OPTICAL</i> | 185 |
| OPTICAL MARKET DRIVERS AND TRENDS | 186 |

| | |
|--|------------|
| PVD EQUIPMENT DEMAND..... | 187 |
| Changing Growth Trends..... | 187 |
| <i>TABLE 94 GLOBAL GROWTH TREND OF PVD FOR THE OPTICS</i> | |
| <i>INDUSTRY THROUGH 2007 (VALUE AND PERCENTAGE RATIO).....</i> | <i>188</i> |
| FORECAST ASSUMPTIONS—PVD IN OPTICS..... | 188 |
| <i>TABLE 95 FORECAST ASSUMPTIONS—PVD GROWTH IN THE</i> | |
| <i>OPTICS MARKET</i> | <i>189</i> |
| <i>TABLE 96 PROJECTED GLOBAL GROWTH TREND OF PVD FOR THE</i> | |
| <i>OPTICS INDUSTRY, THROUGH 2013 (VALUE AND PERCENTAGE</i> | |
| <i>RATIO)</i> | <i>189</i> |
| FORECAST—VALUE OF GLOBAL PVD SHIPMENTS..... | 190 |
| <i>TABLE 97 FORECAST—VALUE OF GLOBAL PVD EQUIPMENT</i> | |
| <i>SHIPMENTS BY TYPE FOR THE OPTICS INDUSTRY, THROUGH</i> | |
| <i>2013 (\$ MILLIONS).....</i> | <i>190</i> |
| <i>FIGURE 11 GLOBAL VALUE OF PVD SHIPMENTS FOR THE</i> | |
| <i>OPTICAL INDUSTRY, 2007-2013 (\$ MILLIONS)</i> | <i>191</i> |
| FORECAST—VALUE OF OPTICAL MATERIAL SHIPMENTS..... | 191 |
| Measurement Considerations | 192 |
| Sputtering Target Materials | 192 |
| <i>TABLE 98 FORECAST—GLOBAL VALUE OF MATERIALS</i> | |
| <i>DEPOSITED BY PVD IN THE OPTICS INDUSTRY, THROUGH 2013</i> | |
| <i>(\$ MILLIONS).....</i> | <i>193</i> |
| <i>FIGURE 12 GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN</i> | |
| <i>THE OPTICS INDUSTRY, 2007-2013 (\$MILLIONS).....</i> | <i>193</i> |
| FORECAST—VALUE OF PVD SERVICES | 194 |
| <i>TABLE 99 FORECAST—VALUE OF GLOBAL PVD SERVICES IN THE</i> | |
| <i>OPTICS INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>194</i> |
| Forecast—Value of PVD Services (Continued)..... | 195 |
| | |
| PVD IN THE MEDICAL EQUIPMENT MARKET..... | 196 |
| PVD IN THE MEDICAL EQUIPMENT MARKET | 196 |
| PRODUCT DEFINITION..... | 197 |
| <i>TABLE 100 BASIC TYPES OF MEDICAL DEVICES</i> | <i>197</i> |
| MEDICAL INDUSTRY COMPETITIVENESS | 197 |
| GLOBAL ECONOMICS | 198 |
| <i>TABLE 101 GLOBAL PRODUCTION OF MEDICAL EQUIPMENT AND</i> | |
| <i>SUPPLIES BY REGION, 2007-2013 (%).....</i> | <i>198</i> |
| <i>TABLE 102 POSITIVE ECONOMIC FACTORS FOR THE MEDICAL</i> | |
| <i>DEVICE INDUSTRY.....</i> | <i>199</i> |
| COST ISSUES..... | 199 |
| TECHNOLOGY..... | 200 |
| MEDICAL MARKET GROWTH FACTORS | 201 |
| Driving Force for PVD..... | 201 |
| Impact of Marketing Growth Factors | 202 |

| | |
|---|------------|
| <i>TABLE 103 IMPACT OF MAJOR FACTORS ON THE GROWTH OF PVD IN THE MEDICAL EQUIPMENT INDUSTRY (%).....</i> | <i>202</i> |
| MEDICAL EQUIPMENT APPLICATIONS | 202 |
| <i>TABLE 104 OVERVIEW OF MEDICAL EQUIPMENT APPLICATIONS.....</i> | <i>203</i> |
| GROWING APPLICATIONS..... | 203 |
| TYPES OF PVD EQUIPMENT | 204 |
| MAJOR MATERIALS USED IN THE MEDICAL DEVICE INDUSTRY ... | 204 |
| <i>TABLE 105 MAJOR THIN FILM MATERIALS USED FOR MEDICAL DEVICES AND EQUIPMENT.....</i> | <i>204</i> |
| NANOMATERIALS | 205 |
| MARKET DRIVERS AND TRENDS..... | 205 |
| GROWTH TRENDS | 206 |
| <i>TABLE 106 GLOBAL GROWTH TREND OF PVD FOR THE MEDICAL EQUIPMENT INDUSTRY, THROUGH 2007 (VALUE AND PERCENTAGE RATIO)</i> | <i>206</i> |
| FORECAST ASSUMPTIONS FOR PVD IN THE MEDICAL INDUSTRY..... | 206 |
| <i>TABLE 107 FORECAST ASSUMPTIONS FOR PVD GROWTH IN THE MEDICAL EQUIPMENT MARKET.....</i> | <i>207</i> |
| <i>TABLE 108 PROJECTED GLOBAL GROWTH TREND OF PVD FOR THE MEDICAL EQUIPMENT MARKET, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | <i>207</i> |
| FORECAST—VALUE OF PVD EQUIPMENT SHIPMENTS | 208 |
| <i>TABLE 109 FORECAST—GLOBAL VALUE OF PVD EQUIPMENT SHIPMENTS FOR THE MEDICAL EQUIPMENT INDUSTRY, THROUGH 2013 (\$ MILLIONS).....</i> | <i>208</i> |
| <i>FIGURE 13 GLOBAL VALUE OF PVD EQUIPMENT SHIPMENTS FOR THE MEDICAL EQUIPMENT MARKET, 2007-2013 (\$ MILLIONS).....</i> | <i>209</i> |
| FORECAST—VALUE OF PVD MATERIALS..... | 209 |
| Measurement Considerations | 210 |
| Sputtering Target Materials | 210 |
| <i>TABLE 110 FORECAST—GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN THE MEDICAL EQUIPMENT MARKET, THROUGH 2013 (\$ MILLIONS).....</i> | <i>210</i> |
| <i>FIGURE 14 GLOBAL VALUE OF PVD SHIPMENTS FOR THE MEDICAL EQUIPMENT MARKET, 2007-2013 (\$ MILLIONS).....</i> | <i>211</i> |
| FORECAST—VALUE OF PVD SERVICES | 212 |
| <i>TABLE 111 FORECAST—VALUE OF WORLDWIDE PVD SERVICES IN THE MEDICAL EQUIPMENT MARKET, THROUGH 2013 (\$ MILLIONS).....</i> | <i>212</i> |
| PVD IN THE FLEXIBLE PACKAGING MARKET | 213 |
| PVD IN THE FLEXIBLE PACKAGING MARKET | 213 |
| PRODUCT DEFINITION..... | 214 |

| | |
|---|-----|
| <i>TABLE 112 REPRESENTATIVE PRODUCTS USING FLEXIBLE PACKAGING</i> | 214 |
| PACKAGING INDUSTRY COMPETITIVENESS | 215 |
| ECONOMIC CONSIDERATIONS | 215 |
| INTERNATIONAL ACTIVITIES | 215 |
| European Activity..... | 216 |
| <i>TABLE 113 GOALS OF FLEXIBLE PACKAGING EUROPE</i> | 216 |
| Increased Asian Activity | 216 |
| <i>TABLE 114 POSITIVE FACTORS FOR INTERNATIONAL FLEXIBLE PACKAGING</i> | 217 |
| TECHNOLOGY..... | 217 |
| FLEXIBLE PACKAGING MARKET GROWTH FACTORS | 218 |
| Driving Force for PVD..... | 218 |
| Impact of Market Growth Factors | 218 |
| <i>TABLE 115 IMPACT OF MAJOR GROWTH FACTORS ON PVD FOR FLEXIBLE PACKAGING (%)</i> | 219 |
| PACKAGING INDUSTRY APPLICATIONS..... | 219 |
| Transparent Coatings..... | 219 |
| <i>TABLE 116 KEY ADVANTAGES OF GLASS COATINGS</i> | 220 |
| <i>TABLE 117 OVERVIEW OF FLEXIBLE PACKAGING APPLICATIONS</i> | 221 |
| TYPES OF PVD SYSTEMS | 221 |
| Web Coating Process | 222 |
| ADVANTAGES OF PVD IN FLEXIBLE PACKAGING..... | 222 |
| <i>TABLE 118 ADVANTAGES OF PVD IN FLEXIBLE PACKAGING</i> | 222 |
| KEY MATERIALS USED FOR FLEXIBLE PACKAGING | 223 |
| Nanomaterials | 223 |
| <i>TABLE 119 KEY MATERIALS DEPOSITED BY PVD IN FLEXIBLE PACKAGING</i> | 224 |
| FLEXIBLE PACKAGING MARKET DRIVERS AND TRENDS..... | 224 |
| PVD EQUIPMENT DEMAND..... | 225 |
| Growth Trends..... | 225 |
| <i>TABLE 120 GLOBAL GROWTH TREND OF PVD FOR THE FLEXIBLE PACKAGING INDUSTRY, THROUGH 2007 (VALUE AND PERCENTAGE RATIO)</i> | 225 |
| FORECAST ASSUMPTIONS—PVD IN FLEXIBLE PACKAGING | 226 |
| <i>TABLE 121 FORECAST ASSUMPTIONS FOR PVD GROWTH IN THE FLEXIBLE PACKAGING MARKET</i> | 226 |
| <i>TABLE 122 PROJECTED GLOBAL GROWTH TREND OF PVD FOR THE SPECIALTY PACKAGING MARKET, THROUGH 2013 (VALUE AND PERCENTAGE RATIO)</i> | 227 |
| FORECAST—VALUE OF PVD EQUIPMENT SHIPMENTS | 227 |
| <i>TABLE 123 GLOBAL SHIPMENTS OF PVD EQUIPMENT BY TYPE FOR FLEXIBLE PACKAGING, THROUGH 2013 (\$ MILLIONS)</i> | 228 |

| | |
|--|-----|
| <i>FIGURE 15 GLOBAL VALUE OF PVD EQUIPMENT SHIPMENTS FOR THE FLEXIBLE PACKAGING MARKET (\$ MILLIONS)</i> | 228 |
| FORECAST—VALUE OF FLEXIBLE PACKAGING MATERIALS | 229 |
| Measurement Considerations | 229 |
| Sputtering Targets | 230 |
| <i>TABLE 124 FORECAST—GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN THE FLEXIBLE PACKAGING INDUSTRY, THROUGH 2013 (\$ THOUSANDS)</i> | 230 |
| <i>FIGURE 16 GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD IN THE FLEXIBLE PACKAGING INDUSTRY, 2003-2013 (\$ MILLIONS)</i> | 231 |
| FORECAST—VALUE OF PVD SERVICES | 232 |
| <i>TABLE 125 FORECAST—VALUE OF WORLDWIDE PVD SERVICES IN THE FLEXIBLE PACKAGING INDUSTRY, THROUGH 2013 (\$ MILLIONS)</i> | 232 |
| PVD IN THE INDUSTRIAL MARKET | 233 |
| PRODUCT DEFINITION | 233 |
| <i>TABLE 126 BASIC TYPES OF INDUSTRIAL PRODUCTS</i> | 234 |
| INDUSTRIAL MARKET COMPETITIVENESS | 235 |
| AUTOMOTIVE MARKET..... | 235 |
| Domestic and International Economic Conditions..... | 235 |
| <i>TABLE 127 CLOSING GAP BETWEEN U.S AND ASIAN AUTOMAKERS, 1996-2006 (PERCENT OF MARKET)</i> | 235 |
| External Factors | 236 |
| <i>TABLE 128 EXTERNAL FACTORS IMPACTING THE AUTO INDUSTRY</i> | 236 |
| Technology | 236 |
| AEROSPACE MARKET | 237 |
| Economic Considerations | 237 |
| <i>TABLE 129 U.S.AEROSPACE SALES BY PRODUCT, THROUGH 2006 (\$ BILLIONS)</i> | 237 |
| International Market..... | 238 |
| Technology | 238 |
| MARKET GROWTH FACTORS FOR INDUSTRIAL PVD..... | 239 |
| Driving Force for PVD..... | 239 |
| Impact of Market Growth Factors | 240 |
| <i>TABLE 130 IMPACT OF MAJOR FACTORS ON PVD GROWTH IN THE INDUSTRIAL MARKET (%)</i> | 240 |
| KEY INDUSTRIAL APPLICATIONS..... | 241 |
| AUTOMOTIVE..... | 241 |
| AEROSPACE..... | 241 |
| <i>TABLE 131 OVERVIEW OF CURRENT AND EMERGING INDUSTRIAL PVD APPLICATIONS</i> | 242 |
| TYPES OF PVD SYSTEMS | 243 |

| | |
|--|------------|
| ADVANTAGES OF PVD IN THE INDUSTRIAL MARKET..... | 243 |
| <i>TABLE 132 ADVANTAGES OF PVD INDUSTRIAL COATINGS.....</i> | <i>244</i> |
| KEY INDUSTRIAL COATING MATERIALS | 244 |
| <i>TABLE 133 KEY MATERIALS DEPOSITED BY PVD FOR INDUSTRIAL</i> | |
| <i>APPLICATIONS</i> | <i>245</i> |
| INDUSTRIAL MARKET DRIVERS AND TRENDS..... | 245 |
| PVD EQUIPMENT DEMAND..... | 246 |
| Fluctuating Growth Trends | 246 |
| <i>TABLE 134 GLOBAL GROWTH TREND OF PVD FOR THE</i> | |
| <i>INDUSTRIAL MARKET, THROUGH 2007 (VALUE AND</i> | |
| <i>PERCENTAGE RATIO)</i> | <i>247</i> |
| FORECAST ASSUMPTIONS—PVD IN THE INDUSTRIAL | |
| MARKET | 247 |
| <i>TABLE 135 FORECAST ASSUMPTIONS—PVD GROWTH IN THE</i> | |
| <i>INDUSTRIAL MARKET</i> | <i>248</i> |
| <i>TABLE 136 PROJECTED GLOBAL GROWTH TREND OF PVD IN THE</i> | |
| <i>INDUSTRIAL MARKET, THROUGH 2013 (VALUE AND</i> | |
| <i>PERCENTAGE RATIO)</i> | <i>249</i> |
| FORECAST—VALUE OF PVD EQUIPMENT SHIPMENTS | 249 |
| <i>TABLE 137 FORECAST—VALUE OF GLOBAL PVD SYSTEMS FOR</i> | |
| <i>USE IN THE INDUSTRIAL MARKET, THROUGH 2013</i> | |
| <i>(\$ MILLIONS).....</i> | <i>250</i> |
| <i>FIGURE 17 GLOBAL VALUE OF AUTOMOTIVE PVD SYSTEMS</i> | |
| <i>DEPOSITED BY PVD 2007-2013 (\$ MILLIONS).....</i> | <i>250</i> |
| <i>FIGURE 18 GLOBAL VALUE OF AEROSPACE PVD SYSTEMS</i> | |
| <i>DEPOSITED BY PVD 2007-2013 (\$ MILLIONS).....</i> | <i>251</i> |
| FORECAST—VALUE OF INDUSTRIAL MATERIALS | 252 |
| Measurement Considerations | 252 |
| Sputtering Targets | 252 |
| Nanomaterials | 252 |
| <i>TABLE 138 FORECAST—GLOBAL VALUE OF MATERIALS</i> | |
| <i>DEPOSITED BY PVD IN THE INDUSTRIAL MARKET, THROUGH</i> | |
| <i>2013 (\$ MILLIONS).....</i> | <i>253</i> |
| <i>FIGURE 19 GLOBAL VALUE OF MATERIALS DEPOSITED BY PVD</i> | |
| <i>FOR THE INDUSTRIAL MARKET, 2007-2013 (\$ MILLIONS).....</i> | <i>253</i> |
| FORECAST—VALUE OF PVD SERVICES | 254 |
| <i>TABLE 139 FORECAST—VALUE OF GLOBAL PVD SERVICES IN THE</i> | |
| <i>INDUSTRIAL MARKET, THROUGH 2013 (\$ MILLIONS)</i> | <i>254</i> |