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High Performance Composites

US Industry Study with Forecasts for **2016 & 2021**

Study #2905 | June 2012 | \$4900 | 240 pages

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High performance composite demand will be fueled by high growth in the commercial airliner market as well as in emerging applications such as wind turbines and pressure vessels.

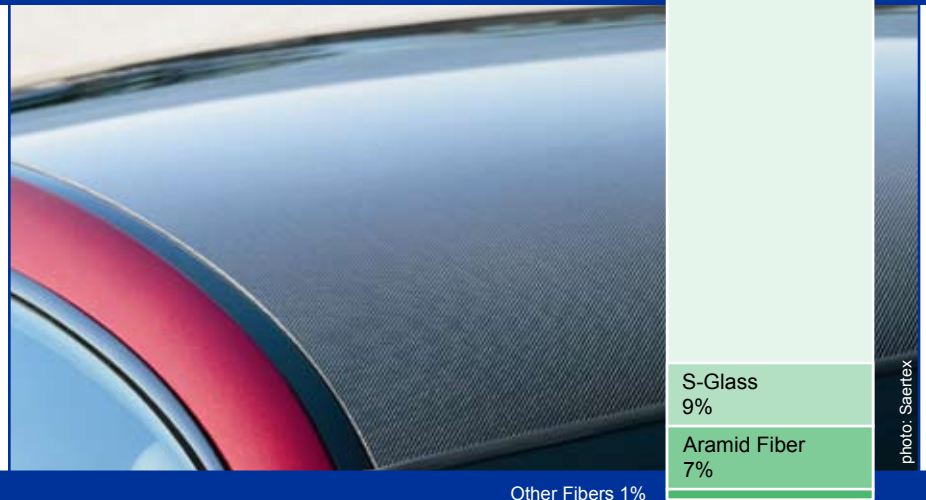
US demand to rise 14.7% annually through 2016

US demand for high performance composites -- i.e., polymer materials containing advanced fiber reinforcements -- is forecast to rise almost 15 percent per year to \$10.2 billion in 2016. Advances will represent a considerable improvement over the pedestrian growth of the 2006-2011 period, during which composite demand was hampered by declines in military and sporting goods applications. Going forward, high performance composite demand will be fueled by tremendous growth in the commercial airliner market as well as emerging opportunities in applications such as wind turbines and pressure vessels. However, the relatively high cost and labor-intensive production of advanced composites will prevent these materials from penetrating high volume and price-sensitive markets.

Aerospace to remain leading market

Aerospace markets will remain the leading outlet for high performance composites in 2016 and will be by far the fastest-growing. While composites have long been used in military aircraft and helicopters, they are beginning to penetrate the commercial airliner segment on a large scale as well. The production ramp up of the Boeing 787 DREAMLINER, which has more than 50 percent composite content, will drive the bulk of the increases in high perfor-

US High Performance Composite Demand by Fiber, 2016 (\$10.2 billion)



mance composite demand. Rising production of other composite-intensive airliners, such as the Airbus A380 and A350 XWB, will also benefit demand.

Outside of aerospace applications, another strong area of growth for high performance composites is the burgeoning wind energy market. Much slower growth is expected for defense and safety applications -- due to a reduction of combat forces in Iraq and Afghanistan -- and the highly mature sporting goods market. The motor vehicle market, which holds perhaps the greatest potential for high performance composites, will see only moderate gains in demand, as their use continues to be restrained by high cost and slow production speeds.

Carbon fiber to remain largest product segment

Among product types, carbon fiber composites will continue to account for the largest portion of demand, totaling 83 percent of the high performance market in 2016. Carbon fiber composites will benefit from robust growth in the aerospace market as well as their versatility, good balance of mechanical properties, and moderate cost compared to other high performance composites. S-glass fiber composites -- the least costly of all advanced composites -- will also see double-digit gains in demand, fueled by opportunities in aerospace, wind energy, and pressure vessel markets.

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Sample Text, Table & Chart

FIBERS

S-Glass

Demand for S-glass fiber in high performance composite is expected to increase by 1.5 million pounds annually through 2021. Gains will be driven by the aerospace market, which is expected to see such as pressure vessels, and the larger defense market. S-glass demand will be driven by its use in high performance applications will be limited by its disadvantages compared to carbon and aramid fibers as well as that it provides no weight savings over traditional E-glass fiber.

S-glass fiber is produced by a similar process as commodity glass fibers, but the chemistry of the glass material is changed to optimize mechanical properties. In glass fiber production, molten glass is extruded through small holes at the base of the furnace to produce very thin glass filaments. These filaments are coated (sized) with chemicals to provide abrasion resistance or enhance compatibility with matrix resins in composites. The filaments are then gathered into strands and bundles of strands called rovings. The strands can also be processed into yarns by twisting several strands together, which improves tensile strength and allows for easier processing. S-glass fibers can be further processed into woven fabrics or mats to be used in prepreg and other composite production techniques.

The cost of S-glass fiber is by far the lowest of all the high performance fibers used in composites. While the price of most advanced fiber types remained flat or rose incrementally during the 2011 period, S-glass prices increased at a more significant rate in large part because the rise in energy and raw material costs experienced during this period was felt more acutely by S-glass producers.

54

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**SAMPLE
TEXT**

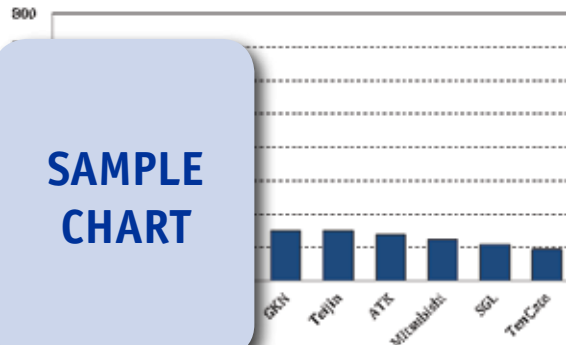
TABLE V-2
EPOXY HIGH PERFORMANCE COMPOSITE
DEMAND BY MARKET
(chart subhead)

Item	2001	2006	2011	2016	2021
High Performance Composite Demand % epoxy					
Epoxy HP Composite Demand					
Aerospace					
Industrial & Automotive					
Defense & Safety					
Energy					
Consumer					
Construction & Other					
\$/lb					
Epoxy HP Composite Demand (mil lb)					

**SAMPLE
TABLE**

CHART VI-1

US HIGH PERFORMANCE COMPOSITE MARKET LEADERS, 2011
(million dollars)



Source: The Freedonia Group, Inc.

**SAMPLE
CHART**

Sample Profile, Table & Forecast

COMPANY PROFILES

AGY Holding Corporation

2556 Wagener Road
 Aiken, SC 29801
 803-648-8251
 http://www.agy.com

Sales: \$1.5 billion
 Employed: 1,000

Key Products:

AGY is a leading distributor of reinforced composites for automotive, marine, recreational and military applications. AGY is majority owned by Kohlberg & Company LLC, a private equity firm with offices in New York and California. The Company operates through two segments: AGY US and AGY Asia.

The Company is involved in the US High Performance Composites industry through the AGY US segment, which recorded sales of \$155 million in 2011. The segment comprises AGY's operations in the US, including those for the manufacture and sale of S-glass fiber products, which are sold under the S-1 GLASS and S-2 GLASS brand names, respectively. These products can be impregnated with resins in the manufacture of high performance composites and other materials. In the US, AGY produces glass fiber products at its headquarters complex in Aiken, South Carolina and a plant in Huntingdon, Pennsylvania.

The S-1 GLASS product line consists of high-strength glass fiber materials that provide a higher level of performance than traditional E-glass products. S-1 GLASS exhibits improved physical properties, among them higher tensile and compressive strength, higher

TABLE IV-3

AEROSPACE MARKETS FOR HIGH PERFORMANCE COMPOSITES BY SECTOR, MARKET & RESIN (million dollars)

Item	2001	2006	2011	2016	2021
Aerospace Equipment Shipments (bil \$)					
\$ HPC/000\$ aerospace					
Aerospace HP Composite Demand					
By Sector:					
Commercial Airliners					
Military Aircraft					
Other Aerospace					
By Fiber:					
Carbon Fiber					
S-Glass Fiber					
Aramid Fiber					
Other					
By Resin:					
Epoxy					
Thermoplastics					
Phenolics					
Polyester					
Other					
\$/lb					
Aerospace HPC Demand (mil lb)					

**SAMPLE
TABLE**

"Demand for high performance composites in commercial airliners will increase nearly 25 percent per year through 2016 to \$5.5 billion. The market is expected to triple in size compared to 2011 levels, driven by increased production of the Boeing 787 DREAMLINER and other composite-intensive airliners such as Airbus A350. Each of these aircraft is around 50 percent composites by weight, far higher than any other commercial airliner that has ever been produced."
 --Section IV, pg. 80

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OTHER STUDIES

Custom Thermoplastic Compounding

US demand for custom compounded thermoplastics is forecast to rise 5.0 percent annually to 11.4 billion pounds in 2017, valued at \$14.3 billion (resin content only). Construction will offer the best market prospects, as the industry recovers from recession. PVC represents the largest and fastest growing compounded thermoplastic. This study analyzes the 8.9 billion pound US custom compounded thermoplastic industry, with forecasts for 2017 and 2022 by resin and market. The study also evaluates company market share and profiles industry players.

#2991 February 2013 \$5100

World Nanomaterials

World demand for nanomaterials will rise more than two-and-a-half times to \$5.5 billion in 2016. Nanotubes, nanoclays and quantum dots will be the fastest growing types. The energy storage and generation and construction markets will offer the best growth prospects. China, India and the US will lead gains among countries. This study analyzes the \$2 billion world nanomaterial industry, with forecasts for 2016 and 2021 by material, market, world region and for 15 countries. The study also considers market environment factors and profiles industry players.

#2871 May 2012 \$6100

Silicones

US demand for silicones is forecast to climb 5.6 percent annually to \$4.1 billion in 2016. Silicone resins and elastomers will be the fastest growing products, with elastomers overtaking silicone fluids as the largest segment by 2016. The industrial market will remain dominant while the construction segment grows the fastest as it rebounds from previous declines. This study analyzes the \$3.1 billion US silicone industry, with forecasts for 2016 and 2021 by product, market and application. It also evaluates company market share and profiles industry players.

#2879 April 2012 \$4900

Wood-Plastic Composite & Plastic Lumber

US demand for wood-plastic composite and plastic lumber is projected to advance 13.2 percent annually to \$5.4 billion in 2015. Decking will remain the largest application and grow the fastest, followed by the molding and trim and windows and doors segments. Wood-plastic composite lumber will outpace plastic types. This study analyzes the \$2.9 billion US wood-plastic composite and plastic lumber industry, with forecasts for 2015 and 2020 by material, application and market. The study also evaluates company market share and profiles industry players.

#2836 January 2012 \$5100

Metal Powders

US metal powder demand will grow 6.2 percent annually to \$4.8 billion in 2015, driven primarily by increased output in several key industries. Ferrrous metal powders will outpace nonferrous types in volume terms, but nonferrous metal powders will remain dominant in value terms. The fastest growing types include tungsten, nickel and ferrous metal powders. This study analyzes the \$3.4 billion US metal powders industry, with forecasts for 2015 and 2020 by type, application and market. The study also evaluates company market share and profiles industry players.

#2811 December 2011 \$4900

About The Freedonia Group

The Freedonia Group, Inc., is a leading international industry market research company that provides its clients with information and analysis needed to make informed strategic decisions for their businesses. Studies help clients identify business opportunities, develop strategies, make investment decisions and evaluate opportunities and threats. Freedonia research is designed to deliver unbiased views and reliable outlooks to assist clients in making the right decisions. Freedonia capitalizes on the resources of its proprietary in-house research team of experienced economists, professional analysts, industry researchers and editorial groups. Freedonia covers a diverse group of industries throughout the United States, the emerging China market, and other world markets. Industries analyzed by Freedonia include:

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