

Eikos inks totally nanotubular deal with Japanese firm

By **ETHAN FORMAN**
STAFF WRITER

Eikos Inc. has cooked up a transparent coating of carbon nanotubes, a breakthrough that could mean flexible displays for laptops with screens that roll up.

The screens may also be used by the military to create wearable, lightweight, flexible displays for soldiers in the field.

Eikos, an 18-person company in a 15,000-square-foot facility in Franklin, said it has begun to make and deliver its Invisicon Carbon Nanotube Technology ink.

Chief executive officer Joe Piché says this see-through conductive carbon nanotube ink can be used for circuits and coatings and could revolutionize computer and television displays.

The ink has become the focus of the company's efforts. It is now trying to clear the production specifications of Japanese manufacturers.

"We started out the company thinking this would be one of the products that we would work on, but it has pretty much devoured much of the company," Piché said.

Carbon nanotubes are rolls of graphite molecules about 10,000 times as thin as human hair. These tubes of hexagonal-shaped molecules can come in varying lengths and can be capped at one end.

Nanotech

Eikos Inc.

Business: Carbon nanotube ink
CEO: Joe Piché
Employees: 18
Location: Franklin
Web: www.eikos.com

A Japanese scientist, Sumio Iijima, discovered them in 1991, Piché said.

Nanotubes can behave as conductors and semiconductors, and they can conduct heat depending on how the structures were rolled.

These structures are some of the strongest on the periodic table, Piché said.

While some companies are trying to develop them into small and powerful computer processors, Piché said his



Joseph Piché, left, and Paul Glatkowski of Eikos Inc. display a sheet of transparent plastic that has been coated with Eikos' Invisicon carbon nanotube ink.

STUART GARFIELD PHOTO

company went after "low-hanging fruit" by using them in a coating.

"I think we have touched upon what is probably going to become the first significant use of carbon nanotubes," said Piché, who founded the company in 1996.

Eikos ink can conduct electricity. Its carbon nanotubes are used by the U.S. Army, the National Aeronautics and Space Administration and other government agencies to create electromagnetic radiation shields, electrostatic discharge film and other uses.

Piché said it could serve as a replacement for indium tin oxide used in flat screen monitors, laptop screens and television sets. Stare at a laptop's screen and you are staring through layers of indium tin oxide, Piché said.

"It turns the pixels on and off," Piché said.

This brittle glass-like material is an excellent conductor but has its shortcomings. Plus, the creation of indium tin oxide involves the use of toxic heavy metals, he said.

Piché said carbon nanotubes might help create a display that rolls up.

He said the idea is known in the industry as the "Val Kilmer display," based on a device the actor wore in the science-fiction movie *Red Planet*, a laptop whose screen rolls up, Piché said.

Eikos is not the only company working on this problem.

Philips Polymer Vision, a division of Netherlands-based Royal Philips Electronics, has made advances in its flexible rollup displays, which are monochrome and use technology from E Ink Corp. The goal is to create a device for mobile device users, the company's website says.

Eikos has caught the attention of researchers at the U.S. Army Flexible Display Center at Arizona State University, a \$43.7 million center established last year.

"We are very intrigued by the technology, interested in working with Eikos in a partnership where they would continue to improve their materials for flexible display applications," said Greg Raupp,

director of the center and a chemical engineering professor. "We would work at the Flexible Display Center to learn how to pattern and process it for flexible display applications."

Eikos has licensed its technology to Takiron Co. Ltd. in Japan, an affiliate of Itochu Corp., a maker of plastics including transparent electromagnetic wave shielding and anti-static plates.

Itochu International Inc., Itochu's U.S. subsidiary, last year poured \$1 million into Eikos.

In May 2004, the company was awarded \$860,000 from the U.S. Air Force Research Laboratory for conductive polymers for aircraft canopies.

Another equity investor in the company is JFC Technologies of New Jersey.

A second Japanese company has also licensed the technology, but Piché would not name it.

"This one company that is licensing (it) is going full-bore (and) has set up an entire plant in Osaka just to manufacture this product," Piché said.

With the ramp-up, the company plans to hire more people.

Paul Glatkowski, the company's vice president of engineering, invented the Invisicon CNT ink after the company won an Army contract to evaluate the use of carbon nanotubes as an electromagnetic shielding material.

Glatkowski, Piché said, figured that an extremely thin layer of carbon nanotubes spread on a piece of transparent plastic would itself be see-through. His theory turned out to be correct.

Eikos does not make the carbon nanotubes but rather buys them and then uses a special process to purify them and create its coatings. The company has 75 patents pending on its work, Piché said.

While the company has focused on the development of its carbon nanotubes for displays, it has won a \$1.5 million contract from the Department of Energy to see if carbon nanotubes could be used to coat the electrodes of solar arrays.

That would allow those panels to become cheaper, flexible and lightweight, Piché said.

NEHI nudges health care system on diabetes

By **DYKE HENDRICKSON**
SENIOR STAFF WRITER

It's said that the U.S. health care system is one of the most unwieldy institutions in the U.S. economy.

But that isn't stopping the New England Healthcare Institute from trying to encourage innovation.

The Cambridge-based group recently released a report with recommendations on ways to limit the cost of treating diabetes for the patient and for the health care system.

Organizers focused on glucose monitoring in diabetes and are launching an initiative to urge doctors and patients to monitor glucose levels more closely so that larger problems don't develop.

"Studies have demonstrated that tight blood glucose control can decrease the risk of complications," said Valerie Fleishman, vice president of research for the non-profit organization.

"But only about 37 percent of patients are achieving an adequate degree of control. We want to bring

stakeholders together to improve that."

NEHI is an organization whose goal is to lower the cost of health care while bringing innovation to the bedside. Its administrators are visionaries, not physicians. It releases "action" reports several times per year in an effort to generate changes in key medical arenas.

Life Sciences

Its December report, for instance, focused on computerized physician order entry. NEHI concluded this form of data posting could save the state \$275 million annually in health costs.

Authors allowed, however, that it would cost close to \$210 million to install a workable system on a statewide basis. NEHI's most recent report declares the cost of diabetes can be lowered if all "stakeholders" get involved.

Industry analysts say that more than 18 million Americans are afflicted with diabetes. The cost of

treating it consumes more than 12 percent of the U.S. health care budget.

One way that NEHI, founded in 2002, hopes to control diabetes costs is through greater education. NEHI leaders are urging stakeholders to work together to address such practical matters as reimbursement, physician adaptation and patient education.

Stakeholders include hospitals, insurers, medical professionals and the patients themselves. A key stakeholder is the medical device industry, which someday could provide tools for more effective monitoring.

One such company is Sontra Inc., a Franklin company whose technology involves ultrasound to permeate the skin.

Sontra is developing a product that would allow a diabetes patient to monitor glucose levels through a device that would wirelessly send glucose readings from the patient's body to a printout device carried in a pocket.

"Diabetes is hugely expensive," said Tom Davison, chief executive officer of Sontra. "If it's not closely monitored, it can result in blindness, kidney failure and even death."

"With the Bayer Corp., we are developing a continuous, non-invasive glucose monitor. It would cut down in skin pricks a patient has to do and provide accurate information that could be acted on immediately."