Advanced Ceramics

US Industry Study with Forecasts for 2017 & 2022

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Table of Contents

EXECUTIVE SUMMARY

MARKET ENVIRONMENT
General .......................................................... 4
Macroeconomic Overview.................................... 5
Demographic Trends ........................................... 8
Consumer Spending Overview ............................... 12
Manufacturing Outlook ...................................... 15
Historical Market Trends .................................... 19
Pricing & Competitive Materials .......................... 21
Technology Trends ............................................ 24
Regulatory & Environmental Factors .................... 26
World Outlook .................................................. 28
Foreign Trade ................................................... 30

MATERIALS
General .......................................................... 32
Alumina Ceramics ............................................. 36
Titanate Ceramics ............................................. 38
Barium Titanate ............................................... 39
Lead Zirconate Titanate .................................... 40
Other Titanate Ceramics .................................... 41
Zirconate Ceramics .......................................... 43
Cordierite Ceramics .......................................... 45
Ferrite Ceramics .............................................. 47
Silicon Carbide Ceramics .................................... 49
Boron Carbide Ceramics .................................... 51
Beryllia Ceramics ............................................. 53
Silicon Nitride Ceramics ..................................... 55
Other Advanced Ceramics .................................. 57

CLASSES & PRODUCTS
General .......................................................... 62
Demand by Class ............................................. 63
Monolithic Ceramics ........................................ 67
Ceramic Coatings ............................................ 70
Ceramic Matrix Composites ............................... 73
Demand by Product ........................................... 76
Electrical & Electronic Parts ............................... 80
Catalyst Supports ............................................ 82
Wear Parts .................................................... 85
Monolithic ..................................................... 87
Coatings ....................................................... 90
CMC .......................................................... 91
Engine Parts ................................................... 91
Monolithic ..................................................... 93
Coatings ....................................................... 95
CMC .......................................................... 96

Filters .......................................................... 97
Bioceramics ................................................... 100
Armor .......................................................... 102
Cutting Tools .................................................. 105
Membranes .................................................... 108
Other Products .............................................. 111
Monolithic ..................................................... 112
Coatings ....................................................... 113
CMC .......................................................... 114
Demand by Process .......................................... 115

MARKETS
General .......................................................... 118
Electronic Components Market .......................... 121
Advanced Ceramics Demand ............................. 122
Capacitors ..................................................... 124
Semiconductors & Integrated Circuit Packages .... 126
Transportation Equipment .................................. 130
Transportation Equipment Outlook ..................... 131
Advanced Ceramics Demand ............................. 134
Motor Vehicles .............................................. 136
Aerospace & Other Transportation Equipment ....... 140
Electrical Equipment ........................................ 142
Electrical Equipment Outlook ............................ 142
Advanced Ceramics Demand ............................. 145
Insulators ..................................................... 147
Permanent Magnets ........................................ 148
Other Electrical Equipment ............................... 149
Chemical Market ............................................. 151
Chemical Industry Outlook ............................... 152
Advanced Ceramics Demand ............................. 155
Machinery Market .......................................... 158
Machinery Outlook ........................................... 159
Advanced Ceramics Demand ............................. 161
Environmental Market ..................................... 162
Pollution Control Equipment Outlook ................. 163
Advanced Ceramics Demand ............................. 164
Medical Product Market ................................... 167
Orthopedic Implant & Dental Procedures Outlook 168
Advanced Ceramics Demand ............................. 170
Defense & Homeland Security Market ............... 174
National Defense Expenditures Outlook .............. 175
Advanced Ceramics Demand ............................. 175
Other Markets .............................................. 177

INDUSTRY STRUCTURE
General .......................................................... 180
Market Share .................................................. 183
Acquisitions & Divestitures ............................... 187
Cooperative Agreements .................................... 189
Marketing & Distribution ................................... 190
Manufacturing ................................................. 191
Research & Development .................................. 193
Competitive Strategies ...................................... 194

COMPANY PROFILES
CeramTec GmbH .............................................. 197
CerCo LLC .................................................... 200
CoorsTek Incorporated .................................... 201
Corning Incorporated ....................................... 205
Covalent Materials .......................................... 207
CTS Corporation ............................................. 208
DENSO Corporation ........................................ 210
DuPont (EI) de Nemours ................................... 211
Ferro Corporation ............................................ 212
General Electric .............................................. 214
HC Starck ...................................................... 216
Hitachi Limited .............................................. 218
Honeywell International .................................... 220
KEMET Corporation ......................................... 222
Kemnemet Incorporated .................................... 223
Kyocera Corporation ........................................ 225
Materion Corporation ....................................... 229
Momentum Performance Materials .................... 231
Morgan Advanced Materials ............................. 233
Murata Manufacturing ...................................... 236
Natel Engineering ............................................ 237
NGK Insulators .............................................. 238
Noritake Company .......................................... 241
Pall Corporation ............................................. 243
Panasonic Corporation ....................................... 246
Refractron Technologies ..................................... 247
Rockwood Holdings ......................................... 248
Saint-Gobain .................................................. 249
Sulzer Limited ............................................... 251
TDK Corporation ............................................. 253
3M Company .................................................. 255
United Technologies ........................................ 259
Vesuvius plc ................................................... 260
Vishay Intertechnology ...................................... 262
Other Companies Mentioned in Study ............... 264-269

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List of Tables/Charts

EXECUTIVE SUMMARY
1 Summary Table .................................. 3

MARKET ENVIRONMENT
1 Macroeconomic Indicators .................. 8
2 Population & Households ................. 12
3 Personal Consumption Expenditures .. 15
4 Manufacturers’ Shipments ............... 19
5 Advanced Ceramics Market, 2002-2012 .... 20
Cht Advanced Ceramics Market, 2002-2012 .... 21
Cht World Advanced Ceramics Demand, 2012 .... 30

MATERIALS
1 Advanced Ceramics Demand by Material .............. 34
Cht Advanced Ceramics Demand by Material, 2012 .......... 35
Cht Increase in Advanced Ceramics Demand by Material, 2012-2017 .... 35
2 Alumina Ceramics Demand .................. 38
3 Titanate Ceramics Demand ................. 39
4 Zirconate Ceramics Demand ............. 45
5 Cordierite Ceramics Demand .......... 47
6 Ferrite Ceramics Demand .................. 48
7 Silicon Carbide Ceramics Demand .... 51
8 Boron Carbide Ceramics Demand ...... 53
9 Beryllia Ceramics Demand ............ 55
10 Silicon Nitride Ceramics Demand .... 57
11 Other Advanced Ceramics Demand .... 61

CLASSES & PRODUCTS
1 Advanced Ceramics Demand by Class .... 65
Cht Advanced Ceramics Demand by Class, 2012 .......... 66
Cht Increase in Advanced Ceramics Demand by Class, 2012-2017 .... 66
2 Monolithic Ceramics Demand by Product ............. 69
Cht Monolithic Ceramics Demand by Product, 2012 .......... 70
3 Ceramic Coatings Demand by Product .......... 72
Cht Ceramic Coatings Demand by Product, 2012 .............. 72
4 Ceramic Matrix Composites Demand by Product .......... 75
Cht Ceramic Matrix Composites Demand by Product, 2012 .... 76
5 Advanced Ceramics Demand by Product ............ 78
Cht Advanced Ceramics Demand by Product, 2012 .......... 79
Cht Increase in Advanced Ceramics Demand by Product, 2012-2017 .... 79
6 Electrical & Electronic Parts Demand for Advanced Ceramics .......... 82
7 Catalyst Support Demand for Advanced Ceramics .......... 85
8 Wear Parts Demand for Advanced Ceramics .......... 87
9 Engine Parts Demand for Advanced Ceramics .......... 93
10 Filter Demand for Advanced Ceramics .......... 99
11 Bioceramics Demand for Advanced Ceramics .......... 102
12 Armor Demand for Advanced Ceramics .......... 105
13 Cutting Tool Demand for Advanced Ceramics .......... 108
14 Membrane Demand for Advanced Ceramics .......... 111
15 Other Advanced Ceramic Product Demand .......... 112
16 Advanced Ceramics Demand by Process .......... 117

MARKETS
1 Advanced Ceramics Demand by Market .............. 119
Cht Advanced Ceramic Demand by Market, 2012 .......... 120
Cht Increase in Advanced Ceramics Demand by Market, 2012-2017 .... 120
2 Electronic Components Shipments .. 122
3 Electronic Components Market for Advanced Ceramics .......... 124
4 Capacitor Market for Advanced Ceramics .......... 126
5 Semiconductor & IC Package Market for Advanced Ceramics ..... 128
6 Other Electronic Components Market for Advanced Ceramics .......... 130
7 Transportation Equipment Shipments .............. 134
8 Transportation Equipment Market for Advanced Ceramics .......... 136
9 Motor Vehicle Market for Advanced Ceramics .......... 140
10 Aerospace & Other Transportation Equipment Markets for Advanced Ceramics .......... 142
11 Electrical Equipment Shipments .......... 145
12 Electrical Equipment Market for Advanced Ceramics .......... 146
13 Electrical Insulator Market for Advanced Ceramics .......... 148
14 Permanent Magnet Market for Advanced Ceramics .......... 149
15 Other Electrical Equipment Markets for Advanced Ceramics .......... 151
16 Chemical Product Shipments .......... 154
17 Chemical Market for Advanced Ceramics .......... 158
18 Machinery Shipments ................. 160
19 Machinery Market for Advanced Ceramics .......... 162
20 Pollution Control Equipment Shipments .......... 164
21 Environmental Market for Advanced Ceramics .......... 167
22 Orthopedic Implant & Dental Procedures by Type .......... 170
23 Medical Product Market for Advanced Ceramics .......... 174
24 National Defense Expenditures .......... 175
25 Defense & Homeland Security Market for Advanced Ceramics ..... 177
26 Other Markets for Advanced Ceramics .......... 179

INDUSTRY STRUCTURE
1 US Advanced Ceramics Sales by Company, 2012 .......... 181
Cht Advanced Ceramics Market Share, 2012 .......... 184
2 Selected Acquisitions & Divestitures .......... 189
Demand will be driven by new applications as well as increasing adoption in already established applications due to advanced ceramics’ superior material and performance properties.

US demand to rise 5.1% annually through 2017

Demand for advanced ceramics in the United States is forecast to increase 5.1 percent annually to $13.6 billion in 2017. Demand will be driven by the development of new applications for advanced ceramics as well as increasing adoption in already established ceramic applications due to superior material and performance properties. These trends will be most pronounced in the medical, transportation, and machinery markets, all of which will display growth at above average paces. Growth will accelerate in the large electrical and electronic components markets, though advances will remain modest and limit faster increases for advanced ceramics overall. The defense market will remain depressed from its 2007 peak due to tight public sector budgeting, a reduction in asymmetric combat equipment requirements, and withdrawal of American forces from Iraq and Afghanistan.

Bioceramics market to offer good growth prospects

The above average growth in bioceramics will be driven by new applications. New bioceramic applications such as dental implants, orbital eye implants, and prosthetic components will help drive the medical products market at a double-digit annual pace over the forecast years, the fastest of any market. A shift in doctors’ preference toward ceramic products in existing orthopedic applications (especially hip replacements) will support rising demand as well, as competing materials fall out of favor.

In transportation markets, rising efficiency standards and more stringent emissions requirements will drive demand not only for advanced ceramic filters and catalyst supports, but also for ceramic engine parts. The key driver of demand in transportation markets will be particulate filters due to increasing heavy-duty truck production. Catalyst supports and engine components will also contribute to a strong performance for advanced ceramics in this market. Increasingly, high-pressure, high temperature operating environments will further ceramic demand because they require engine parts which offer greater compressive strength and wear resistance than traditional materials.

Advances in multiple markets can often support one another. For instance, next generation jet turbines have applications for new ceramic composite parts that are machined to tight tolerances. Increasingly, industrial machinery and advanced manufacturing processes require bearings, wear parts, and tools which will remain operational even under the harshest or most demanding environments. In the machinery market, ceramic materials will be steadily adopted due to their superior performance characteristics. This rise in demand will be further aligned to a general shift toward onshoring of advanced manufacturing.
Sample Text, Table & Chart

**Bioceramics**

Demand for bioceramics is projected to see double-digit annual growth, rising to $815 million in 2017. Bioceramics is the fastest growing market for advanced ceramics, due to an aging US population, expansion of new applications, and increasing competition from other (typically more traditional) materials that are immune to cyclical trends. While changes to the health insurance marketplace may become a variable with an unpredictable, though expectedly positive, impact on total number of orthopedic procedures performed each year.

Advanced ceramics are suitable for use in dental and orthopedic applications due to their hardness, smoothness, and biocompatibility characteristics, the last of which allows these materials to function inside the body without causing rejection. In fact, bone, muscle, and other tissues tend to grow around and through ceramic implants (a property called bioconductivity), bonding with them as if they were natural bone. Several new types of implant take advantage of bioconductivity and can replace parts of bone that have been destroyed, including small pieces of the tibia and skull. A small ceramic plate is implanted and, eventually, bone and blood vessels will regrow over the implanted matrix. Ceramic materials used in bioceramic products include alumina and zirconates. These materials are used to produce components for both orthopedic and dental applications.

Advanced ceramic materials demand in dental components constituted more than 80 percent of overall bioceramic demand in 2012, though like orthopedic components this is a very young market, and demand is expected to grow robustly. For instance, after several years of popular use in Europe, in 2007 the US Food and Drug Administration (FDA) approved the first all-ceramic endosseous (“into bone”) dental root implants for the US market. These root implants go by the brand names of CERARoot, etc.
Sample Profile, Table & Forecast

COMPANY PROFILES

CerCo LLC
453 West McConkey Street
Shreve, OH  44676
330-567-2145
http://www.cercollc.com

Annual Sales:  $45 million (estimated)
Employment:  210 (estimated)
Key Products:  structural ceramics, alumina ceramic linings, ceramic grinding media, and ceramic coatings

CerCo produces and sells kiln furniture, ceramic armor, grinding media and mill linings, wear resistant ceramic products, and advanced structural components for the ceramics, electronics, aerospace, brick and clay, coal power, minerals, military, automotive, chemicals, steel, and other industries. The Company is privately held.

The Company is involved in the US advanced ceramics industry through the production of structural ceramics, alumina ceramic linings, ceramic grinding media, and ceramic coatings. Structural ceramics products from CerCo are intended for use in such applications as ball valve components, thermal components, electronics, prototyping, fluid handling components, body armor, and microwaves. Typical properties of these ceramics products include high mechanical strength; extreme temperature stability; impenetrability to liquid and gases; and resistance to electricity, wear, corrosion, and chemicals. Among CerCo’s structural ceramics products are ZIRMONITE ceramics for fluid handling applications, and DIAMONITE alumina oxide products.

CerCo’s alumina ceramic linings are designed to offer resistance to abrasion, corrosion, wear, and erosion for such material handling

TABLE III-4
ZIRCONATE CERAMICS DEMAND (million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturers’ Shipments (bil $)</td>
<td>3713</td>
<td>5031</td>
<td>5421</td>
<td>6520</td>
<td>7730</td>
</tr>
<tr>
<td>$ zirconate ceramics/000$ mfg</td>
<td>0.15</td>
<td>0.15</td>
<td>0.19</td>
<td>0.23</td>
<td>0.27</td>
</tr>
<tr>
<td>Zirconate Ceramics Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Equipment</td>
<td>90</td>
<td>130</td>
<td>160</td>
<td>190</td>
<td>230</td>
</tr>
<tr>
<td>Machinery</td>
<td>105</td>
<td>130</td>
<td>155</td>
<td>200</td>
<td>260</td>
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<td>Other Markets</td>
<td>330</td>
<td>445</td>
<td>605</td>
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<tr>
<td>% zirconate Advanced Ceramics Demand</td>
<td>8.4</td>
<td>7.7</td>
<td>9.9</td>
<td>10.8</td>
<td>12.0</td>
</tr>
</tbody>
</table>

STUDY COVERAGE

This Freedonia study, Advanced Ceramics, provides historical data (2002, 2007, 2012) plus forecasts for 2017 and 2022 by material, market, class and product. This study also considers key market environment factors, assesses industry structure, evaluates company market share and profiles 34 competitors in the US industry.
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