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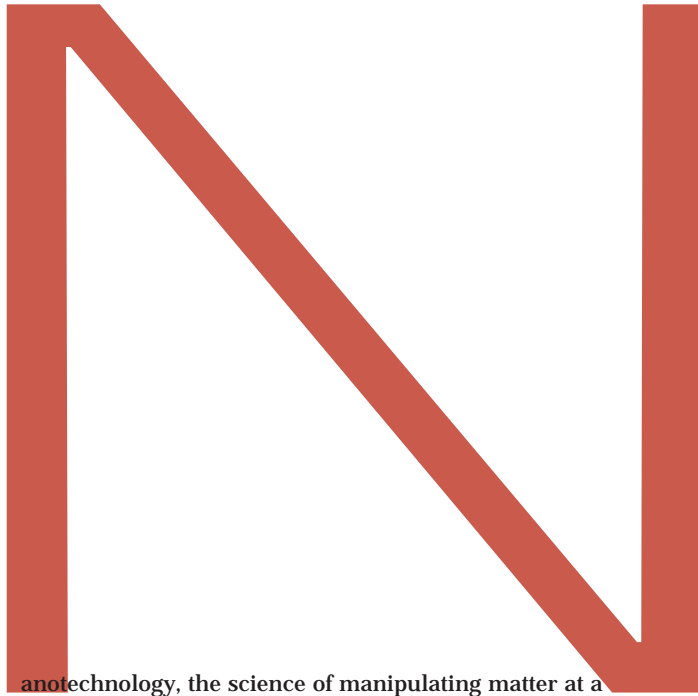
After decades of hype, interior designers and manufacturers finally are seeing the impact of nanotechnology in their daily work.

BY
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MIND OVER MATTER



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nanotechnology, the science of manipulating matter at a molecular level, is a revolution in the making. It already has improved stain resistance in textiles and the insulation properties of glass, and the implications for architects and interior designers are enormous as new and enhanced materials come on stream.

For leading research institutions across the world, this revolutionary new technology is the hot topic. As materials, science, biology, chemistry, computer science and functional technologies meet at the nanometer scale, exciting new products are being built from individual atoms. (One nanometer is one-millionth of one millimeter. In comparison, the diameter of a human hair is 50,000 times bigger.)

Nobel Laureate Physicist Richard Feynman first suggested that substances could be synthesized atom by atom in 1959. In 1981, K. Eric Drexler published the first scientific paper on molecular technology. That paper, combined with the development of scanning tunneling electron microscopes that allow researchers to see and move individual atoms, put nanotechnology on the fast track. Today nanotechnology-based products are a reality, and within 10 to 15 years, they are expected to generate billions of dollars worldwide.

In 1993, Charles L. Owen led a team of researchers in an early, award-winning project. In the project's report, "Nanoplastics: A Home System," Owen, Distinguished Professor Emeritus of the Institute of Design at the Illinois Institute of Technology, writes, "This radical new technology dramatically changes the way materials and products will be produced. It also mandates sweeping rethinking of how products will be designed and used. The ability for materials and products to intelligently alter form, texture, color and myriad other characteristics only hints at what nanotechnology portends."

Ana Maregatti, IIDA, President of Maregatti Interiors in Indianapolis, believes nanotechnology will make huge inroads into the interior design industry and will have an enormous effect on the way designers think. "We will be able to break free of the many rules imposed by product limitations," Maregatti says. "Because materials will have increasingly outstanding performance rates, we as designers can try new materials in places that may not presently be appropriate due to maintenance needs and the performance of the given material. If we could specify a hard surface such as a porcelain tile with acoustical components, for instance, or specify work and floor



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surfaces with total chemical resistance, the results would be terrific.”

Maregatti attended advanced technology workshops and recently installed nanotechnological fabric upholstery at the Purdue University Birck Nanotechnology Centre. “We wanted to learn everything we could about nanotechnology,” she says. “There are important lessons to be learned in the planning, design and construction of advanced technology facilities, such as nanoscale research. Nanotechnology is allowing many universities to build new buildings to further their research, which means more jobs for us as designers – and more requirements for us to design around in these facilities.”

Maregatti believes that although nanotechnology is still in its infancy, the possibilities are endless. Whether it be stain- and liquid-repellent

textiles, new paints and coatings with superior finishes or fabrics that change color and emit light, she says it will somehow affect everyone in the future. “If designers did not have to be so concerned about how materials perform and maintain, they could spend more energy developing new concepts and ideas for improving people’s lives through design solutions.”

NANO PRODUCTS

California-headquartered Nano-Tex was the first company to bring nanotechnology to the textile industry. Currently, more than 80 textile mills worldwide use Nano-Tex enhancements in products sold by more than 100 apparel and interior furnishing brands. Nano-Tex President of the Americas Renee Hultin says that while the interiors focus currently is on

resist-spills textiles, the company has pinpointed commercial interiors and home furnishings as future growth areas.

Nanotechnology has been a reality at Nano-Tex for the last five years, and the company now is seamlessly transitioning from the apparel sector into commercial interior products. “What this is bringing to the interior design market is far greater flexibility. Spill-resistant textiles mean lighter fabric colors can be chosen for environments that may previously have called for darker colors – or even vinyls – without compromising how a project looks long term,” Hultin says. “That in turn provides the end user with additional life-cycle costing benefits they would not have had in the past.

“One thing we like about this market is that value-added is very important to specifiers and end

users, and we think it could be a great opportunity for us to expand beyond repellent products to provide more benefits to interior designers," Hultin says.

Conrad Burke is not as likely to use the word seamless when describing his nanotechnology research. His Santa Clara, Calif.-based company, Innovalight, is refining photovoltaic processes for reducing silicon to nano-size, light-sensitive dots, which could revolutionize solar energy production. These flexible solar cells could be built into shingles or wrapped around surfaces in lieu of a solid glass panel.

Burke admits that "it's a roller coaster ride every day of the week" as the company strives to be the first to bring a commercially viable, nanotechnology-based solar energy solution to the marketplace. "Because of the solution-based capabilities of our

material, we want to be able to print very low-cost solar panels. Cost is a big part of the reason why the penetration of solar energy has been limited compared to fossil fuels. We've put our nose to the grindstone here – we've exerted a lot of pain and energy over the last two years – and we think we've developed a very good capability that could significantly impact people's lives. What's more, silicon is abundant and harmless."

THE NANOHOUSE

In an attempt to demonstrate the applications of nanotechnology and their interaction with conventional building and interior materials, Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and Sydney's University of Technology launched the Nanohouse

in 2002. The largely glass nanohouse features a range of nanotechnology-based products, including UV/IR filtering and reflecting windows to control unwanted solar heat; self-cleaning TiO₂ coated glass; UV-protective coatings on furniture; self-cleaning tiles; cold lighting systems for harvesting daylight; and heat-absorbent nano-particulate paints that are light-colored in the visible part of the spectrum.

Michael Cortie, Ph.D., says the portable Nanohouse generated a huge amount of international interest and has shown that real nanotechnology already is available for use in the construction industry. "Glass is the one material where nanotechnology has made a reasonable impact," says Cortie, Director of the Sydney's Institute of Nanoscale Technology at the University of Technology.



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—Michael Cortie, Ph.D., Director, Institute of Nanoscale Technology, Sydney, Australia

"In terms of energy efficiency — and as legislation requires housing to be more energy-efficient — architects and designers will need to invest a lot in nanotechnology-based materials. They'll need to look at every possible technology in an attempt to get an edge. Nanotechnology is moving fast, and there is a great deal of change ahead."

MATTERS OF SAFETY

As nanotechnology becomes embodied in hundreds of products, questions are being raised about its safety. Critics question everything from the health and safety risks of inhaling tiny nanoscale materials to the more dramatic (and unlikely) doomsday scenario of thousands of tiny nanomachines escaping laboratories and self-replicating.

Cortie says there always will be

critics of technology, but he believes there is nothing uniquely different or dangerous about nanotechnology. "Some people have put it in with genetic modification and nuclear power, but it is fundamentally more mundane than that," he says. "Nanotechnology at the moment doesn't have anything self-reproducing or toxic about it."

"The only thing in nanotechnology which may or may not have a credible hazard is carbon nanotubes," Cortie says. "Could they be the asbestos of the future? Could they be inhaled? Could they affect the lungs? It's hard to say at this point. We all know that any material that presents as tiny fibers or a dust can have respiratory implications, but that is the only hazard I'll concede to in nanotechnology. All the rest is science fiction."

In his book, *Unbounding The*

Future: The Nanotechnology Revolution, Drexler tackles the issue of nanotechnology safety. "Some truisms: Almost any technology is subject to use, misuse, abuse and accidents," Drexler writes. "The more powerful the technology is when properly used, the worse it is likely to be when abused. Any powerful technology in human hands can be the subject of accidents. Nanotechnology and molecular manufacturing will be no exception."

More than with any other technology, research is being used to understand nanotechnology's potential dangers. Organizations like the Woodrow Wilson International Center for Scholars and the U.S. National Institute for Occupational Safety and Health are researching risks and drawing up guidelines for working with nanomaterials. In that regard, the nanotechnology sector already is ahead of the game.