

Calif. region is epicenter of U.S. nano-revolution

August 27 2009, By Steve Johnson

The San Francisco Bay Area has become the nation's hot spot for a microscopic technology that's already being used for everything from keeping drill bits sharp to extending the usable life of cooking oil, and that one day may help detect food-borne pathogens, kill cancer and make objects invisible.

One-tenth of the 1,218 companies, universities and other entities in the country that have jumped into the fast-growing field known as [nanotechnology](#) are in or around [Silicon Valley](#), according to a new study by the nonprofit Woodrow Wilson International Center for Scholars in Washington.

"The Bay Area is the epicenter of the nano-revolution in the U.S.," said David Rejeski, who directs the center's Project on Emerging Nanotechnologies in collaboration with Pew Charitable Trusts. "This is how we're going to make things over the next 50 to 100 years. This is huge economically."

A lot of other people agree.

The federal government, convinced that the potential for microparticles is huge, in 2001 launched the National Nanotechnology Initiative, which so far has committed nearly \$12 billion to further the technology. That money, plus billions more invested by the private sector, has generated a market that is growing with remarkable speed.

In 2007, the value of nanotech-enabled products worldwide totaled \$147 billion, according to market-intelligence firm Lux Research. This year, it's estimated to hit \$254 billion and by 2015, \$2.5 trillion.

Yet most consumers have no idea of how they are being impacted by the tiny particles. That's because, being small, nanotechnology "works behind the scenes," said Lux senior analyst Jurrion Bradley.

Indeed, more than 600 products on the market already incorporate some nanotechnology. The term refers to the production or use of materials ranging in size from 1 nanometer -- which is one-billionth of a meter, or about 100,000 times thinner than a human hair -- to 100 [nanometers](#).

Carbon nanometer-scale structures called nanotubes, which are much stronger and lighter than steel, are used to make tennis rackets and bicycle frames. Some sunscreens use nanobits of titanium dioxide and zinc oxide to block ultraviolet radiation without making a person's skin look pasty white.

Food storage containers have been made of nanoscale silver to ward off unwanted microbes, while other nanoparticles have been used to make long-lasting batteries, stain-resistant clothes, more efficient auto exhaust systems and hard-to-scratch eyeglasses.

In Silicon Valley, semiconductor companies have steadily reduced the size of their microchip components to where advanced microprocessors contain hundreds of millions of transistors, each just 45 nanometers wide. A chip with 32-nanometer transistors is expected to be introduced soon. And last week, IBM researchers in San Jose said they are making progress using DNA to make a chip with transistors that are much smaller than those available today.

Tiny electronics are only part of what the Bay Area is developing. Other

nanotech applications being explored in the region range from new drugs and structural materials to energy and environmental products.

A Santa Clara firm called sp³ Diamond Technologies sells coatings made from nano-size diamond dust to help prevent microchips from overheating and to keep drills and other cutting tools sharp, said Dwain Aidala, the company's chief operating officer.

Nanosolar of San Jose makes solar panels that the company claims are more cost-effective than panels made from other materials. And OilFresh of Sunnyvale uses nanotechnology to make a specially designed ceramic pellet, which, when placed in a restaurant fryer, helps the oil cook faster and "can extend the usable life of the oil," said company founder and CEO Sonny Oh.

That could be just the beginning. Researchers across the country are studying the possibility of using nanoparticles to hunt out and kill tumors, clean up chemical waste sites and spot dangerous bacteria or other substances in food.

Some scientists have even experimented with nanomaterials that "bend light and may one day be able to create an 'invisibility cloak,'" according to the National Technology Initiative.

Not everyone is ecstatic about the trend. Environmentalists have voiced fears that nanomaterials could pose serious health threats, and the National Research Council in December issued a report saying the government has failed to fully assess such risks. To determine the potential danger of using carbon nanotubes, California's Department of Toxic Substances Control in January asked companies involved in the technology in the state to report any problems the tiny materials may have caused and how the firms are monitoring the particles' safety.

Lloyd Tran, president of the San Jose-based International Association of Nanotechnology, said his group is working to resolve concerns. Given the benefits the technology can offer, he added, "I feel confident that nanotech companies have very positive upside potential."

TOPS IN NANOTECHNOLOGY

Here are the metropolitan areas with the most nanotech entities.

San Francisco: 48

Boston: 48

San Jose, Calif.: 46

Raleigh, N.C.: 34

Middlesex-Essex, Mass.: 31

Oakland, Calif.: 30

San Diego: 27

Seattle: 25

Austin, Texas 24

Houston 24

Source: Woodrow Wilson International Center for Scholars" Project on Emerging Nanotechnologies

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