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# Advanced Ceramics

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US Industry Study with Forecasts for **2015 & 2020**

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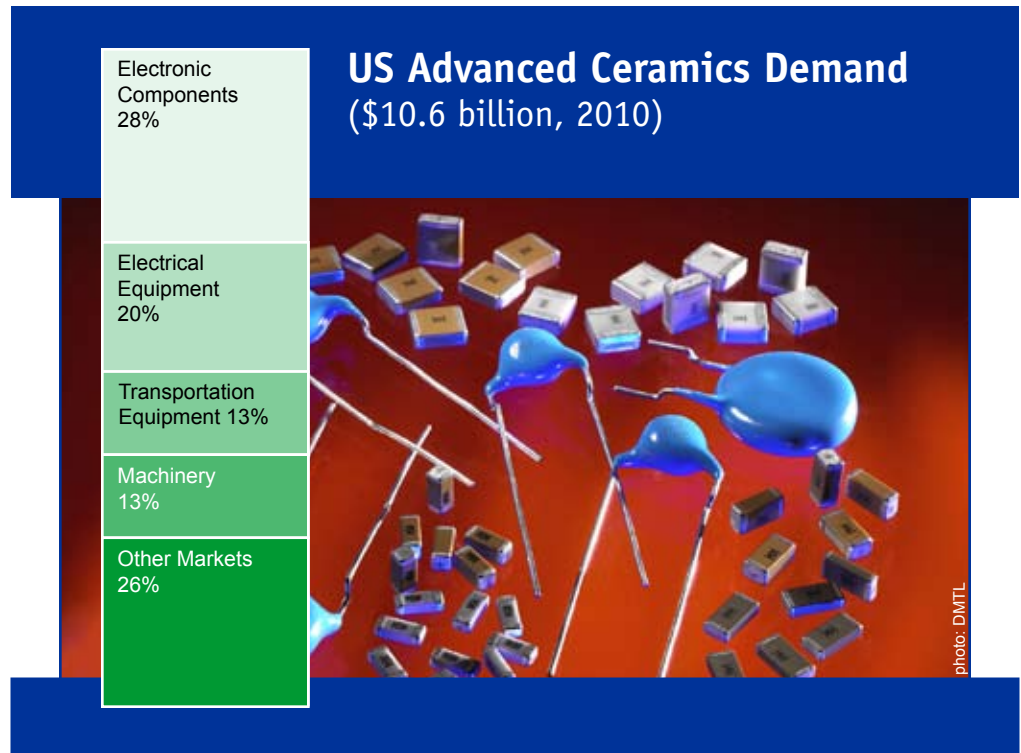
*Demand will be driven by an increase in motor vehicle and electrical equipment manufacturing, and from new regulations that will boost pollution control ceramic filters and membranes.*

## US demand to rise 6% annually through 2015

Demand for advanced ceramics in the United States is forecast to increase 6.0 percent annually to \$14 billion in 2015. Demand will be boosted by an increase in original equipment manufacturing in the US, especially of motor vehicles and electrical equipment, from modest 2010 levels. Further growth will come in environmental markets, where new regulations will dramatically increase demand for pollution control systems that use advanced ceramic filters and membranes. Additional growth in ceramic membrane sales will come as they replace other filtration media because of their better performance and durability. Ceramic bearing demand will increase in the turbine market for similar reasons. The medical, aerospace and energy markets are expected to grow as well, as new materials offering better performance and longer part life are introduced. Joint replacements, including ceramic-on-ceramic and recently approved ceramic-on-metal hip replacements, will post strong gains as the US population continues to age.

## Transportation equipment market to grow the fastest

Transportation equipment markets will register double-digit annual gains through 2015. An upturn in motor vehicle production, especially of medium and heavy vehicles, will spur increased demand for ceramic parts used in



commercial diesel and gasoline engines. Additionally, new regulations (now being phased in) that control diesel particulate emissions, as well as other pollutants, will spark growth in the filtration and catalyst segments. For the aviation and electric utility industries, advanced ceramic turbine blades are lighter, more heat resistant and longer lived than their metal counterparts. Also, coatings containing advanced ceramics are already in wide use in the aviation industry.

Environmental markets will rise at a strong rate through 2020, spurred by growing emissions control spending by US industry. In addition, greater use of ceramic membranes in filtration applica-

tions, along with increases in demand for ceramic filters and catalyst substrates, will fuel gains in this market.

The overall market for advanced ceramics is impacted by the performance of the electronic components industry. More than one-quarter of all demand for advanced ceramics came from this market in 2010, and it will remain the largest market going forward, boosted by growth in piezoceramics. Semiconductors are the biggest single segment of this market, followed in size by capacitors. However, US production for capacitors and semiconductors will grow at a below-average pace, as manufacturing activity continues to shift to lower-cost parts of the world.

## Sample Text, Table & Chart

### TYPES

#### Alumina Ceramics

Demand for alumina ceramics is projected to climb to \$ in 2015, an increase of all advanced ceramics account for in that year. Alumina ceramics are the most common type of advanced ceramics offer good electrical and thermal insulation properties at a low cost. They are used in a wide variety of applications, along with resistors and thermal shields. Alumina ceramics are the most common type of advanced ceramics. Generally, alumina ceramics are used when their performance characteristics are not suitable for the application. The market for alumina ceramics will increase less quickly than the total advanced ceramics market, although growth in the US manufacturing sector demand for alumina expand more quickly than it did in the 2000 period. Advances will be driven by increasing substitution of alumina for other materials, rising use of alumina environmental filters and growing industrial wear part demand. Despite these gains, several other types of advanced ceramics have begun to gain momentum as their manufacture becomes less costly, and these ceramics will take some of the growth that otherwise would have gone to alumina. Specifically, cordierite, titanate and carbide ceramics will begin to replace alumina in some applications.

Alumina ceramics consist of two main types: alumina oxide (90 percent of total use in 2010) and alumina nitride (10 percent). Oxides are cheaper, slightly softer and more shock resistant, while nitrides are harder and better insulators, positioning them as a substitute material in electronics applications. Metallization of aluminum oxide, or cermet, increased alumina's toughness and opened up several new uses for the material. In 2008, for instance, CoorsTek introduced an ultra-high purity alumina material, PLASMAPURE-UC, designed for extreme temperature settings. Major applications for alumina ceramics include electrical insulators, filters, insulators for spark plugs and igniter implants and seals in pumps and engines.

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SAMPLE  
TEXT

TABLE IV-2

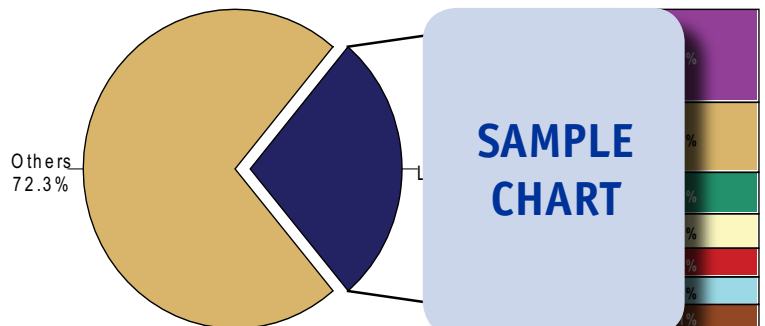
### MONOLITHIC CERAMICS DEMAND (million dollars)

Item	2000	2005	2010	2015	2020
Manufacturers' Shipments (bil \$)	3988	4400	4800	5200	5600
\$ ceramics/000\$ mfg	4	5	6	7	8
Monolithic Ceramics Demand	0	1	2	3	4
Electrical & Electronic Parts	0	1	2	3	4
Catalyst Supports	0	1	2	3	4
Filters	0	1	2	3	4
Body & Vehicle Armor	0	1	2	3	4
Wear Parts	0	1	2	3	4
Bioceramics	0	1	2	3	4
Membranes	0	1	2	3	4
Engine Parts	0	1	2	3	4
Cutting Tools	0	1	2	3	4
Other Products	0	1	2	3	4
% monolithic	7	8	9	10	11
Advanced Ceramics Demand	9	10	11	12	13

SAMPLE  
TABLE

CHART VI-1

### ADVANCED CERAMICS MARKET SHARE BY COMPANY (\$10.6 billion, 2010)

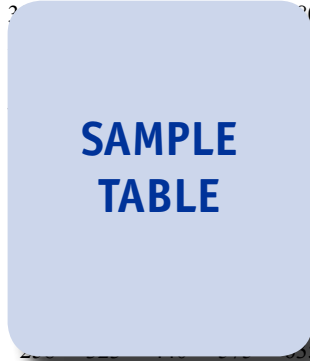


SAMPLE  
CHART

## Sample Profile, Table & Forecast

**TABLE V-1**  
**ADVANCED CERAMICS DEMAND BY MARKET**  
 (million dollars)

Item	2000	2005	2010	2015	2020
Manufacturers' Shipments (bil \$)	2	2	2	2	2
\$ ceramics/mil \$ mfg					
Advanced Ceramics Demand					
Electronic Components					
Electrical Equipment					
Transportation Equipment					
Machinery					
Chemical & Plastic					
Pollution Control					
Armor					
Medical Products					
Other Markets					



**COMPANY PROFILES**

**Pall Corporation**  
 25 Harbor Park Drive  
 Port Washington, NY 11050  
 516-484-5400  
 http://www.pallcorp.com

Sales: \$  
 Employe

Key Pro  
 media

assemblies and filter

Pall Corporation is a leading manufacturer of specialty filtration products for solids, liquids and gases. The Company operates through two segments: Industrial and Life Sciences.

The Company competes in the US advanced ceramics industry through both segments. Among other products, these segments manufacture ceramic membrane elements, filter assemblies and filter media. Pall's Industrial segment had FY 2010 sales of \$1.2 billion, of which the countries in the Western Hemisphere accounted for \$359 million. Of the segment's FY 2010 revenues, the energy and water market accounted for \$480 million; the aerospace market represented \$418 million; and the microelectronics market accounted for \$266 million. This segment manufactures a wide range of products, including MEMBRALOX ceramic membrane elements for filtration applications that involve extreme processes, and MEMBRALOX ceramic filter assemblies for ultra-high purity gas filtration applications. Pall's MEMBRALOX ceramic membrane elements are designed for use in processes that involve extreme temperature or pressure, and exposure to aggressive solvents. These elements can also be used in high solids bulk processes. MEMBRALOX ceramic filter assemblies are made

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"The market for advanced ceramic electronic components is projected to rise 3.5 percent annually to \$3.5 billion in 2015. The pace of expansion for advanced ceramics demand overall will be higher than for electronic components shipments but considerably lower than expected demand gains for advanced ceramics overall. Sales will be spurred by continued US manufacturing of very high-end and precision components, while constraints ..."

--Section V, pg. 128



**OTHER STUDIES**

**Metal Powders**

This study analyzes the US metal powders industry. It presents historical demand data for the years 2000, 2005 and 2010, and forecasts for 2015 and 2020 by type (e.g., iron and steel, stainless steel, aluminum, zinc, magnesium, copper, tungsten, nickel, cobalt, molybdenum, precious metals, tantalum), application and market (e.g., motor vehicles, machinery, electrical and electronic, chemicals, aerospace). The study also considers market environment factors, details industry structure, evaluates company market share and profiles industry players.  
 #2811 ..... November 2011 ..... \$4900

**World Membrane Separation Technologies**

Global demand for membranes is projected to rise 9.0 percent annually through 2015. The BRIC countries and others with large, developing industrial bases and stressed local water resources will see the fastest growth. The US and China combined will account for nearly half of market gains between 2010 and 2015. This study analyzes the \$12.6 billion global membrane industry, with forecasts for 2015 and 2020 by product, market, world region and for 34 countries. The study also evaluates company market share and profiles industry participants.  
 #2755 ..... June 2011 ..... \$6100

**World OEM Automotive Electronics**

Global OEM automotive electronics demand will rise 12.4 percent yearly through 2014. Gains will be driven by economic recovery, regulatory pressures and automobile differentiation efforts. Safety and security, powertrain and emissions, and communication and navigation electronics will lead gains. This study analyzes the \$9.9 billion world OEM automotive electronics industry. It presents historical demand data and forecasts for 2014 and 2019 by product, world region and for 23 countries. It also evaluates company market share and profiles industry players.  
 #2728 ..... February 2011 ..... \$6100

**Chemical Sensors**

US demand for chemical sensors is projected to grow 8.9 percent annually through 2014. Biosensors will remain the largest product type, while electrochemical and optical sensors grow the fastest. The medical market will remain the largest end use, while the industrial market will see the fastest gains. This study analyzes the \$4 billion US chemical sensor industry, with forecasts for 2014 and 2019 by product, analyte and market. It also evaluates company market share, reviews chemical sensor technology, and profiles industry competitors.  
 #2716 ..... January 2011 ..... \$4800

**Advanced Flat Glass**

US advanced flat glass demand will rise 11.6 percent annually through 2014, driven by a rebound in residential construction and motor vehicle production. Consumption will also benefit from increasing market penetration of low-emissivity glass, heads-up display windshields, electrochromic mirrors, smart glass and other products. This study analyzes the \$4.1 billion US advanced flat glass industry, with forecasts for 2014 and 2019 by type and market. It also evaluates company market share and profiles industry competitors.  
 #2674 ..... December 2010 ..... \$4800

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