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# Battery & Fuel Cell Materials

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US Industry Study with Forecasts for **2013 & 2018**

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Study #2574 | November 2009 | \$4700 | 253 pages

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*Volume demand will benefit from accelerating output of lead-acid motor vehicle batteries and advanced batteries used in high-drain electronics, and from the commercialization of fuel cells.*

## US volume demand to rebound through 2013

US demand for materials used in batteries and fuel cells is expected to decline to \$4.3 billion in 2013, largely as a result of a moderation in raw material prices, particularly lead, which increased at double-digit rates during the 2003-2008 period. However, in volume terms, materials demand will rebound due to an improvement in US battery production. In particular, growth will be bolstered by an acceleration in lead-acid battery output as motor vehicle production recovers. The continued popularity of high-drain electronic devices will provide favorable opportunities for metals, chemicals and other materials used to make advanced battery types, such as primary and rechargeable lithium. Demand will also benefit from rapid growth in fuel cell materials as fuel cells become more commercially available.

## Metals to remain leading material type

Metals will continue to be the leading material type in batteries and fuel cells largely as a result of the enormity of the lead-acid motor vehicle battery market. Although metal prices spiked during the 2003-2008 period, spurring strong value gains for metals in batteries and fuel cells, prices are expected to moderate, holding back future growth in value terms. However, volume growth will accelerate through 2013 due to heightened demand for steel and zinc in

Metals  
71%

Chemicals  
18%

Polymers 6%

Other Types 5%

## US Battery & Fuel Cell Materials Demand, 2008 (\$4.9 billion)



alkaline and primary lithium batteries. Demand for chemicals in volume terms will recover from the losses of the 2003-2008 period, aided by increases in demand for lead-acid and alkaline batteries. Polymers demand will benefit from the widespread use of high-value fluoropolymer membranes in fuel cells, while demand for carbon/graphite materials will be supported by healthy advances in production of lithium batteries.

## Performance additives, catalysts to lead gains by functional category

Among the functional categories for battery and fuel cell materials, the most

rapid gains will be for performance additives and catalysts. Demand will be driven by the ongoing need to improve battery performance and longevity, as well as by good prospects for the production of fuel cells, most of which incorporate costly precious metal catalysts such as platinum. Active materials and electrodes comprised the largest functional category for materials in 2008, accounting for more than half of demand. While volume demand for active materials and electrodes, current collectors and battery containers will be healthy, market value will decline through 2013 based on an expected moderation in metals pricing from the high levels of the 2003-2008 period.

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## Sample Text, Table & Chart

### FUEL CELL MATERIALS

#### Catalysts

Fuel cell catalyst materials demand is expected to advance at a rate of approximately 10 percent per annum through 2018, representing 10 percent of all fuel cell materials demand. This demand growth in terms is due to the widespread use of platinum-group metals, which are speeding up chemical reactions in various types due to differences in construction. PEM fuel cells generally use platinum catalysts, and platinum is also employed in alkaline and phosphoric acid fuel cell systems, although ruthenium and other noble metals are being investigated as potential alternatives. Molten carbonate systems typically use nickel catalysts, while solid-oxide fuel cells use perovskites. Catalysts are utilized in fuel reformers as well. Recent product developments involving catalysts include BASF Fuel Cell's April 2009 introduction of SELECTRA-E precious metal fuel cell catalysts, which are intended for use in fuel cell electrodes. The SELECTRA-E range includes CRC series products that facilitate high activity and long-term stability.

Because catalysts can account for a large percentage of a fuel cell's material expenses, fuel cell stack and system developers are constantly looking for ways to reduce catalyst costs. Considerable strides have been made in this area in recent years, particularly in reducing the amount of platinum required. For example, in March 2009 scientists at the University of Rochester reported that they had created long platinum nanowires that could be used as fuel cell catalysts. The large surface areas of these nanowires greatly improves catalyst efficiency, requiring the use of less material. In May 2009, scientists at Washington University in St. Louis, Missouri announced the development of a bimetallic fuel cell catalyst, made of palladium and platinum, that can substantially reduce overall platinum consumption.

155

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SAMPLE  
TEXT

TABLE V-13

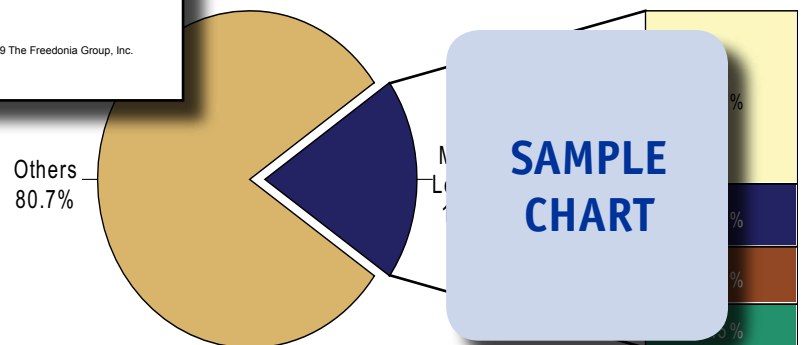
FUEL CELL MATERIALS DEMAND BY APPLICATION  
(million dollars)

Item	1998	2003	2008	2013	2018
Fuel Cell Shipments \$ materials/000\$ shpts					
Fuel Cell Materials Demand					
Proton-Exchange Membrane					
Molten Carbonate					
Phosphoric Acid					
Alkaline					
Solid-Oxide					
Direct Methanol					
Other					

SAMPLE  
TABLE

CHART VI-1

FUEL CELL MATERIALS MARKET SHARE, 2008  
(\$4.9 billion)



SAMPLE  
CHART

## Sample Profile, Table & Forecast

### COMPANY PROFILES

#### Superior Graphite Company

Ten South Riverside Plaza  
 Chicago, IL 60606  
 312-559-2999  
<http://www.superiorgraphite.com>

Annual Sales  
 Employment

Key Products

Superior Graphite Company is a technology manufacturing company that produces and markets high-purity graphite products. The products include the battery, fuel cell, and agricultural machinery industries.

For battery and fuel cell applications, the Company makes FORMULABT high-purity graphitic carbons, which are produced using Superior Graphite's patented continuous thermopurification treatment. This treatment vaporizes impurities, gases and volatiles by exposing the raw materials to temperatures of up to 5,072 degrees Fahrenheit. FORMULABT graphitic carbons are available in five varieties: spherical graphite, expanded graphite, graphite in combination with other carbons, standard graphite and selected graphite.

The spherical graphite grade of FORMULABT can be used as a negative electrode for lithium ion (Li-Ion) batteries and can also function as a conductive additive in fuel cell bipolar plates. The expanded graphite type is designed for use as an electrically conductive or compaction additive in primary alkaline, lead-acid and Li-Ion batteries; fuel

**SAMPLE  
PROFILE**

TABLE IV-8

### METALLIC CHEMICALS DEMAND IN BATTERIES (million dollars)

Item	1998	2003	2008	2013	2018
Battery Shipments	710	710	710	710	7350
\$ metallic/000\$ shpts	2	2	2	2	2
Battery Metallic Chemicals Demand					53
By Type:					
Manganese					97
Lead					50
Silver					51
Lithium					98
Nickel					30
Other Metallic Chemicals					27
By Application:					
Primary Batteries					76
Secondary Batteries					87
\$/lb					50
Battery Metallic Chemicals (mil lb)					41
% metallic					1
Battery Chemicals Demand (mil \$)	30	30	30	30	980

**SAMPLE  
TABLE**

"Silver chemical products demand in the battery industry is expected to fall to \$44 million in 2013 as a result of a moderation in silver prices. Silver oxide batteries will continue to account for the largest single share of product demand. Demand for these batteries, as well as the silver chemicals used in their fabrication, will benefit from the widespread use of button cell silver oxide batteries in applications such as watches and calculators. Silver chemicals demand will also be supported by ..."  
 --Section IV, pg. 68

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**OTHER STUDIES**

**Batteries in China**

This study analyzes the Chinese battery industry. It presents historical demand data (1998, 2003, 2008) and forecasts for 2013 and 2018 by type (e.g., zinc-carbon/zinc-chloride, alkaline, primary lithium, lead-acid, rechargeable lithium, nickel-cadmium, nickel-metal hydride) and market (e.g., consumer, industrial, government, transportation equipment, portable devices, motive power, backup power). The study also considers market environment factors, evaluates company market share and profiles industry participants.

#2466 ..... 12/2009..... \$5200

**Circuit Breakers & Fuses**

US circuit breaker and fuse demand will reach \$3.8 billion in 2013. Residential construction will be the fastest growing market while electric power will remain the largest. High-power fuses will lead gains based on their intense use in electric utilities and wind farm step-up transformers. Molded case types will pace growth among circuit breakers. This study analyzes the US circuit breaker and fuse industry, with forecasts for 2013 and 2018 by product and market. It also evaluates company market share and profiles industry players.

#2583 ..... 11/2009..... \$4700

**World Fuel Cells**

Global commercial fuel cell demand will triple through 2013 in dollar terms. Portable fuel cell systems will remain the dominant application by unit, while electric power generation will continue as the top use in value terms. PEM chemistry fuel cells will strengthen their dominant position over the next decade. This study analyzes the \$570 million world fuel cell industry, with forecasts for 2013 and 2018 by product, chemistry, application, world region and for 15 national markets. It also details market share and profiles major players.

#2502 ..... 05/2009..... \$5800

**Batteries**

US demand for primary and secondary batteries will reach \$16.8 billion in 2012. Growth will be supported by healthy demand for battery-driven electronics and a shift toward higher-priced, better-performing batteries. In the secondary battery segment, the rapidly growing market for hybrid vehicles will boost demand for Ni-MH and Lilon batteries. This study analyzes the \$14.9 billion US battery industry, with forecasts for 2012 and 2017 by product and market. It also evaluates market share and profiles industry players.

#2449 ..... 01/2009..... \$4800

**World Batteries**

Global battery demand will increase 4.8% annually through 2012. China will record the largest gains and surpass the US as the largest market. Consumer battery demand will outperform the market as a whole. Non-lead-acid secondary battery market gains will outpace demand for primary and lead-acid secondary batteries. This study analyzes the \$71 billion world battery industry, with forecasts for 2012 and 2017 by product, market, world region and for 32 countries. It also evaluates market share and profiles industry players.

#2375 ..... 10/2008..... \$6100

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