

# Nanomaterials

Study # 1887      January 2005      \$4200

## Nanomaterials now establishing US commercial presence

Despite “next big thing” hype on one side and “killer nanobot” alarmism on the other, nanomaterials are beginning to establish a commercial presence in the US market. The development of nanomaterials (i.e., substances with particle size between 1 and 100 nanometers in at least one dimension) is a key step in the eventual production of more sophisticated machines, electronics and health care products.

In fact, the production and use of nanomaterials is in part the continuation of miniaturization efforts for many products, such as ultrafine powders in catalysts or smaller features of electronic components. In other cases, however, research and development activities have focused on the identification, production and commercialization of new materials such as nanotubes, buckyballs and dendrimers.

## US nanomaterials market to reach \$1.4 billion in 2008

The US market for nanomaterials (which totaled only \$125 million in 2000) is expected to reach \$1.4 billion in 2008 and exceed \$30 billion by 2020. Early growth will come from a wide variety of niche

applications. These include semiconductor wafer polishing abrasives and data storage media for the electronics industry; improved diagnostic aids for medical uses; transparent sunscreens, stain-resistant pants, better-performing athletic equipment and wear-resistant flooring for consumers; fuel-saving components for the auto industry; and beer and soft drink bottles with superior barrier properties for beverage manufacturers.

In the next decade or two, however, the best opportunities are anticipated in health care and electronics, which together are predicted to comprise nearly two-thirds of the market for nanoscale materials by 2020. Pharmaceuticals alone are expected to account for about 40 percent of overall demand for nanomaterials.

## Health care, electronics to be key markets by 2020

As production of nanomaterials increases and high-tech niche markets are penetrated, material prices will drop, opening up opportunities in more cost-sensitive applications, such as construction materials and some consumer products. Additionally, new applications and material formats will continue to emerge, presenting further growth opportunities. Originally, these high-performance materials



fulfilled niche requirements in these markets, such as for equipment used in the space program or in specialized imaging devices. However, they will become more prevalent of necessity, as only nanoscale products will be able to meet future technological demands.

Health care alone will account for nearly half of all demand in 2020, with sales of \$16 billion. Growth is predicated mostly on the conversion of a large share of US-produced pharmaceuticals to more effective nanoscale formats -- both active ingredients and drug delivery systems -- but also on opportunities in diagnostics, implants and prosthetics. The electronics market is projected to

approach \$7 billion in 2020 as current silicon-based technology reaches the limits of practical use. Other markets with significant long-term potential include consumer goods, aerospace and defense, construction, and energy markets such as fuel cells.

## Study coverage

This 407-page Freedonia industry study, *Nanomaterials*, is available for \$4200. It presents historical US demand data (2000, 2003) and forecasts to 2008, 2013 and 2020 by nanomaterial type, function and market. The study also considers market environment indicators, details industry structure and market share, and profiles leading industry players.

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tables forecast to 2008 & 2013

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# #1887 - "Nanomaterials"

## Freedonia's methods involve:

- Establishing consistent economic and market forecasts
- Using input/output ratios, flow charts and other economic methods to quantify data
- Employing in-house analysts who meet stringent quality standards
- Interviewing key industry participants, experts and end-users
- Researching a proprietary database that includes trade publications, government reports and corporate literature

## FUNCTIONS

### Abrasives

Demand for nanomaterials in abrasives applications is forecast to grow to \$1.5 billion by 2013, driven by increasing demand for more sophisticated and improved consistency. The market is dominated by slurries, which are abrasives used to polish electronics products. However, faster growth is expected for a number of other high precision grinding applications. Nevertheless, despite early dominance of the nanomaterials market, the majority of abrasives applications (such as sandpaper, fabrication and personal care products) will not require the high performance properties of more expensive nanoscale particles, which will limit market potential in this sector.

Explanations that support each table's data and forecasts

SAMPLE PAGE

CMP slurry applications accounted for nearly all of the nanoscale abrasives market in 2003. Demand for CMP slurries is being driven by advances in integrated circuit designs which require increasingly smaller line widths. As components become smaller, problems with CMP-related defects caused by inconsistent particle size are becoming more of an issue. The growing use of copper interconnect technology will also promote significant changes in slurry formulations. Silicon dioxide (silica) — primarily fumed silica and colloidal silica — continues to dominate material usage in CMP slurries. However, a shift in component technology is expected to drive demand for non-silica abrasives. As component circuitry increasingly becomes metal-based, silica is expected to lose ground to aluminum oxide (alumina) and cerium oxide (ceria) slurries. Silica is used on oxide layers, while alumina and ceria are used for planarizing tungsten and copper.

While CMP slurries have offered an early, high value market opportunity for nanomaterials suppliers, a number of threats may limit future growth in this sector, including the development of slurryless processes. In addition, as components become smaller, it is likely that new processes will be developed to replace CMP, which, like many technologies in the

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

Item	2000	2003	2008	2013	2020
Gross Domestic Product (bil \$)	9,800	11,500	13,500	15,500	17,500
\$ nanomaterials/000\$ GDP	0.0001	0.0002	0.0004	0.0008	0.0015
Nanomaterial Demand	100	200	400	800	1,500
Electronics	50	100	200	400	800
Consumer Goods	50	100	200	400	800
Health Care	50	100	200	400	800
Paper, Printing & Packaging	50	100	200	400	800
Construction	50	100	200	400	800
Aerospace & Defense	50	100	200	400	800
Machinery & Instruments	50	100	200	400	800
Motor Vehicles	50	100	200	400	800
Energy Generation & Storage	50	100	200	400	800
Other	50	100	200	400	800

SAMPLE TABLE  
Historical data for 1993, 1998 & 2003 plus Freedonia forecasts through 2008 and 2013

Source: The Freedonia Group, Inc.

## This study can help you:

- Determine your market & sales potential
- Learn more about industry competitors
- Assess new products & technologies
- Identify companies to merge with or acquire
- Complement your own research & planning
- Gather data for presentations
- Confirm your own internal data
- Make better business decisions

**TABLE III-18**  
NANOSCALE CHEMICALS & POLYMERS  
MARKET/COMMERCIALIZATION OUTLOOK

Current	Short Term	Long Term
Stain-resistant textile treatments	Semiconductor manufacturing inspection	Ophthalmic drug-carrying
Thermal spray coatings	Vitamins	Electronics
Film-forming coatings	acetaminophen pain relief	Opticals
Anti-corrosion coatings	Cosmetics	Additives
	Motor Vehicle	Systems
	Dental	Active
	Food & Additives	Fast cancer treatments

SAMPLE TABLE  
Data illustrated with the aid of over 50 tables and charts



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### Nanotechnology in Healthcare

This study forecasts emerging nanotech uses in drug delivery, drug discovery, wound healing, tissue regeneration and related areas. It projects sales to 2009, 2014 and 2020 by material (e.g., biodegradable polymers, cellular scaffolds, ligands, quantum dots); by indication (e.g., cancer, diabetes, neurological diseases, paralysis, skin disorders, stroke and trauma, coughs and colds, nutritional supplements); by application and by end use. The study also evaluates market share and profiles leading industry players.

#1899 ..... 04/2005 ..... \$4200

### World Nanomaterials

Global demand for nanomaterials will grow five-fold to US\$3.7 billion in 2008, driven mainly by nanoscale metals and oxides. In the longer term, nanomaterials could be used to produce more effective drugs, safe water supplies for poor regions, and more efficient power generation. The US will remain the largest market throughout. This study analyzes the world nanomaterial industry to 2008, 2013 and 2020 by product, market, world region and for 14 countries. It also reviews R&D and profiles industry participants.

#1911 ..... 03/2005 ..... \$5200

### Nanotech Tools

The US market for nanotech tools will jump 30% annually through 2008. Microscopes and related tools dominate now but measurement, fabrication/production and simulation/modeling tools will grow the fastest. Electronics and life sciences markets will emerge first; industrial, construction, energy generation and other applications will arise later. This study analyzes the \$245 million US nanotech tools industry to 2008, 2013 and 2020 by product and market. It also evaluates market share and profiles major firms.

#1838 ..... 08/2004 ..... \$4200

### MEMS:

#### Micro-Electromechanical Systems

The US market for MEMS will grow over 19% annually through 2008. Gains will be driven by further tech sector recovery, advances in MEMS design and fabrication, and expanding uses. Best prospects include optical switches for telecom carrier and corporate networks; RF switches and relays for wireless phones; biochips; and tire pressure monitors. This study analyzes the \$1.4 billion US MEMS industry to 2008 and 2013 by product and application. It also details market share and profiles major competitors.

#1809 ..... 06/2004 ..... \$4100

#### Nanocomposites

The US market for nanocomposites will approach 345 million pounds in 2008 as they partially supplant traditional reinforced plastics in many applications. Nanoscale materials can increase plastics' strength, stiffness, and thermal/chemical resistance; enhance conductive properties; reduce weight; and either reduce or increase barrier permeability. This study analyzes the \$382 million US nanocomposites industry by product, market and material. It also considers market drivers and profiles selected firms.

#1786 ..... 04/2004 ..... \$3900

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