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Nanotechnology in Construction

US Industry Study with Forecasts for **2011, 2016 & 2025**

Study #2185 | May 2007 | \$4500 | 174 pages

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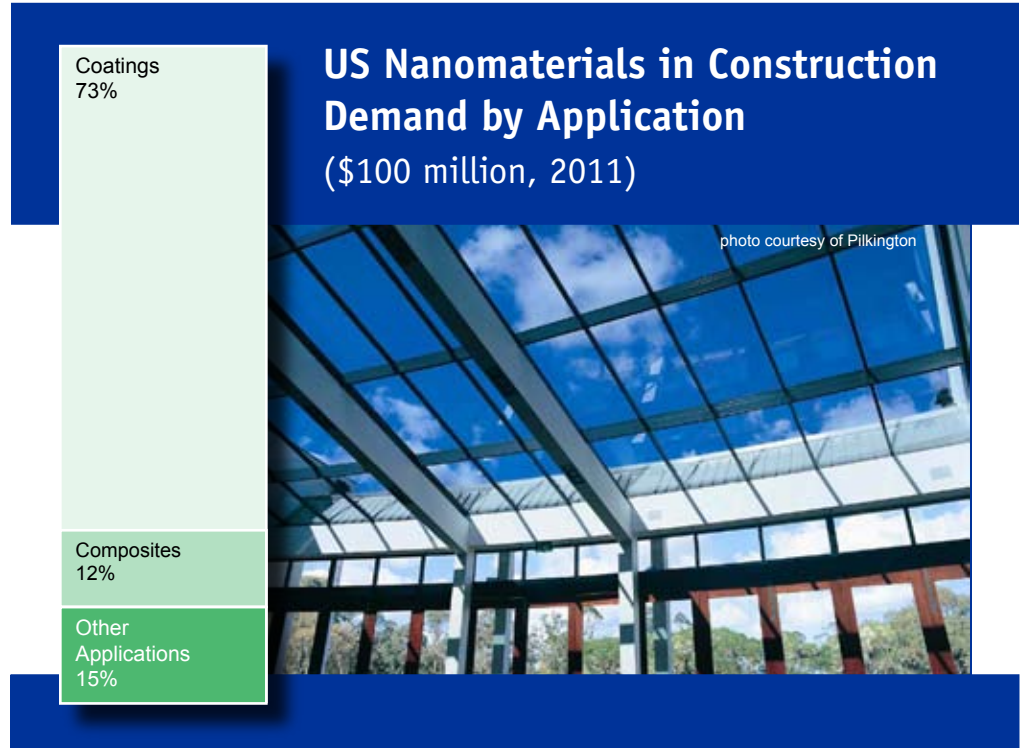
Nanomaterials offer many improved performance properties for adhesives, concrete, coatings, flooring, glass, lighting equipment, plumbing fixtures and other construction products.

US demand to approach \$1.75 billion by 2025

While current use of nanomaterials in construction is limited (demand in 2006 totaled less than \$20 million in the US), the market is projected to reach \$100 million in 2011 and approach \$1.75 billion in 2025. Nanomaterials offer a myriad of improved performance properties for adhesives, concrete, coatings, flooring, glass, lighting equipment, plumbing fixtures, and other construction products.

Outlook for nanoscale materials very favorable

Overall, the outlook for nanomaterials in construction is very favorable. Nanoscale versions of established manufactured materials, such as silica, titanium dioxide and clay, are all expected to post substantial gains. At the nanoscale, these materials can behave differently from their conventional scale counterparts, which creates exciting new prospects in a variety of construction applications. Newer nanomaterials such as carbon nanotubes and buckyballs have been the focus of considerable enthusiasm, and are likely to become more commonplace in the coming years. However, they will take a backseat to metal oxides in construction, because oxides are far less expensive and will therefore be more widely used in architectural paints, functional coatings and adhesives; and as reinforcements for high performance concrete and plastic composites.



Coatings to be largest use of nanomaterials

Coatings are expected to constitute the largest application for nanomaterials in construction. Architectural paints, water sealers and deck treatments, and treatments applied during fabrication, such as scratch-resistant coatings on vinyl or wood flooring, all present substantial market opportunities for nanomaterials. Nanomaterials offer a number of performance attributes that make them useful in coatings applications, including transparency, photoreactivity, UV blocking, and stain and odor resistance. Additionally, they can be used in coatings that create self-cleaning surfaces similar to those now being

engineered into window glass and plumbing fixtures.

A number of other applications are also notably promising. Silica and other materials are finding use in high-performance concrete. Materials such as nanoscale silver incorporated into adhesives can impart conductive properties, increase strength, or protect them from microbial attack. Composites with oxides and clay reinforcements are being developed for use in insulation, roofing materials, vinyl siding and flooring. Because of their exceptional strength, nanocomposites may be developed for use as primary building materials, replacing traditional materials such as wood and gypsum.

Sample Text & Tables

PRODUCTS

Silica

Demand for nanoscale silicon dioxide in construction is expected to increase significantly through 2011. By 2025, demand is expected to exceed \$1 billion. Nanoscale silica is already widely used in construction applications. Currently, nanoscale silica is expected to be used in a wide range of applications, spreading to higher-volume applications such as coatings, cement and concrete. For high-end applications, such as coatings, demand has limited growth, especially in high-end settings. Nanoscale materials offer suitable performance. However, as production increases, prices may drop to a level that will allow nanoscale silica to become competitive in additional applications such as in plastic composites as a filler/reinforcement.

Nanoscale silica particles have found use in scratch-resistant coatings for flooring, and are also expected to find use in UV-resistant coatings. Other potential applications include fire protective glass, in which the silica improves thermal properties. A similarly ambitious glass-related use is the fabrication of windows that can control light and temperature. Super Sky Products is among the firms offering products incorporating silica into skylighting systems, using Cabot's NanoSilica.

High performance concrete is another application for nanoscale silica. Tests conducted by Spanish researchers on the mechanical properties of modified cement pastes incorporating colloidal silica ranging from 5 to 100 nanometers suggest that the nanoscale silica enhanced compressive strength.

A number of leading silica suppliers are involved in nanoscale silica production, including Cabot and Degussa. Other companies include Altair Nanotechnologies, DA NanoMaterials (a joint venture of DuPont and Air Products and Chemicals), Dow Corning, Hytrel, Hytrel, Nyacol Nano Technologies and Wacker Silicones.

**SAMPLE
TEXT**

**SAMPLE
TABLE**

TABLE IV-3

NANOSCALE SILICA DEMAND IN CONSTRUCTION (million dollars)

Item	2006	2011	2016	2025
Total Silica Demand	1320	1700	2200	2890
% nanoscale				9
Nanoscale Silica Demand				260
% construction				2
Nanoscale Silica in Construction				260
Coatings				10
Cement & Concrete Additives				10
Adhesives				5
Other				5
% silica				0
Nanoscale Metal Oxides in Construction	14	90	310	1470

TABLE VI-1

CONSTRUCTION MARKETS FOR NANOMATERIALS (million dollars)

Item	2006	2011	2016	2025
Total Construction Expenditures (bil \$)	1100	1500	2000	2150
\$ nano/000\$ construction				4
Nanomaterial Demand				20
Paint				0
Windows & Doors				0
Flooring				0
Siding				0
Roofing				0
Plumbing				0
Lighting				0
Roads & Bridges				0
Other	5	15	75	370

**SAMPLE
TABLE**

Sample Profile, Table & Forecast

COMPANY PROFILES

Masco Corporation

21001 Van Born Road
 Taylor, MI
 313-274-7400
<http://www.masco.com>

Behr Process Corporation
 3400 West
 Santa Ana, CA
 714-545-7100
<http://www.behr.com>

**SAMPLE
PROFILE**

Key Products: nanoparticle-containing architectural paints and coatings

Key Information: Masco Corporation is engaged in the manufacture, installation and sale of home improvement and building products. The Company's operations include Behr Process Corporation (Santa Ana, California), a manufacturer of architectural paint and coatings, including products that incorporate nanomaterials. In late 2005, Behr introduced its first architectural coating featuring nanomaterials, BEHR PREMIUM PLUS Kitchen & Bath Paint, a water-based acrylic latex paint. This product incorporates NANOTEK nanosized additives from Nanophase Technologies Corporation (Romeoville, Illinois), which are employed to lend greater density to the acrylic latex carrier. As the carrier dries, the nanoparticle additives help create a harder, more durable film that is resistant to water, mildew, fungal growth, stains and grease. In 2006, Behr introduced two additional nanoparticle-containing coatings: BEHR PREMIUM PLUS ULTRA, an exterior architectural paint designed to combine primer and paint in one step; and BEHR No. 875 Basement & Masonry Waterproofing Paint, an interior and exterior paint that employs nanotechnology to form an extremely strong adhesive barrier to stop water infiltration. These products, which are marketed by the company as part of the NANOGUARD product

TABLE V-2

COATINGS APPLICATIONS FOR NANOMATERIALS IN CONSTRUCTION (million dollars)

Item	2006	2011	2016	2025
Construction Coatings Demand	10695	12888	16818	22500
\$ nano/000\$ coating				
Nanomaterials in Coatings				
By Material:				
Metal Oxides				
Other				
By Market:				
Paint				
Windows & Doors				
Flooring				
Siding				
Lighting				
Roads & Bridges				
Other				
% coatings				
Nanomaterials in Construction	10	100	575	1750

**SAMPLE
TABLE**

"Coatings applications are one of the first areas in the construction market where nanomaterials are expected to establish a market presence. In 2011, coatings applications are projected to account for about three-quarters of nanomaterial demand in construction. In the following years, that percentage is expected to decline, although growth for nanomaterials in coatings applications will continue to register substantial growth, reaching ..."

--Section V, pg. 70

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OTHER STUDIES

World Nanomaterials

As nanomaterials reach the market, manufacturers of many types of products hope to avail themselves of the exceptional strength-to-weight ratios of carbon nanotubes and montmorillonite clay; the UV-blocking ability of titanium dioxide and zinc oxide; and other desirable properties of nanomaterials. This study analyzes the global nanomaterials industry with forecasts for 2011, 2016 and 2025 by product, market and region. The study also discusses R&D funding and activities and profiles leading industry players.

#2215 07/2007..... \$5500

World Cement & Concrete Additives

Global demand for cement and concrete additives will grow 5.1% annually through 2010. Gains will be fueled by the increased acceptance of additives in high-volume developing markets for cement, and by higher additive loadings and costlier product (e.g., superplasticizers) use in mature markets. This study analyzes the \$8.7 billion world cement and concrete additive industry to 2010 and 2015 by type, market, world region and for 24 countries. It also evaluates company market share and profiles major producers.

#2135 12/2006..... \$5400

World Flat Glass

Global demand for flat glass will rise 5.2% annually through 2010. Developing countries in Asia will show the strongest gains, especially China and India. The dominant construction market will grow the fastest, driven by greater use of value-added glazing products and by architectural trends favoring more natural lighting. This study analyzes the \$46.6 billion world flat glass industry to 2010 and 2015 by market, world region and for 20 countries. It also evaluates market share and profiles major players.

#2116 10/2006..... \$5500

Advanced Flat Glass

US demand for advanced flat glass will rise 5.9% annually through 2010. Growth factors include the emergence of smart glass and other technologies and strong gains in protective laminated glass. The best prospects are for solar control flat glass and other advanced flat glass products (e.g., heads-up display windscreens, self-cleaning glass). This study analyzes the \$5.8 billion US advanced flat glass industry to 2010 and 2015 by product and market. It also evaluates market share and profiles major players.

#2074 08/2006..... \$4200

Nanocomposites

US nanocomposites demand will reach 1.4 billion pounds by 2015 as nanomaterial and composite prices decline and technical issues are overcome. Initial growth will be in higher-priced resins such as engineered plastics and thermoplastic elastomers, but eventually nanocomposites based on commodity plastics will dominate. This study analyzes the \$311 million US nanocomposites industry to 2010, 2015 and 2020 by resin, market and nanomaterial. It also profiles major producers and evaluates market share.

#2042 03/2006..... \$4200

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